

Guide for the evaluation of agroecology

A method for assessing its effects and
the conditions necessary for its development

Under the coordination of **Laurent Levard**



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This methodological guide is the result of collaboration between:

- the Working Group on Agroecological Transitions (GTAE), which is made up of Agrisud International, Agronomes et Vétérinaires Sans Frontières (AVSF), the Centre for International Actions and Achievements (CARI) and GRET;
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The Working Group on Agroecological Transitions (GTAE)

Agrisud International, AVSF, CARI and GRET are four French NGOs whose professional action to promote sustainable development focuses largely on agroecology. These organisations support peasant and family farming, and defend and promote agroecology in different contexts to develop territories for rural populations. Together with their partners throughout the world, they have confirmed practical experience in various fields. They have published on the subject and are often involved in and invited to contribute to the national and international public debate on the agroecological transition.

In January 2016, Agrisud, AVSF, CARI and GRET set up the GTAE working group, which focuses on the agroecological transition. The objective was – together with the world of research and based on their own experiences in cooperation with their partners in developing countries, farmers' organisations and NGOs – to carry out work to validate the conditions necessary for successful agroecological transition and measure the effects and impact of agroecology in order to contribute, ultimately, to the desired change of scale. Drawing on its analysis of these experiences and their findings, the group wanted to increase its capacity for policy dialogue in order to strengthen existing collective advocacy for agroecology led by civil-society organisations both nationally and internationally.

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Introduction

Agroecology is increasingly emerging as one of the pertinent responses to major global challenges in terms of economic and social development and the environment, largely reflected in the UN's Sustainable Development Goals (SDGs): improvement of the performance of food and agricultural systems, food and nutrition security, the environment, climate, employment, migration, and vulnerable rural populations' resilience and adaptation to climate change.

The term "agroecology" was not coined until the 1920s, but agroecological practices and systems – although they are not always studied and referenced – are not new. Peasant and family farms¹ implement, to a smaller or larger degree, practices and systems that may be considered agroecological, i.e. they make it possible to reproduce the cultivated ecosystem and protect the environment, while also being economically viable and socially acceptable.

In the 1960s and '70s agroecology, as a science, became more widespread in scientific communities, as well as among farmers' organisations and civil-society organisations that wanted an alternative agricultural model to the one largely disseminated by the Green Revolution.

This is why initiatives – by NGOs, farmers' organisations, professional agricultural organisations, research centres, academic institutions, companies and public institutions – are being developed to support transition processes by promoting and supporting agroecological practices and systems. Most of these stakeholders, however, still lack the tools needed for evaluating the economic, social and environmental effects of agroecology, and for better understanding how certain factors facilitate or hinder its development.

Scepticism is sometimes expressed as to whether agroecology is a suitable solution in response to the challenges currently faced. These concerns are felt by decision-makers and throughout the agricultural community. Numerous evaluations and one-off studies have been conducted in recent years, but these often cover only a narrow spectrum of agrosystems, territories and practices. They are scattered, partial, incomplete or conducted using different methods and tools.

1. In this Guide, the concept of "agriculture" covers both crop and livestock production. A farm may therefore have livestock-production activities in addition to other activities, or it may be entirely devoted to livestock production. Likewise, a farmer may be someone who raises livestock either exclusively or in addition to other activities.

Systematic references produced using a robust common methodology are still lacking. Demand for reliable, aggregate data on the effects and conditions necessary for the development of agroecology, however, is on the rise among political decision-makers, farmers and development stakeholders.

It is against this backdrop that GTAE's member organisations – Agrisud International, AVSF, CARI and GRET – conducted joint work on the evaluation of agroecology with their academic and research partners: AgroParisTech, CIRAD, IRD and Institut Agro Montpellier.

An initial framework for evaluating agroecological practices and systems was defined under the Calao project, which sought to capitalise stakeholders' experiences for the development of resilient agroecological techniques in West Africa. The project was implemented in 2017 in three West African countries (Burkina Faso, Senegal and Togo) in partnership with AgroParisTech and various universities and NGOs, with support from the Economic Community of West African States (ECOWAS) and AFD. This initial experience led to the publication of a report².

The approaches and methods used by different stakeholders to evaluate agroecology were presented and discussed at a methodological workshop organised in Paris in December 2017, with support from AFD and the French Facility for Global Environment (FFEM)³.

Drawing on the experience of the Calao project and the results of the methodological workshop, GTAE, AgroParistech, CIRAD and IRD produced a *Handbook for the Evaluation of Agroecology*, which was published in 2019, and later translated into English and Spanish.

The methodological approach proposed in the handbook was implemented in a number of areas under the Oscar project⁴ (Burkina Faso, Cambodia, Ecuador, Haiti⁵) and as part of a project carried out for the Agricultural Water Scientific and Technical Committee (COSTEA) (Algeria, Cambodia, Senegal⁶), both funded by AFD.

These experiences made it possible to test, validate and improve the method, and prepare this Guide for the Evaluation of Agroecology. The fieldwork that was carried out also provided practical examples of how to apply the method.

2. Levard and Mathieu, 2018.

3. Berton S. *et al.*, 2018.

4. Strengthening civil society organisations for successful agroecological transitions.

5. The areas in question are: Burkina Faso, villages of Guiè and Douré, in the Sahel area, under the Sharing the Sahelian Bocage (*Bocage sahélien en partage*, BSP) project supported by ECOWAS; Cambodia, Siem Reap region, as part of the Apici project, with support from the Hauts-de-Seine Departmental Council; Ecuador, Pillaro canton, in the Andes region, under the project supported by Fondation Ensemble; Haiti, commune of Saint-Raphaël, as part of the Agricultural Research-Training-Extension Programme on Adapting to Climate Change in the commune of Saint-Raphaël, in Haiti's Nord department, with support from the Inter-American Development Bank.

6. Project coordinated by AVSF in collaboration with CARI, GRET, CIRAD and local partners (APEB, Torba, Cread for Algeria; Enda Pronat and ISRA for Senegal; UBB for Cambodia) to study the performance of agroecology and the conditions necessary for its development in different irrigated systems. The areas in question are: Algeria, large agricultural water project in the Mitidja plain and irrigated oasis agriculture in the M'Zab valley; Cambodia, two zones with a predominant focus on irrigated rice production in the Battambang region, with varying levels of water control; Senegal, market gardens in the Niayes region and large agricultural water project managed by SAED in Guédié (<https://www.comite-costea.fr/actions/agroecologie/>).

PURPOSE OF THE GUIDE

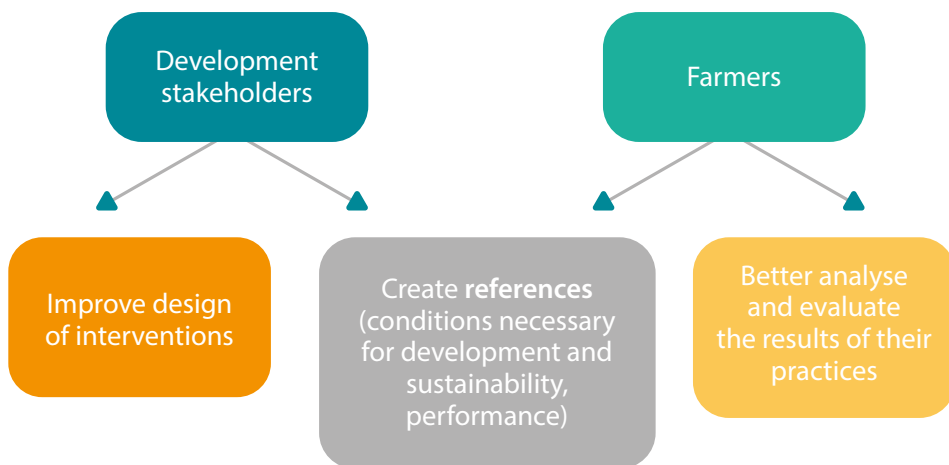
This Guide has three objectives.

The first is to help development stakeholders **improve the design of their interventions** (projects, programmes, public policies) in favour of agroecology. Evaluating agroecology makes it possible to identify which agroecological practices and systems to promote and which systems to implement with a view to supporting, advising and working with farmers. The evaluation may be conducted before an intervention, during an intervention to implement corrective or incentivising measures (adjustments to the intervention system), or in preparation of or with a view to future interventions. The evaluation is therefore a tool that development stakeholders can use to help them guide interventions and make decisions.

The second objective is to **create references** on the agro-environmental, economic and social performance of agroecology, and on the conditions necessary for its development and sustainability. This objective may be of interest to development stakeholders and farmers alike. References are useful for better assessing the usefulness of agroecology and identifying which measures to take in order to promote and facilitate the development of agroecology, particularly among public authorities.

The third objective is to work with farmers to help them better **analyse and evaluate the results of their practices** so that they can make more informed decisions regarding possible technical and economic changes that would be more or less strategic. The evaluation is therefore a decision-making tool for farmers.

Figure 0.1. Users and objectives of this Guide.



OBJECTIVE

The overall objective of this Guide is to offer an approach and methodological tools for assessing the effects of agroecological practices and systems on the agro-environmental and socio-economic performance of agriculture, and for assessing the conditions necessary for the development of those agroecological practices and systems.

With regard to evaluating the **effects of agroecological practices and systems**, the areas in which these practices and systems are likely to have an impact, and for which an evaluation method is proposed, are as follows:

- agro-environmental: crop yields, soil health, water-management performance at plot level, regulation of bio-aggressors, agricultural biodiversity and reduction of exposure to pesticides;
- socio-economic: crop and livestock yields, economic performance from the farmer's point of view, value chains and organisation of trade, the attractiveness of agriculture for young people, job retention and creation, autonomy, food security, farm resilience and ability to adapt to climate change⁷.

Where relevant, this Guide proposes methods for evaluating effects differentiated according to a gender-specific approach, with particular attention given to gender equality.

With regard to the **conditions necessary for the development of agroecological practices and systems**, this Guide presents a set of factors to be analysed, as they are likely to play a role in facilitating or hindering the implementation of agroecology on farms and within territories, depending on the context.

Four comments may be made on the formulation of this overall objective.

- An agricultural practice never exists in isolation: it is part of a **coherent set of practices forming a system** (crop-production system, livestock-production system, agricultural production system, agrarian system). That is why it is systems, above all, that are evaluated, not just specific practices. The agricultural production system, for its part, includes all activities in connection with the production and marketing of agricultural products, as well as on-farm storage and processing (where applicable).
- When defining an agroecological practice or system, we start from the idea that agroecology complies with a certain number of principles. The FAO has defined ten elements of agroecology⁸. Practices and systems may vary in how well they comply with the principles of agroecology as a whole, or they may comply closely with some principles and less closely to others. That is why, instead of referring to **practices or systems as being agroecological or non-agroecological**, we prefer to refer to them as being more agroecological or less agroecological. In this Guide, we present the principles of agroecology that we use, as well as a grid that can be used to define how closely a particular farm complies with these principles (see [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms).
- Some of agroecology's economic and social effects (improvement in power relations for farmers in value chains, empowerment of women, etc.) result less from agroecological practices and systems as such, than from the **social and institutional dynamics** that support and enable their development (creation or strengthening of farmers' organisations or organisations providing support, etc.). In this Guide, we have decided to limit ourselves to the **effects of agricultural practices and systems as such**, even though it is not always possible to clearly differentiate between what results from the development of agroecological practices and systems, and what results from social and institutional dynamics.

7. Crop yield may be considered as both an agro-environmental and socio-economic criterion.

8. Diversity, co-creation and sharing of knowledge, synergies, efficiency, recycling, resilience, human and social values, culture and food traditions, responsible governance, circular and solidarity economy (FAO, 2018).

- “Development of agroecology” refers to **all of the processes for testing, adapting and expanding agroecological practices and systems** at different levels – from plot, livestock-production activity and farm as a whole, up to territorial level. The dynamics of the development of agroecology include agroecological-transition processes, i.e. the transition from systems that are non-agroecological or slightly agroecological to systems that are substantially agroecological.

Agroecology is likely to have essential effects for which no evaluation methods are proposed in this Guide. Examples include its effects and impacts on carbon sequestration and climate-change mitigation on the one hand, and human health on the other. Such evaluations would require systems that are much larger, more complex and longer-lasting than the ones proposed in this Guide. These evaluations are generally carried out as part of studies conducted by scientific teams, and the evaluator may supplement his/her evaluation with a desk review of documents focusing on these questions. The evaluation of effects in terms of exposure to pesticides (see [Evaluation Sheet 6](#), Reducing exposure to pesticides) and food security (see [Evaluation Sheet 14](#)), however, provides important information for the evaluation of effects and impacts on human health.

All of the criteria proposed in this Guide for evaluating agro-environmental and socio-economic effects contribute to the SDGs defined by the United Nations, and more specifically to the goals appearing in Figure 0.2.

Figure 0.2. Main SDGs supported by the proposed evaluation criteria.



Focus

Specificities of the proposed methodological approach

A growing number of scientists and development stakeholders are taking interest in the evaluation of agroecology, such as the FAO with the TAPE tool for evaluating the performance of agroecology, which GTAE, CIRAD and IRD helped develop⁹.

This Guide draws on various pre-existing methodological tools that have been adapted to the objective of evaluating the effects and conditions necessary for the development of agroecology. The main characteristics of the proposed method are as follows:

- the proposed methodological tools fall under one of the two general approaches (general approach for one-off evaluations, and approach for monitoring and evaluation);
- the method takes into account the evaluation of agro-environmental effects, socio-economic effects and conditions necessary for the development of agroecology;

9. FAO, 2021.

- it was decided to conduct an in-depth study of the different farms and plots (case studies), which requires a small, and therefore purposive, sampling;
- the typology of farms used for sampling and for making comparisons draws on the general characterisation of farms, and not solely on how agroecological they are;
- the characterisation of the degree of agroecologisation of farms draws solely on the principles of agroecology that characterise the agricultural practices and systems themselves (biodiversity, synergies, recycling of elements, etc.), and not on those that characterise more the conditions necessary for the development of agroecology (responsible governance) or the effects of agroecology (resilience). The generic grid used to characterise the degree of agroecologisation also needs to be adapted to each context.

STRUCTURE OF THIS GUIDE AND INSTRUCTIONS ON HOW TO USE IT

This Guide is divided into **three parts**.

The first part presents the **general approaches** for one-off evaluations and for monitoring and evaluation, with three chapters: [Chapter 1](#) covers general methodological principles, [Chapter 2](#) covers the general approach for one-off evaluations, and [Chapter 3](#) covers the general approach for monitoring and evaluation.

The second part consists of various **evaluation sheets** covering different aspects that are likely to be impacted by agroecology and that should therefore be evaluated. These evaluation sheets are grouped together in three chapters covering the agro-environmental evaluation ([Chapter 4](#)), the socio-economic evaluation ([Chapter 5](#)) and the evaluation of the conditions necessary for the development of agroecology ([Chapter 6](#)).

The third part consists of eight **tool sheets** providing methodological supplements needed at certain stages of the approach for one-off evaluations or the approach for monitoring and evaluation.

Depending on the situation, the evaluator may refer to [Chapter 2](#) (General approach for one-off evaluations) or [Chapter 3](#) (General approach for monitoring and evaluation), bearing in mind that monitoring and evaluation also follows the approach for one-off evaluations at certain key stages (baseline situation, final evaluation, and potentially an interim evaluation). And regardless of the situation, the evaluator must familiarise himself/herself with the general methodological principles outlined in [Chapter 1](#) (General methodological principles).

The evaluator will also use various evaluation sheets and tool sheets, depending on the stage and specific objectives of the evaluation.

With regard to the evaluation sheets, it is not possible (owing to time constraints) to expect to evaluate the effects of agroecology on all the aspects for which an Evaluation Sheet is proposed. It is essential to evaluate the effects of agroecology on certain aspects, while it is optional for other aspects (for more details, see [Chapter 1](#), General methodological principles).

With regard to the tool sheets, three of them mention additional documents available on the internet¹⁰, which the evaluator may use: [Tool Sheet 4](#), Grid for analysing issues linked to a key feature of the territory, [Tool Sheet 7](#), Presentation of the spreadsheet for automated economic calculation and its user manual, and [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms.

10. These files are available for download on the websites of Éditions du Gret and Éditions Quæ.

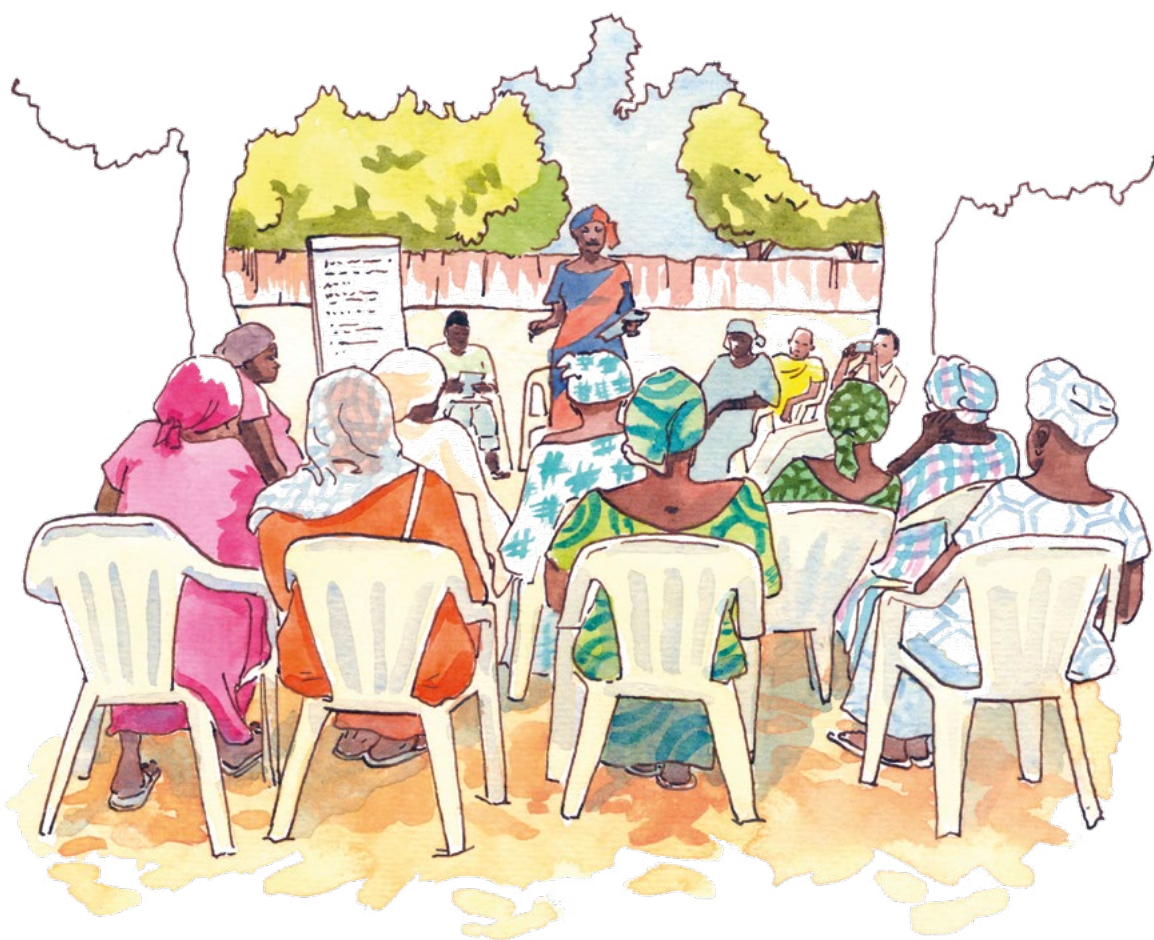
General approaches for one-off evaluations and for monitoring and evaluation



1

CHAPTER

General methodological principles



This chapter presents the general methodological principles for one-off evaluations and for monitoring and evaluation, i.e. the evaluation's objectives and situations of use, as well as four key aspects of the methodology: the comparative approach, consideration of different scales, consideration of impacts on gender equality, and the participative approach.

EVALUATION OBJECTIVES AND SITUATIONS OF USE

Objectives

As stated in the introduction, the overall objective of evaluating agroecology is to assess:

- its effects on the **agro-environmental and socio-economic performance** of agriculture;
- the **conditions necessary for its development**, i.e. the factors that facilitate or hinder its implementation on farms.

The specific objectives refer to aspects for which one wishes to evaluate the agro-environmental and socio-economic effects of agroecology. An evaluation sheet for each aspect is provided in this Guide (see Introduction).

It is not possible to expect to evaluate the effects of agroecology on all the aspects for which an evaluation sheet is provided. Nor would it be relevant, as the effects to be evaluated depend on the specific context of each territory, and on the specific expectations of the sponsors who commissioned the evaluation and local stakeholders. It is therefore the specific objectives of the evaluation and the specific issues affecting the territory that determine which aspects to focus on, and therefore which evaluation sheets the evaluator will use. The evaluation of certain aspects, however, seems indispensable: yield according to stakeholders (see [Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders), economic performance from the farmer's point of view (see [Evaluation sheets 8 and 9](#)) and, in most situations, the conditions necessary for the development of agroecology (see [Chapter 6](#)). The evaluation of other effects is optional and should be assessed in accordance with the specific objectives of the evaluation and available resources. For the socio-economic evaluation, it is generally recommended to examine the effects on at most two or three additional aspects, in addition to the indispensable aspects. For the evaluation of agro-environmental effects, it is recommended to focus on a maximum of three or four aspects.

Two situations of use

This Guide may be used in two different situations.

- A **one-off evaluation** may be conducted before, during or after an intervention to evaluate practices and systems at a given point in time T , following the approach for one-off evaluations presented in [Chapter 2](#).
- A **monitoring-and-evaluation system** may be put in place to monitor and evaluate the evolution of the agroecological practices and systems promoted by an intervention (project, programme or public policy) throughout that intervention, following the approach for monitoring and evaluation presented in [Chapter 3](#).

Focus

Evaluating agroecological practices and systems versus evaluating an intervention

Evaluation of agroecological practices and systems must be differentiated from evaluation of an intervention (project, programme or public policy).

Agroecological practices and systems can be evaluated independently of any intervention. In addition, the standard evaluation of an intervention includes a certain number of criteria that have been established as benchmarks for the evaluation of development projects: relevance, effectiveness, efficiency, impact, sustainability, etc., which is not the case for the evaluation of agroecological practices and systems, even when conducted as part of an intervention.

The evaluation of agroecological practices and systems may, however, contribute to the evaluation of an intervention if:

- one of the intervention's objectives is to promote agroecological practices and systems: the evaluation of their effects thus contributes to the evaluation of the effects of the intervention itself;
- the analysis of the conditions necessary for the development of the agroecological practices and systems promoted by the intervention helps explain how pertinent, effective, efficient and sustainable it is.

KEY ASPECTS OF THE METHODOLOGY

Implementing a comparative approach

One essential aspect of the proposed methodological approach is the systematic attention given to the **differences between land-use patterns and between farms with varying degrees of agroecologisation**, and the attempt to find **the reason behind these differences**. This is why the proposed method falls within the comparative agriculture approach¹. The aim is to:

1. For more on the comparative agriculture approach, see Cochet, 2016.

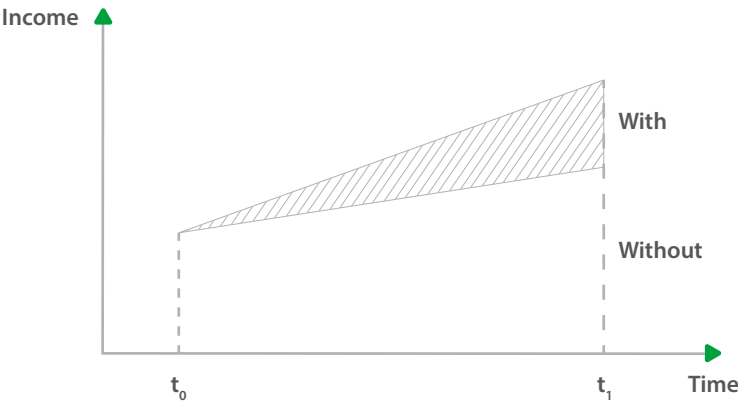
- evaluate and compare the differences in the results and performance of these land-use patterns and farms with varying degrees of agroecologisation;
- figure out why farmers make different choices and, ultimately, understand the conditions necessary for the development of agroecology, i.e. the factors that facilitate or hinder its development.

The evaluation of the effects of agroecological practices and systems is therefore based on comparing farms, plots or herds where certain agroecological practices and systems are implemented with “benchmark” farms, plots or herds where such practices and systems are not implemented (the “control group”). In the approach for one-off evaluations (see [Chapter 2](#)), the comparison is made at a given point in time T . In the approach for monitoring and evaluation (see [Chapter 3](#)), the focus is on the farms’ trajectories of change compared with a baseline situation. It is important to compare, both during and at the end of an intervention, the trajectory of farms that implemented these practices and systems with the trajectory of farms that were initially similar but that were not beneficiaries of the project (or programme or public policy). It is not sufficient to compare the situation of beneficiary farms “after a project” with the same farms “before a project”, because some of the changes occurring between these two periods may be attributable not to the intervention but rather to other factors such as the climate, the economic and institutional environment, or agricultural policies (see Figure 1.1A). Basing an evaluation on a simple comparison of beneficiary farms “before” and “after” an intervention would create a bias in the evaluation (see Figure 1.1B).

Another bias may be created in relation to the group of benchmark farms. It should be noted, first of all, that when a monitoring-and-evaluation system relating to a project (or programme or public policy) is implemented, it is possible, prior to the intervention, to identify a comparable group of farms which supposedly will not be beneficiaries of the actions and which will serve as a benchmark group for the comparative evaluation at the end of the intervention. But if there is no monitoring-and-evaluation system, or if it is not possible to know which farms will be beneficiaries and which ones will not be beneficiaries of the project, then the benchmark group can only be defined a posteriori. This definition needs to be made carefully, as there is a risk of choosing, as a benchmark group, farms that were not identical to the beneficiary farms at the start of the intervention (see Figure 1.1C).

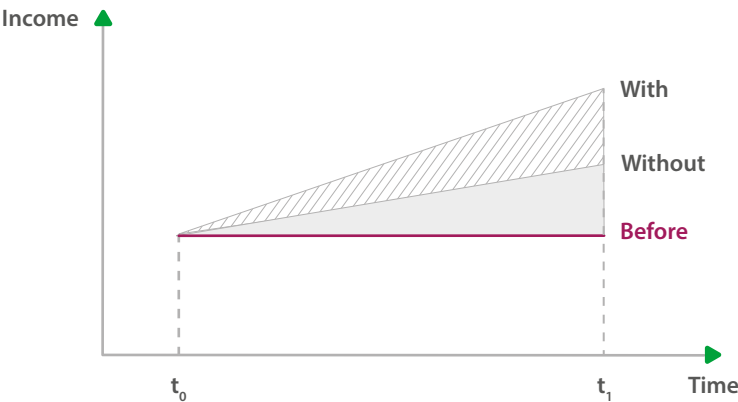
Figure 1.1. Comparative approach, trajectories of change and baseline situation.

A. Evaluating the effects [differential with or without project]

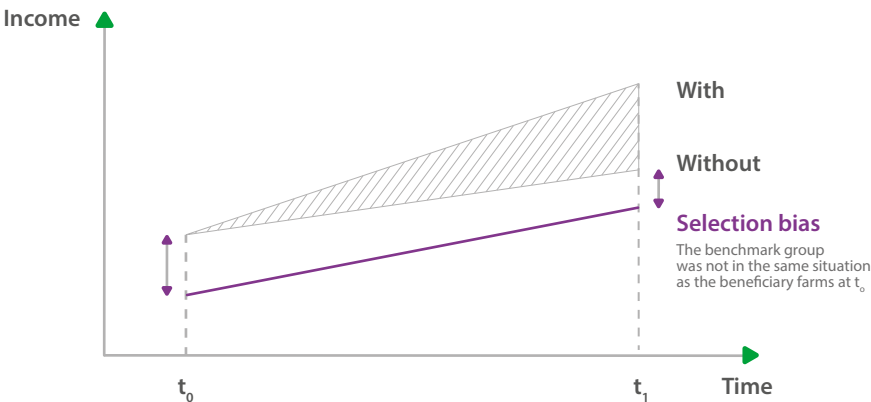


Mistakes to avoid:

B. Using the initial situation as a baseline situation



C. Introducing a selection bias in the choice of comparison group



Analysing at different scales

We refer to “agroecological practices and systems” because a practice is generally not carried out in isolation and is accompanied, most of the time, by other agroecological practices within a larger system, whether on the scale of a plot, herd, farm or territory. These scales of analysis must therefore be taken into account. To do this, the evaluation uses concepts that make it possible to understand the links between the various elements of the reality at these different scales, i.e.:

- crop-production activity and cropping system on the scale of a plot (or group of plots);
- livestock-production activity and livestock-production system on the scale of a herd;
- agricultural production system on the scale of a farm;
- water system on the scale of an irrigated scheme or watershed;
- agrarian system on the scale of an agricultural region;
- food system on the scale of a territory, which may be large or small.

These different scales are particularly important to understand because they are closely connected, particularly if focusing on the conditions necessary for the development of agroecology: a facilitating or hindering factor at territory level may have an impact on the development of a practice at farm level. Moreover, the results of the evaluation of a particular practice may depend on the scale. For example, an agroecological practice where organic matter is transferred between farms may have a positive impact on the fertility of the plots on the farms receiving the organic matter, and a negative impact on the fertility of the plots on the farms transferring the organic matter. For plots on the farms receiving organic matter, the conclusion will be that the effect was positive, while the overall effect for the territory may be neutral (with some people positively affected and some negatively affected).

The effects of agroecological practices and systems are of interest to stakeholders at different levels: farmer, household, entire population of a local community or region, entire population of a nation, or even all of humanity (for instance, with regard to the effects of climate change).

Furthermore, each type of effect of agroecology is generally measured or assessed at a given scale, the scale at which the assessment is meaningful: for example, soil fertility is measured at plot level, and agricultural income at farm level. The scale at which effects are measured or assessed is not necessarily the same as the scale at which the evaluation is meaningful. For example, some effects on climate change are measured at plot level, but are of interest to all of humanity. Some effects may be assessed at several different scales. Food security, for instance, can be assessed at household level or more globally at regional level.

Ensuring greater consideration of the agroecological transition's impact on gender equality

Taking gender equality and empowerment of women into account in the evaluation of agroecology is pertinent in several regards:

- on family farms, which make up the majority of farms implementing agroecological practices, the involvement of women in production, processing, trade and management activities is real and often very important; it is therefore pertinent to seek to assess their involvement;

- agroecological practices may have an influence on women's work and the arduousness of their work, on access to and control of land, on women's roles in the management of agricultural activities, and on the control and management of the products obtained and associated income. Diversification may generate new income exclusively managed by women, which helps them become more autonomous. It has also been demonstrated that incomes managed by women are reinvested more in educating, feeding and ensuring the health of their family members, particularly children;
- women's participation in community or technical groups, and their influence in these groups, are often essential for the development of agroecological practices on farms.

Taking gender equality into account in the evaluation of agroecology means focusing on the results and impacts that concern women, and on how these results and impacts differ between men and women. It is best to have **data broken down by gender** and thus a gendered perspective at all stages of the evaluation in order to collect sex-specific data (disaggregated by gender), where relevant, which will then be evaluated. The evaluation ultimately makes it possible to assess whether agroecology impacts men differently than women.

In order to evaluate the level of women's empowerment and gender equality in connection with the development of agroecology, the indicators need to measure:

- **differences** between men and women in terms of participation, decision-making, distribution of profits, and results and impacts;
- **changes** in gender relations (positive or negative) towards greater equality or greater inequality between men and women (in the case of project monitoring and evaluation).

These social aspects are dependent on many factors, so it is necessary to accurately identify differences and changes that may actually be attributed to changes in agricultural practices, as some may be linked more to changes in lifestyle or the organisation of society.

An ethnological survey should be conducted focusing specifically on gender relations in the societies that are studied. The survey may be conducted internally by the organisation (if it has the skills to do so) or externally, before the case studies of farms or as part of group interviews, in order to help create a grid of specific interviews, based on a thorough understanding of the gender context within the communities that are being studied.

The individual and group interviews no longer provide information just on the "how" of gender relations, but also the "why".

Basing the evaluation approach on a participative approach

At the different stages of the one-off evaluation and the monitoring-and-evaluation process, the approach is partially based on participative methods that bring together the different stakeholders in question (see [Chapter 2](#), General approach for one-off evaluations, and [Chapter 3](#), General approach for monitoring and evaluation). Farmers and various development stakeholders are brought together in the evaluation approach to a greater or lesser extent. The participation of women and young people may require organising – in addition to interviews with the heads of the

different farms – specific interviews with these otherwise under-represented groups. The specific interviews may be conducted individually or in focus groups, depending on the context and constraints in terms of carrying out the evaluation.

Further reading

Cochet H., 2016, *Comparative Agriculture*, Éditions Quæ/Springer, 168 p.

F3E, 2021. Mesurer les changements en termes de genre, fiche 13 in F3E *Agir pour le genre. Paroles et pratiques d'actrices et acteurs*, p. 103-105. <https://f3e.asso.fr/ressource/guide-agir-pour-le-genre-paroles-et-pratiques-dactrices-et-acteurs/>

General approach for one-off evaluations



INTRODUCTION

The proposed approach is based on the **method for conducting a diagnostic analysis of the agrarian system**. That method has been adapted here so that it can be used to evaluate agroecology. The purpose is to describe the situation of a particular territory before, during, or at the end of an intervention – or outside of an intervention – depending on the specific objectives of the evaluation (see [Chapter 1](#), General methodological principles). It is therefore necessary to clearly define the specific objectives and the territory in question.

Important

The specific objectives of the evaluation are defined together with the sponsor of the study, the main partner or the stakeholders in the territory. The delimitation of the territory may be defined based on stakeholders' expectations or specific characteristics identified during the landscape-description stage (parts of the territory may be included or eliminated based on their specific usefulness for the study, their marginality, their accessibility, etc.) [see Stage 1c, Figure 2.1].

Evaluation of agroecology based on the diagnostic analysis of the agrarian system

The evaluation of agroecology is based on the diagnostic analysis of the agrarian system, as this analysis makes it possible to do the following at territorial level:

- identify and analyse the different **land-use patterns** (combinations of crop- and livestock-production activities, and techniques used), distinguishing between systems that are more agroecological and those that are less so;
- explain the **factors** that influence which land-use patterns farmers choose, which is helpful in terms of identifying the conditions necessary for the development of agroecology, i.e. the factors that help or hinder the development of agroecological practices and systems;
- measure and compare a certain number of agro-environmental and socio-economic **performance** criteria for these different land-use patterns. Using this comparative method, it is possible to determine the effects of agroecology on a number of agro-environmental and socio-economic aspects. In addition to evaluating performance from the farmer's perspective, the evaluation also makes it possible to

assess the effects of agroecological systems from society's perspective: indirect and secondary economic and social effects (jobs, economic value, food security) and environmental externalities (productive potential of ecosystems, biodiversity, contamination of the environment and people, etc.);

- identify the main **problems** limiting the development of agriculture and farms. It is then possible to estimate the extent to which agroecology may help solve some of these problems.

As mentioned in [Chapter 1](#), General methodological principles, it is not possible to evaluate the effects of agroecology on all of the aspects for which an evaluation sheet is provided. It is essential to evaluate the effects of agroecology on certain aspects, while it is optional for other aspects. Choosing several essential and relevant aspects – based on the evaluation's objectives and context – is therefore a prerequisite. As a general rule, in addition to yield estimates according to stakeholders, economic performance from the farmer's point of view and the conditions necessary for the development of agroecology (essential criteria for any evaluation), only two or three additional socio-economic aspects and three or four agro-environmental aspects should be used at most, depending on available time and resources.

Throughout the method, **special attention is given to agroecological practices and systems** – both to their effects and to the conditions necessary for their development. This is a comparative method, which means it covers all farms and land-use patterns in the territory in question, regardless of how agroecological they are.

The aim of the conventional diagnostic analysis of an agrarian system is to identify the main types of farms and land-use patterns. The conventional approach makes it possible to identify the most representative land-use pattern possible for a given type of farm, which means not all specific situations within a given type are taken into account.

Often, certain types of farm and associated land-use patterns are clearly more agroecological than others. Comparing types and sub-types with varying degrees of agroecologisation through a conventional diagnostic analysis of an agrarian system provides direct information on the effects of agroecology (by comparing the respective performance of each type and sub-type) and on the conditions necessary for its development (by comparing the factors differentiating the various types and sub-types).

The conventional diagnostic analysis of an agrarian system, however, needs to be adapted. It does not focus on **analysing specific practices or systems**, which are deemed to be of minor importance and not structural because they are implemented on a small scale in the territory. When evaluating agroecology, however, it is useful to focus on all agroecological practices and systems, even those that are considered marginal.

Another specificity of the proposed approach compared with the conventional diagnostic analysis of an agrarian system is the integration of a tool for characterising the **degree of agroecologisation** of agricultural production systems. In order to evaluate the effects of agroecology by comparing the performance of farms and land-use patterns with varying degrees of agroecologisation, it is necessary to have a tool that is capable of objectively measuring how agroecological those farms and systems are. That is the function of this tool, which calculates an "agroecolo-score" for each farm as well as an average or range for each type or sub-type of farm.

Specific agroecological systems

There are two explanations for the existence of specific agroecological practices and systems. On the one hand, there are often farmers who are more curious, innovative, or who have had the opportunity to experience other realities, and who test and implement agroecological practices and systems in isolation. On the other hand, some agroecological practices and systems may be promoted by organisations (research or advisory organisations, NGOs, producers' organisations) and so may only be implemented by a small number of farms and, on those farms, only on part of the cultivated area. Farmers may consider these simply as experiments that will only be more broadly and definitively incorporated into their production system (with possible adaptations) once they are convinced of their usefulness. Sometimes agroecological practices and systems are even implemented opportunistically by farmers, if the organisation promoting agroecology offers something in return (grants, loans, access to services).

It should be noted that the existence of these isolated practices and systems does not necessarily profoundly change the overall land-use pattern, nor does it justify the creation of specific types or sub-types of farms. Furthermore, farmers who implement these crop practices and systems are not necessarily all working on the same type of farm.

Different levels of analysis

Land-use patterns and their performance are studied at several different levels.

The first level is that of **individual plots** or groups of plots managed homogeneously, and **livestock** managed homogeneously. The focus is on the concepts of "crop-production system" and "livestock-production system", respectively.

→ This is the main level for evaluating the effects and agro-environmental performance of agroecological practices and systems.

The second level is that of the **farm**. The focus is on the concept of "agricultural production system". This level is used primarily when the basic economic unit is the farm (where technical and economic decisions are made, and where the economic and social dynamics of agriculture are expressed). This is therefore the level where certain conditions necessary for the development of agroecology are identified, where one evaluates how all the conditions necessary for the development of agroecology influence farmers' decisions, and where one assesses most of the effects of agroecological practices and systems as well as their economic and social performance.

→ The evaluation approach therefore focuses on developing a typology of farms, where each type is defined by a specific combination of various characteristics. They are presented in [Tool Sheet 5](#), Developing a typology of farms.

The third level is that of the **territory** as a whole. The focus is on the concept of "agrarian system".

→ This level is used to evaluate certain conditions necessary for the development of agroecology, and agroecological practices and systems implemented on farms but whose effects are visible outside those farms: value chains, national economy or social organisation in the territory.

The entire approach for evaluating agroecology is based on these three complementary levels of analysis, which are useful for planning interventions (projects, programmes, public policies). Taking this into account ensures that interventions are relevant, and improves their effectiveness, efficiency and sustainability. Depending on the conditions identified as necessary for development, it will also be possible to design external interventions to help ensure the sustainable implementation of these practices and systems.

Phases and stages of the evaluation process

The overall evaluation process comprises two main phases, which are presented in Figure 2.1.

The first phase provides **a general description of the agricultural territory**, and is broken down into five stages:

- initial scoping for the evaluation (1a);
- consultation with stakeholders in the territory (1b);
- description of the landscape and identification of agroecological practices and systems (1c);
- reconstitution of the agrarian history and assessment of the current situation in the territory (1d);
- summary and discussion of results (1e).

Outcomes of the first phase:

- description of the territory's agrarian dynamic, including the key stages of the agrarian history up to the current situation;
- pre-typology of farms;
- identification of production practices and systems presumed to be agroecological. These may include systems that are characteristic of certain types and sub-types of farms, as well as specific practices and systems;
- hypotheses on the conditions necessary for the development of agroecology.

The second phase involves a **deeper analysis of agroecology** (agroecological practices and systems, effects and conditions necessary for development) **in the agrarian system** (agricultural production systems and farms, common spaces). It is broken down into five stages:

- scoping for Phase 2 (2a);
- in-depth case studies of farms (2b);
- agro-environmental evaluations of sampled plots (2c);
- complementary approaches in the territory (2d);
- summary of results, discussion with stakeholders and finalisation of the study report (2e).

Outcomes of the second phase:

- typology of farms and evaluation of how agroecological each type of farm is (evaluation based on the degree of agroecologisation);
- description of specific agroecological practices and systems not reflected in the typology;
- evaluation of the performance of agroecological practices and systems as well as their socio-economic and agro-environmental effects;
- validation of the conditions necessary for the development of agroecology (supporting or limiting factors).

Important

Literature review

Throughout the evaluation process, a literature review is conducted in order to make use of pre-existing information. The literature review makes it possible to initiate the general description of the territory and formulate the initial hypotheses concerning the landscape, land-use patterns, agrarian structure (types of farms), agrarian history, the situation of and problems affecting the different stakeholders, and potentially the practices and systems existing in the territory that are presumed to be agroecological. Different types of materials need to be considered: books, study reports, articles, evaluations, statistical data, maps, aerial and satellite photos, etc. Some of these documents can be found on the internet, but institutions that are likely to have sources of information should also be identified, including outside the territory covered by the study: universities, ministries, statistical offices, NGOs, etc.

Throughout the overall evaluation process, the evaluator may, if necessary, make use of various documents designed to guide the exercise. There are **evaluation sheets** (for socio-economic effects, agro-environmental effects and conditions necessary for development) and **tool sheets** (specifying the methods for completing certain stages). These evaluation sheets and tool sheets are referenced throughout the detailed presentation of the approach, and the evaluator may refer to them along the way to develop his/her own protocols for data collection and analysis.

From the initial objectives of the sponsor or main partner to the conclusions of the evaluation

In the overall methodology, differentiation should be made between the evaluation of the effects of agroecology and the evaluation of the conditions necessary for its development, even though in both cases the evaluator starts with the sponsor's initial objectives and ends with the conclusions (see Figure 2.2).

For evaluation of the **effects of agroecology**, the sponsor or main partner formulates its own objectives and evaluation criteria during the initial scoping for the evaluation (Stage 1a). Throughout Phase 1, the evaluator formulates hypotheses on the various possible effects of agroecology, which may lead him/her to identify potential important effects that would not have been included in the objectives of the sponsor or main partner. Finally, the list of specific objectives in terms of evaluating the effects of agroecology, and therefore the resulting elements in question and evaluation criteria, is validated during the last stage of Phase 1: summary and discussion of results (1e). For each evaluation criterion used, indicators are defined during the Phase 2 scoping stage (2a) and then measured during subsequent stages: in-depth case studies of farms (2b), agro-environmental evaluations of sampled plots (2c) and complementary approaches in the territory (2d). The results by type and sub-type of farm, by farm (for specific agroecological systems) or by crop- or livestock-production activity are obtained during stages 2b, 2d (socio-economic evaluations) and 2c (agro-environmental evaluations of sampled plots). All this is summarised in a synthesis and conclusion of the evaluation of the effects of agroecology in Stage 2e (summary of results, discussion with stakeholders and finalisation of the report).

Figure 2.1. Overview of the evaluation approach.

Phase 1

General description of the agricultural territory

1a Initial scoping for the evaluation

- ♦ Territory covered by the study
- ♦ Specific objectives and resulting evaluation criteria, questions
- ♦ Deadlines
- ♦ Resources to be mobilised
- ♦ General evaluation framework
- ♦ Stakeholders to be included

1b Consultation with stakeholders in the territory

1c Description of the landscape, identification of agroecological practices and systems

1d Reconstitution of the agrarian history, assessment of the current situation in the territory

1e Summary and discussion of results



At the end of Phase 1, a summary is produced covering:

- agrarian dynamic of the territory
- pre-typology of farms
- practices and systems presumed to be agroecological
- hypotheses on the conditions necessary for the development of agroecology

The following may be used throughout Phase 1:

- ♦ Tool Sheet 5, Developing a typology of farms
- ♦ Chapter 6, Evaluation of the conditions necessary for the development of agroecology
- ♦ Tool Sheet 1, Guide for interpreting the agrarian landscape and establishing zoning
- ♦ Tool Sheet 2, Guide for interviews on the past and current situation of the territory
- ♦ Tool Sheet 3, Inventory and description of agroecological practices
- ♦ Tool Sheet 4, Grid for analysing issues linked to a key feature of the territory

Phase 2

In-depth analysis of agroecology in the agrarian system

2a

Scoping for Phase 2

- ♦ Definition of definitive indicators
- ♦ Need for additional surveys in the territory
- ♦ Need for agro-environmental evaluations of sampled plots
- ♦ Adaptation of the grid for characterising the degree of agroecologisation to fit the context
- ♦ Revision of the evaluation framework for Phase 2

2b

In-depth case studies of farms

2c

Agro-environmental evaluations of sampled plots

2d

Complementary approaches in the territory

2e

Summary of results, discussion with stakeholders, finalisation of the report

Outcomes of Phase 2:

- typology of farms
- characterisation of the degree of agroecologisation
- identification of specific agroecological practices and systems
- evaluation of the effects of agroecology
- evaluation of the conditions necessary for the development of agroecology

The following may be used throughout Phase 2:

- ♦ Tool Sheet 5, Developing a typology of farms
- ♦ Evaluation sheets 7 to 15 on evaluating socio-economic effects
- ♦ Evaluation sheet 1 to 6 on evaluating agro-environmental effects
- ♦ Chapter 6, Evaluation of the conditions necessary for the development of agroecology
- ♦ Tool Sheet 6, Information to gather during case studies and tools for formatting that information
- ♦ Tool Sheet 7, Presentation of the spreadsheet for automated economic calculation and its user manual
- ♦ Tool Sheet 8, Characterisation of the degree of agroecologisation of farms

For evaluation of the **conditions necessary for the development of agroecology**, the sponsor or main partner again formulates its own objectives and questions during the initial scoping for the evaluation (Stage 1a). Throughout phases 1 and 2, the evaluator formulates hypotheses on the possible conditions necessary for development and on the resulting evaluation questions. At each stage of the study, the information gathered is processed to verify, clarify and modify the previously formulated hypotheses, potentially leading to reformulation of the evaluation questions, which tend to be more specific. More specifically, it is during Stage 2b (in-depth case studies of farms) that the question of the conditions necessary for the development of agroecology is fully addressed. The evaluation questions are therefore carefully revised beforehand during the Phase 2 scoping stage (2a), and are then refined during Stage 2b. The summary of the conditions necessary for the development of agroecology is prepared during that same stage and may be refined and expanded on during Stage 2e (summary of results, discussion with stakeholders and finalisation of the report).

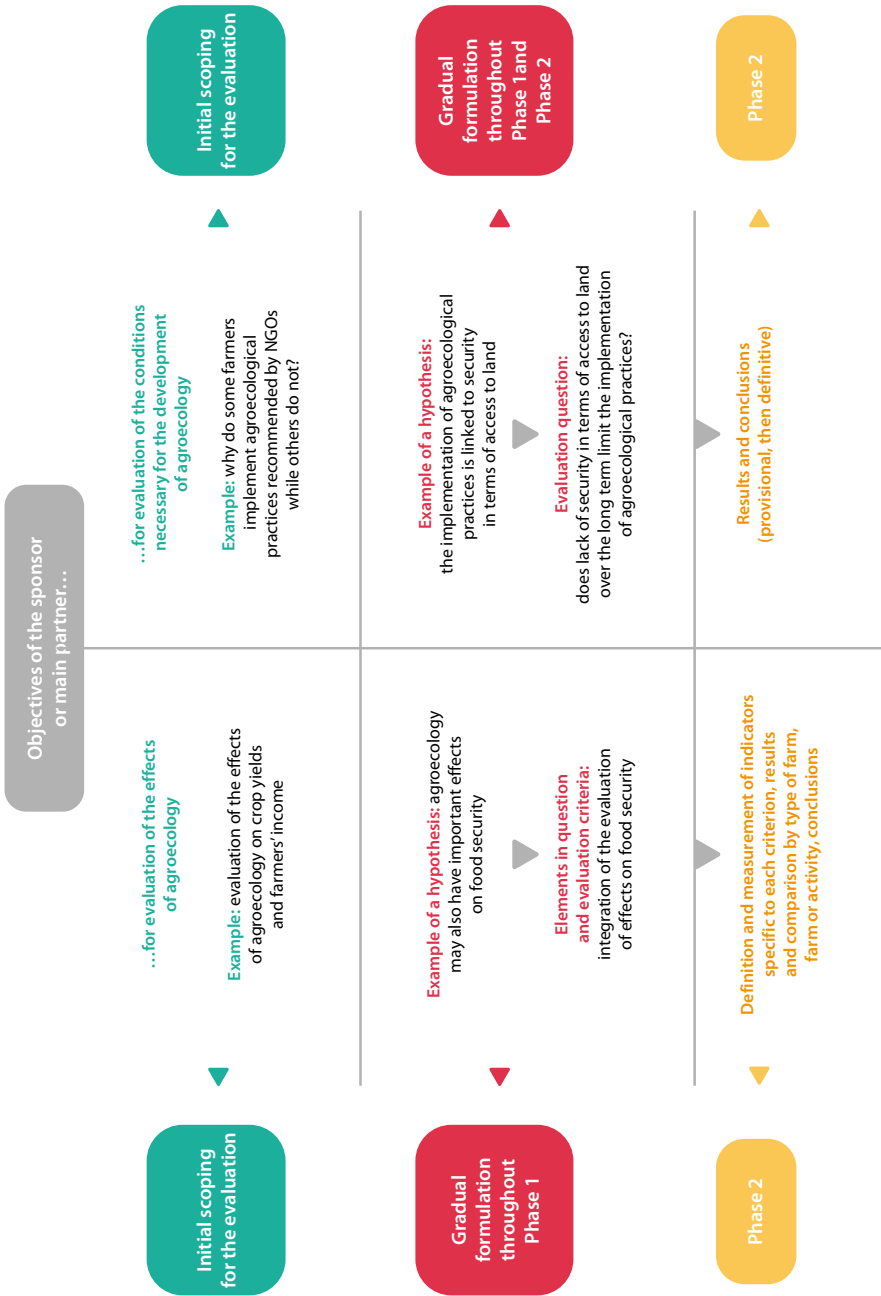
Important

Coordination of data collection and processing throughout the evaluation

In the evaluation approach, it is not possible to identify an initial phase for data collection and a second phase for data processing. Why?

- Because certain questions are dealt with at the start of the evaluation and continue to be dealt with throughout the evaluation process: typology of farms, description of agroecological practices and systems, identification of the conditions necessary for development. The evaluator formulates hypotheses at the start of the first phase, and refines them at each subsequent stage of the study. These hypotheses will gradually become provisional conclusions, and then definitive conclusions.
- Because certain questions are dealt with at very specific moments: evaluation of the socio-economic performance and degree of agroecologisation of each type of farm (Stage 2b), and evaluation of agro-environmental performance (Stage 2c).
- Also, although there is a logical succession of stages throughout the evaluation process, that process must not be interpreted as being strictly linear. At each stage, specific questions may arise and justify returning to a previous stage in order to refine certain points and develop new hypotheses. Such back-and-forths between the various stages are frequent. This is particularly true for the literature review, which may be conducted throughout the evaluation process where needed, but it also concerns other aspects of the process. For example, new practices may be identified during the in-depth case studies of farms, requiring specification of the changes that occurred during the agrarian history.

Figure 2.2. Presentation of the scientific approach applied to the evaluation of the effects of agroecology, and to the evaluation of the conditions necessary for the development of agroecology.



General description of the agricultural territory



Stage 1a

Initial scoping for the evaluation

The initial scoping stage includes a number of activities to prepare for the evaluation itself.



Objective

The objective of the initial scoping stage is to define certain points before carrying out the evaluation.

An effort is made to define the following:

- **specific objectives of the evaluation:** the specific objectives help guide the selection of elements used to evaluate the effects of agroecology, the selection of evaluation criteria, and the formulation of evaluation questions on the conditions necessary for the development of agroecology. The evaluation criteria and evaluation questions will be definitively confirmed at the end of Phase 1;
- **territory covered by the study:** the definition of the territory may be based on several criteria, depending on previously defined objectives: the interest of the sponsor or main partner (zone where an intervention is carried out, zone where an organisation is present, etc.), diversity of situations (consideration of different agrarian zones, etc.) and operational feasibility (depending on available time and resources);
- **which stakeholders to include:** Phase 1 requires meeting stakeholders individually (interviews with different categories of stakeholders) and organising group consultation sessions (presentation of the approach, discussion of results). Many stakeholder categories are to be included: farmers, local representatives of farmers' organisations, public authorities and NGOs, village leaders, etc. It is essential to take the time to carefully identify these categories in advance so that no important stakeholders are forgotten;
- **time frame for completing the evaluation:** deadlines depend on the objective, the conditions defined by the sponsor (e.g. if it is in response to an order) and the availability of resources (human and financial). For the entire evaluation process (including all stages presented for the two phases), four to five months of availability should be allowed for on average. The scale of the evaluation – and therefore the studies to be carried out – should be adapted to suit the time available for conducting the evaluation. It may also be useful to consider the timing of climate events (floods, etc.) and agricultural trends (periods when farmers have limited availability) when planning the overall schedule for the study;
- **resources to be mobilised:** it is essential to take into account resources that are actually available. The main resources are linked to personnel in charge of the evaluation, their preliminary training and support, transport to the study location, travel and accommodation during the study, interpretation expenses (if necessary), organisation of meetings, performance of specific agro-environmental analyses, and the

preparation, translation (if necessary) and printing of the study report. Extra human resources may need to be mobilised in addition to the main evaluator for certain aspects of the evaluation;

→ **overall evaluation framework:** this includes the people involved in the different aspects of the evaluation, how it will be implemented and the timeline for completion. Most of the evaluation may

be conducted by one or two people. Specialised personnel, however, may also be mobilised in addition to the main evaluator for certain aspects of the evaluation requiring specific skills (e.g. for assessing agro-environmental effects);

→ **documentary resources to look for,** taking into account those that are already available.

Important

Social acceptance and perception of the evaluator

The social acceptance of the evaluator, and therefore the quality of cooperation – particularly on the part of farmers – requires that the evaluator be presented, as early as the scoping stage, by the sponsor or main partner to the key stakeholders in the territory (village leaders, central government representatives, farmers' organisation representatives), to whom he/she may explain the objectives of his/her work and the nature of the activities he/she will conduct. It is important that the evaluator be seen as a person who has no association with the sponsor, main partner or any other local stakeholder (public authorities, NGOs, etc.). If, however, the evaluation is conducted by the personnel of a project, it is important to be aware of the biases that such a situation could give rise to.



Methodology

The initial scoping for the evaluation occurs before the evaluation itself. It is conducted in conjunction with the sponsor or main partner of the study, who is asked to state its objectives by answering a number of questions: what challenges do they think agroecology can help address, and what criteria would be of interest for evaluating the effects of agroecology? Do they wish to have a comprehensive inventory of agroecological practices? What questions do they have regarding the conditions necessary for the development of agroecology? The evaluation criteria and evaluation questions will be defined throughout Phase 1.



Stage 1b

Consultation with stakeholders in the territory

Consultation with stakeholders in the territory is an essential stage in terms of ensuring that the evaluation is conducted properly, verifying the suitability of the objectives and formulating the evaluation questions.



Objectives

The objectives of the consultation with stakeholders in the territory are to:

- **present the evaluation project** to them in order to ensure their cooperation throughout the process;
- **discover their points of view** on the main problems in the territory;
- **define the objectives** of the evaluation: this involves identifying the points that are specifically of interest to stakeholders in the territory with a view to validating or reformulating the initial hypotheses, and thus clarifying the evaluation criteria for the effects of agroecology and the evaluation questions concerning the conditions necessary for the development of agroecology.



Methodology

This phase may be organised together with the sponsor or main partner of the study. The consultation is held during a meeting with the stakeholders from the territory identified during the scoping stage (1a): local representatives of farmers' organisations, public authorities, NGOs, village leaders, etc. In some cases, in order to facilitate better-quality discussions (smaller groups with a more homogeneous composition), several meetings may be organised with different types of stakeholders. Once the study is presented, the emphasis shifts to a discussion structured around identifying the main problems affecting the territory and its population. If a key feature of the territory needs to be considered in the evaluation (an irrigated scheme, for instance), it is recommended to use the grid created for that purpose in order to prepare in advance how the discussions will be organised.



Time required

While one day may be enough to conduct the initial consultation, it might be wise to devote two days to it, as two days would make it possible for several meetings to be held. Taking into account preparation time, several days therefore need to be provided for to carry out the consultation.



Associated tool sheet

- **Tool Sheet 4**, Grid for analysing issues linked to a key feature of the territory.

Characterisation of the landscape, and identification of agroecological practices and systems

Agriculture is rooted in its biophysical environment, which is the visible part of the agrarian system. The landscape both determines and is a consequence of agricultural practices.

Being able to assess how agroecological an agrarian system by simply observing the landscape is no easy task. That observation of the landscape needs to be complemented by more detailed analyses at farm level (production systems), plot level and herd level (cropping and livestock-production systems). Moreover, the factors behind the dynamics at work are to be sought in value chains or public policies.

That said, many elements and indicators may already be collected at this stage.

Objectives

This stage has two objectives.

The first objective is to **characterise the agrarian landscape** as a whole:

- describe the different components:
 - biophysical environment (geomorphology, hydrography) structuring the landscape,
 - vegetation (both cultivated and wild),
 - visible agricultural practices, equipment and tools,
 - presence of livestock,
 - improvements (buildings, terraces, irrigation canals, etc.),
 - distribution of housing,
 - shape and size of plots,
- identify the different landscape units (agro-socio-economic zoning), making hypotheses as to how they could be utilised;
- formulate hypotheses on links between the different units, their past and current agricultural uses;
- if there is a key feature in the territory (irrigation system, value chain, etc.), describe that feature based on the study of the landscape.

The second objective is to **assess how agroecological the agrarian system is**, and more specifically to:

- roughly characterise the density and state of agroecological infrastructure, i.e. areas in or around which are growing mainly wild vegetation or cover crops that are deliberately left unharvested;
- make an initial inventory and initial description of practices presumed to be agroecological in the different units: enclosures for gathering manure (see example of enclosures on diéri lands in Senegal in [Tool Sheet 1](#), Guide for interpreting the agrarian landscape and establishing zoning), crop associations (see example of the flood-recession cropping system for sorghum associated with cowpea on “hollaldé” soils in the same tool sheet), crop rotations, agroforestry, improved fallows, no-till practices, planting of hedges, conservation of animal breeds considered to be adapted to local conditions, mulching of vegetable crops, zai, etc.;
- make hypotheses, based on the observation of the landscape, with regard to factors that encourage or limit the geographic expansion of these agroecological practices: access to irrigation, external factors (grants, development projects), etc.;

→ formulate hypotheses on current dynamics: is a transition to agroecology taking place or, on the contrary, is the environment becoming “artificialised” and are input-intensive practices becoming more prevalent?

 Methodology

It is important to begin the description of the territory with a **literature review** on the geographic, geological, ecological, agronomic and historical characteristics of the area in question. The documentary resources may then be viewed iteratively in the field depending on need and on the initial hypotheses that were made. Maps and aerial photos are particularly useful tools and are nowadays easily accessible for many geographic areas via internet (e.g. Global Forest Watch website for forest-cover dynamics).

To facilitate the observation of the landscape, it is recommended to divide the landscape using carefully selected **transects**, and then work with farmers and specialists to describe and explain these portions of the landscape.

To characterise how agroecological the landscape is, the creation of a **grid** like the one in Table 2.1 might make it possible to consolidate the main information on each agroecological practice identified.

Table 2.1. Identification and analysis of agroecological practices.

Landscape unit	Agro-ecological practice identified	Type of practice and scale of implementation (plot, farm, scheme, territory)	Crop-production system, livestock-production system or agricultural production system associated with the practice	Main problems the practice helps address	Biophysical factors (or other type of factor) favouring implementation of the practice	Importance in the agrarian landscape. Hypotheses on current dynamics: expansion, decline
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The proposed course of action for this stage is presented in greater detail in [Tool Sheet 1](#), Guide for interpreting the agrarian landscape and establishing zoning.

It is also possible during this stage to conduct a more in-depth inventory and description of practices presumed to be agroecological using [Tool Sheet 3](#), Inventory and description of agroecological practices. This description may be expanded on in the next stage (1d, Reconstitution of the agrarian history and assessment of the current situation in the territory).

Describing a key feature of the territory

If there is a **key feature in the territory** (irrigation system, agrifood value chain, etc.), it may be necessary to include in the general approach for one-off evaluations a specific activity for describing that feature. The objective of that activity would be to:

- identify the main issues affecting the feature (which contributes to the initial diagnostic assessment of the zone covered by the study);
- better understand how agroecology can help address these issues;
- better understand how the key feature influences farmers' decisions, particularly with respect to agroecology.

The description of the key feature of the territory may be initiated during the study of the landscape using [Tool Sheet 4](#), Grid for analysing issues linked to a key feature of the territory. Tool Sheet 4 presents the Nexus grid¹, which makes it possible to study the relationship between agroecology and the key feature. The description may be expanded on in the next stage (1d, Reconstitution of the agrarian history and assessment of the current situation in the territory).

Time required

The time required depends on the diversity of the landscape, size of the zone and ease of travel. For just one person working on a small agricultural region (40 km × 40 km), one week is needed.

Associated tool sheets

- [Tool Sheet 1](#), Guide for interpreting the agrarian landscape and establishing zoning.
- [Tool Sheet 3](#), Inventory and description of agroecological practices.
- [Tool Sheet 4](#), Grid for analysing issues linked to a key feature of the territory.

1. The term *nexus* ("connect") emphasises the interactions between one or more elements, whether they are relationships of dependence or interdependence.



Stage 1d

Reconstitution of the agrarian history and assessment of the current situation in the territory

This stage is essential in order to develop a provisional typology of farms, identifying the main problems affecting the territory and its stakeholders, and conducting an initial assessment of the conditions necessary for the development of agroecology.



Objective

The objective of this stage is to describe the history and current situation of the territory, which involves:

- reconstituting the **agrarian history** of the territory, i.e. the socio-economic environment, agrarian structure (types of farms) and land-use patterns. The purpose is to identify the main stages of differentiation for farms and explain the reasons for them. This is where the main factors that historically influenced the development of agroecology, whether favourably or unfavourably, may be identified;
- assessing the **current situation** of the territory as it stems from the agrarian history: types of stakeholders (farms, socio-economic and institutional environment, value chains, relations between stakeholders, socio-economic dynamic, main problems) and activities (agricultural and extra-agricultural). Particular focus is given to stakeholders (public authorities, universities, NGOs, farmers' organisations, stakeholders in the upstream and downstream segments of value chains) who have influence over farmers' technical and economic decisions. This makes it possible to further develop hypotheses on factors that facilitate or hinder the development of agroecology.

If a key feature of the territory (irrigation system, value chain, etc.) was identified during the previous stage (Stage 1c, Description of the landscape and identification of agroecological practices and systems), then the description of that feature and its impact on agriculture is expanded on. The identification of agroecological practices and systems carried out during the same stage may also be expanded on.



Methodology

The methodology mainly consists in **individual interviews** that complement the literature review. Although some interviews focus more on the territory's agrarian history and others on its current situation, there is a complementarity between the two approaches and therefore between these two types of interviews. The historical approach makes it possible to understand the current characteristics of the territory and its agriculture.

Interviews focusing on the past

- Target people who have in-depth knowledge of the territory's history (particularly older farmers and other people from the older generation, and academics).
- Conduct the interviews (semi-open style) starting with a description of the territory and its agriculture from as long ago as the interviewee can remember, and then discuss changes that have occurred since then as well as the factors behind those

changes. This approach makes it possible to connect the different changes that have occurred in terms of the socio-economic environment, agrarian structure and land-use pattern.

- Highlight changes that are more or less agroecological in land-use patterns (particularly dynamics of innovation, development, regression and disappearance of agroecological practices and systems) and the factors behind these changes.
- Update (if necessary) the grid for the inventory and description of agroecological practices and systems. A few additional questions may focus on specific isolated agroecological practices and systems that existed in the past or that still exist.

The main changes may be represented in the form of a **timeline** showing changes in the socio-economic environment alongside the process for differentiating farms (structure of the farms and land-use pattern), resulting in a provisional typology (pre-typology) of current farms. Figure 2.3 presents the timeline created as part of a study conducted in the Ecuadorian Andes.

Interviews focusing on the “current situation”

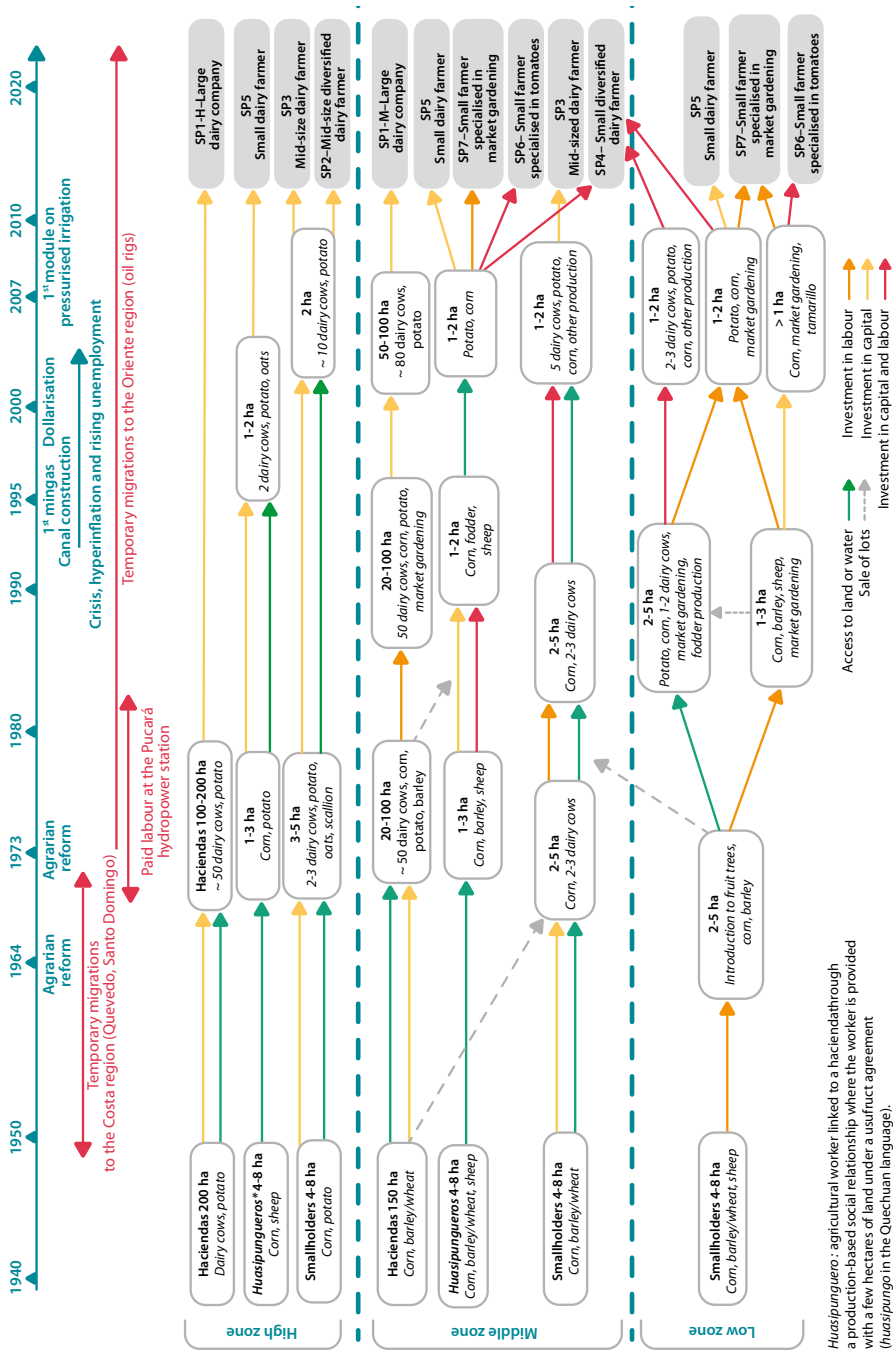
- Target people representing organisations (farmers’ organisations, NGOs, etc.), institutions and companies who have direct ties with farmers, integrating specifically entities that work to promote agroecology.
- Conduct the interviews (semi-open style) focusing on the activities of these entities, the diversity of farms and land-use patterns, and the factors behind that diversity.
- Continue, through these interviews, to identify agroecological practices and systems (including those considered to be isolated) and the conditions for their development. This will make it possible to update, if need be, the grid for the inventory and description of agroecological practices (see [Tool Sheet 3](#), Inventory and description of agroecological practices).
- Expand, through these interviews, on descriptions of a possible key feature in the territory using the grid for analysing issues linked to key features of the territory (see [Tool Sheet 4](#)). Additional interviews may be conducted focusing specifically on that key feature.

Important

Coordination between stages 1c and 1d

For all the interviews in this stage, the formulation of the questions takes into account the information obtained in Stage 1c [description of the landscape, and identification of agroecological practices and systems]. The historical surveys and surveys of the territory’s current situation make it possible to describe and explain the major land-use patterns identified in each of the zones. Identifying several well-differentiated zones within a particular territory makes it possible to formulate questions that are more specific to each zone.

Figure 2.3. Example of a timeline in the canton of Píllaro (province of Tungurahua) in the Ecuadorian Andes [source: Aupois, 2021, p. 89].





Time required

Based on about twenty interviews, with two interviews per day (scheduling, interview and finalisation of the information), plus a few days for conducting the literature review and finalising the interview notes, allow for three weeks on average to complete this stage.



Associated evaluation sheets and tool sheets

- **Chapter 6**, Evaluation of the conditions necessary for the development of agroecology.
- **Tool Sheet 2**, Guide for interviews on the past and current situation of the territory.
- **Tool Sheet 3**, Inventory and description of agroecological practices.
- **Tool Sheet 4**, Grid for analysing issues linked to a key feature of the territory.
- **Tool Sheet 5**, Developing a typology of farms.



Stage 1e

Summary and discussion of results

This is the last stage of the first phase, and it helps prepare for the second phase of the evaluation.



Objectives

This stage has several objectives.

The first objective is to **summarise and structure the hypotheses and results obtained at the end of the previous stages**. The summary includes:

- the territory's agrarian dynamic, including the major stages of its agrarian history up to the current situation, differentiating between the different zones identified;
- elements relating to general problems affecting the territory;
- pre-typology of farms. The situation and problems specific to each type of farm make it possible to assess the potential usefulness of agroecological practices and systems;
- practices and systems existing in the territory that are presumed to be agroecological. These may include agricultural production systems that are characteristic of certain types and sub-types of farms, as well as specific practices and systems for crop production, livestock production or other types of production;
- usefulness and presupposed effects of agroecological practices for farmers and the community with respect to the problems identified;
- conditions necessary for the development of agroecology.

The second objective is to **present the summary** to certain stakeholders in the territory and **discuss it in order to try to improve it** (clarification, additional details, corrections).

The third and final objective is to propose and validate a potential **revision of the criteria for evaluating effects** with the stakeholders in the territory, based on:

- the general problems affecting the territory and agroecology's expected effects on those problems;
- the supposed specific problems of the different types of farms, and agroecology's probable or possible effects on those problems.



Methodology

Firstly, a provisional summary is produced from the various information obtained in the previous stages, drawing from [Tool Sheet 5](#), Developing a typology of farms, [Tool Sheet 3](#), Inventory and description of agroecological practices, [Tool Sheet 4](#), Grid for analysing issues linked to a key feature of the territory, and [Chapter 6](#), Evaluation of the conditions necessary for the development of agroecology.

This summary is then presented to certain stakeholders in the territory at a meeting, and then discussed. The discussion helps refine the summary (clarification, additional details, corrections).

The stakeholders who are invited may be the same as those who attended the first meeting during the consultation phase, but the group may also be smaller or include

specialists who were met with during Stage 1d (reconstitution of the agrarian history and assessment of the current situation in the territory).

Time required

One week on average. But the actual duration depends on the amount of information gathered and the modifications made to the summary after the meeting.

Associated evaluation sheets and tool sheets

- [Chapter 6](#), Evaluation of the conditions necessary for the development of agroecology.
- [Tool Sheet 5](#), Developing a typology of farms.
- [Tool Sheet 3](#), Inventory and description of agroecological practices.
- [Tool Sheet 4](#), Grid for analysing issues linked to a key feature of the territory.

Phase 2

In-depth analysis of agroecology in the agrarian system



Stage 2a

Scoping for Phase 2

This new scoping stage makes it possible to prepare for the implementation of Phase 2.

Objective

The objective of this stage is to define a certain number of prerequisites for the implementation of Phase 2:

- definitive **indicators** and **evaluation questions** specific to the main problems affecting farms and to the conditions necessary for the development of agroecology, based on the summary of Phase 1 (Stage 1e). It should be noted that while it is important to validate the evaluation criteria with the stakeholders (Stage 1e), it is the evaluator's responsibility to choose the specific indicators (Stage 2a). Likewise, while it is important to discuss with the stakeholders about the hypotheses regarding the conditions necessary for the development of agroecology (Stage 1e), it is the evaluator's responsibility to formulate the specific evaluation questions (Stage 2a);
- the need for **surveys in the territories**, in addition to case studies of farms, depending on the criteria and indicators used for the socio-economic evaluation;
- the need for additional **agro-environmental evaluations** of sampled plots, depending on the criteria and indicators used for the agro-environmental evaluation;
- adaptation of the **grid for characterising the degree of agroecologisation** of farms to fit the specific context of the territory (see [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms);
- the **evaluation framework** for Phase 2 (people involved in the different aspects, how it will be implemented, timeline for completion), which may be updated compared with what was initially planned in Stage 1a (initial scoping);
- identification of any **additional resources** that might be needed if significant changes are made to the criteria established during the initial-scoping stage.

Methodology

This operational scoping is conducted together with the sponsor or main partner of the study, and any other individuals who may be involved in the evaluation framework. It is based on the initial scoping for the evaluation (Stage 1a) and on the results of Phase 1 (Stage 1e).



Time required

This scoping requires one to two days of work, depending on the amount of modifications and adjustments to make with respect to the initial scoping for the evaluation (Stage 1a) and on the number of people to consult.

In-depth case studies of farms

This stage is at the heart of the proposed approach. It makes it possible to evaluate the main socio-economic effects of agroecology. It is also essential in terms of assessing the conditions necessary for the development of agroecology.

Objective

The objective of this stage is to conduct in-depth case studies based on a purposive sampling of farms, and produce a summary of those case studies.

For each farm **case study**, the purpose is to:

- **describe the farm:** agro-climatic conditions, socio-economic and institutional environments, constitutive elements of the farm including production factors (workforce, land, means of production), social relations (with other farms and other stakeholders), objectives and fundamental interests of the farmer, land-use pattern (agricultural production system), historical trajectory. With regard to the land-use pattern, particular attention is given to agroecological practices and systems (description, place within the entire agricultural production system, history);
- **interpret the farmer's choices** regarding the technical and economic management of the farm and his/her production system. Special attention is given to choices regarding agroecological practices and systems, and in particular to the factors behind their presence or absence, taking into account the farmer's assessment of their implementation;
- **evaluate a certain number of performance indicators:** crop and zootechnical yields, economic results from the farmer's point of view, other variables depending on the criteria and indicators used for the evaluation. If some crop- and livestock-production activities on the farm are conducted using agroecological practices and others are not, try to compare relative performance in terms of yield and economic results;
- **assess the farm's economic, social and ecological dynamic** (development, stagnation, decapitalisation and crisis);
- **identify the general problems** affecting the farm, i.e. its main limiting factors with regard to the farmer's objectives. Particular attention is given to problems that could potentially be addressed by agroecological practices and systems, and to factors that hinder the development of agroecology;
- **evaluate the degree of agroecologisation** of the farm and its agricultural production system, i.e. assess how agroecological they are. This evaluation makes it possible to later compare the socio-economic and agro-environmental performance of farms and types of farms with varying degrees of agroecologisation, and therefore makes it possible to deduce the effects of agroecology on that performance.

The case-studies **summary** makes it possible to:

- finalise the typology of farms;
- compare the socio-economic performance of farms belonging to the different types and sub-types, and of farms implementing specific agroecological systems;
- evaluate the relative weight of each type and sub-type;
- characterise the specific agroecological practices and systems not reflected in the typology;
- evaluate the degree of agroecologisation for each type and sub-type, and for farms implementing specific agroecological systems;
- evaluate the socio-economic effects of agroecology. This evaluation will be complemented by the agro-environmental evaluation in Stage 2c;
- summarise the results of the evaluation of the conditions necessary for the development of agroecology;
- complete the grid for the identification and description of agroecological practices.

Methodology

Sampling

In order to thoroughly understand how farms operate and reliably calculate their economic performance, **in-depth case studies** need to be undertaken. These case studies take time (two to three meetings lasting each two to three hours for one farm). The sample size is therefore necessarily small (generally between 25 and 30 farms)². In order to ensure that the different types and sub-types of farms are effectively studied, the sample must be purposive and not randomly selected. This is referred to as **“purposive sampling”**. On average, four to six farms are studied for each type. The selection of farms must also include the different agro-socio-economic zones in the territory. If, because of the intervention of an external entity, some farms of a particular type have implemented agroecological practices and others have not, it is important to include farms from both of these scenarios in the sample. It may even be useful to include farms that are at different stages in their implementation of these practices, or farms that abandoned them after trying them out. It is also important to include in the sample farms that have implemented the **specific agroecological practices and systems** identified during Phase 1, and that are therefore not representative of a particular type or sub-type.

Once the provisional typology (or “pre-typology”) has been established, sampling is conducted based on a combination of approaches:

- selection of farms based on their external aspect (location, plot size, crop types, equipment, livestock, buildings) and after a brief discussion with the farmer to verify which type the farm corresponds to;
- discussions with key informers who were met with during Phase 1, particularly farmers who were observed to have in-depth knowledge of the territory. The characteristics of the different types are presented to them, and they are asked to name farms that match these characteristics. A variant consists in bringing together several farmers with a wide range of profiles for a group discussion in order to encourage interaction and help make the sample more reliable and diverse;
- discussions with stakeholders that are in contact with farmers (agricultural advisory

2. The sample size depends in part on the available time and resources. However, a sample size should not be smaller than 20-25 farms, especially if there is high diversity among farms. In such cases, the sample size may be increased to 35-40 farms.

services, NGOs, businesses, etc.), particularly stakeholders working to promote agroecology among farmers.

Important

Enlargement of the initial sample

As case studies are conducted, the farmers who are met with may themselves propose new farms to add to the sample. This is particularly important as during the fieldwork, the evaluator may observe differences between farms or specificities in the territory that had not been fully identified initially and that justify the addition of more case studies to the sample. It is therefore not necessary, nor even desirable, for the sample to be fully defined at the outset.

Conducting case studies

The methodology of the case studies is based mainly on **individual interviews**. It is important to verify in advance that the farmer agrees to take part in the interviews, for instance during a visit where the objective of the study is presented to the farmer. If the farmer agrees, a date is scheduled. At that time, is it essential to mention that:

- the farmer was recommended (if that is the case) and by whom (in order to encourage the development of a relationship of trust);
- the study may potentially be useful for farmers in the region. The wording of this should be adapted depending on the context (in order to encourage the farmer to participate and give his/her time);
- the individual data collected will remain strictly confidential, which of course means this must actually be complied with (in order to encourage the development of a relationship of trust);
- the evaluator is not associated with any organisation, and that there will be no compensation for the farmer's participation (in order to minimise bias in the farmer's responses). If the evaluation is conducted by an individual who is employed by an organisation that works directly with farmers (NGO, public institution, etc.), it is necessary at the very least to explain to the farmer that the study is independent of the intervention system, even though it is difficult to avoid all bias;

Important

Independence of the evaluator

It is important for the evaluator to be seen as not having any association with organisations operating in the territory, so that farmers are not tempted to answer questions in the hopes of ultimately either obtaining something in return or pleasing the evaluator. Moreover, although ties with the sponsor of the study or the main partner must not be concealed, the independence of the evaluator (intern, service provider) must be mentioned. For the same reason, it is not desirable for a representative of this organisation to take part in the interviews, even as an interpreter.

- the farmer's participation will involve two to three interviews lasting two to three hours each, with the possibility, if need be, of additional visits and analyses for the agro-environmental evaluation (in order to verify the farmer's availability).

The interviews are semi-open and are organised in accordance with two major guidelines:

- a certain number of specific questions must be asked depending on the objectives of the evaluation, criteria and indicators used. The questions are mainly necessary for the evaluation of the socio-economic effects and the conditions necessary for the development of agroecology, but they are also necessary for certain aspects of the agro-environmental evaluation developed in Stage 2c;
- there must be a real discussion during which the farmer is free to expand on the aspects that he/she believes have priority, and where the evaluator is able to ask additional questions in order to explore certain subjects in greater depth.

A list of topics which may be used as a reference is presented in [Tool Sheet 6](#), Information to gather during case studies and tools for formatting that information.

After the interviews, the evaluator must:

- conduct the economic calculation of the farm. [Tool Sheet 7](#), Presentation of the spreadsheet for automated economic calculation and its user manual, may be used for that;
- summarise the information from the case study using the plan and tools in [Tool Sheet 6](#), Information to gather during case studies and tools for formatting that information;
- fill in the grid for characterising the degree of agroecologisation of farms.

Summarising the case studies

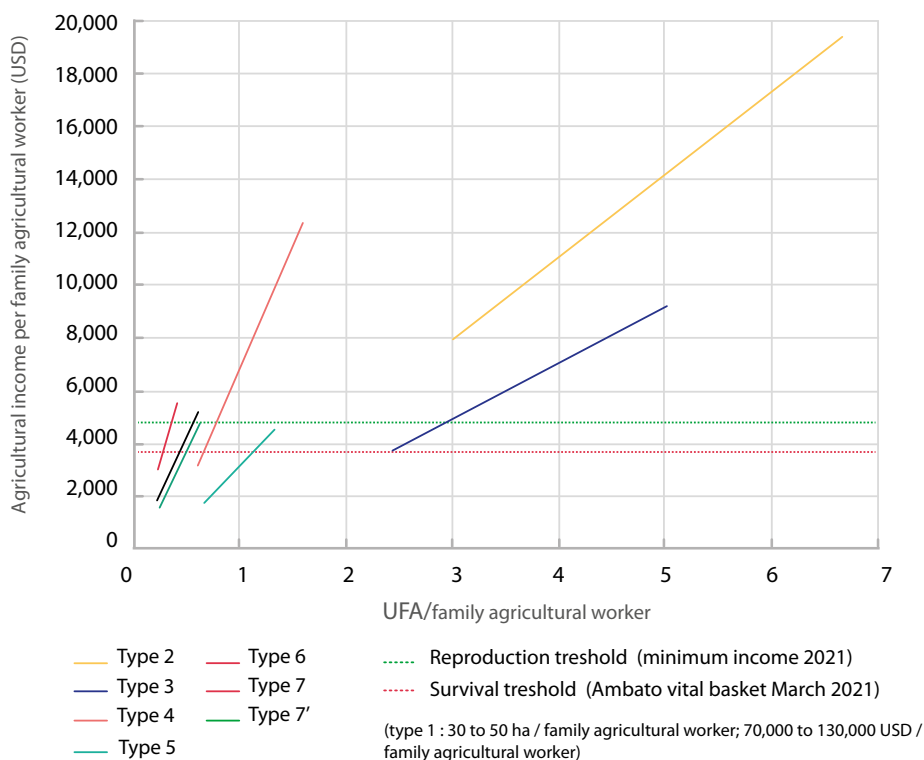
The **typology** is first finalised based on a comparative analysis of the farms. That comparative analysis is based on the creation of a table comparing data from the different case studies, and on a graphical representation of their economic results. The analysis is complemented by the creation of an "archetype" for each type or sub-type, and the graphical representation of the economic results for each of the different archetypes. An example from a study in the Ecuadorian Andes is presented in Figure 2.4.

The evaluation of the **relative weight** for each type is based on pre-existing statistical data, on a geographic analysis of the territory and on interviews conducted with key informers. For these aspects, reference may be made to [Tool Sheet 5](#), Developing a typology of farms.

The evaluation of the **degree of agroecologisation** for each type and sub-type is conducted based on the agroecolo-score range for farms belonging to that type or sub-type (see [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms).

In some cases, the degree of agroecologisation may vary greatly from one type of farm to another, such as in Algeria's M'Zab Valley (see box below).

Figure 2.4. Example of a graphical representation of economic results for different types of farms in the Ecuadorian Andes
(source: Aupois, 2021, p. 116).



Example

In Algeria, there is a strong link between type of farm and degree of agroecologisation

In the irrigated zone of Algeria's M'Zab Valley, three types of farm have been highlighted: one that is slightly agroecological, one that is moderately agroecological, and one that is substantially agroecological. Table 2.2 shows the calculation of average scores for the agroecolo-score criteria (there are significant differences between the different types of farm) and the totals for those criteria.

In other situations, there is no direct link between the types of farm identified and the degree of agroecologisation. Within each type, there are farms that are more agroecological and those that are less so (see box below).

Table 2.2. Extract of the calculation of agroecolo--scores for three types of farm with varying degrees of agroecologisation
[source: Irekti *et al.*, 2022].

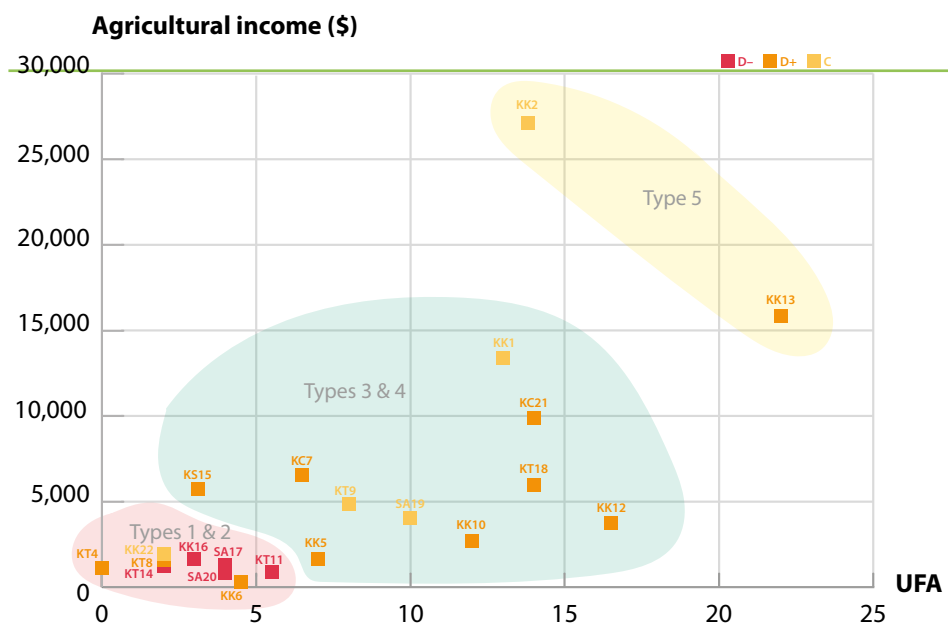
Criteria and sub-criteria identified as discriminating, for the grid used to evaluate the degree of agroecologisation		Slightly agroecological	Moderately agroecological	Substantially agroecological
Criteria	Sub-criteria			
1. Integration of crop and livestock production	1.1. Crop diversity	1	3	3
	1.2. Livestock	0	2.6	2
2. Synergies	2.1. Cultivated biodiversity and livestock biodiversity	0.33	1.2	1.66
4. Autonomy of the system resulting from valorisation of the ecosystem's resources, synergies, and saving and recycling of elements	4.2. Fertilisation practices	0.66	1.8	2.33
	4.3. Sanitary and phytosanitary protection	0.33	1	1
	6.1. Valorisation of local varieties and species, and of local know-how for food preparation	0.33	0.8	1.66
6. Contribution to territorialisation and to the ecological viability of the food system	6.2. Products marketed in the territory	1.33	2.2	2.66
	6.3. Relationships with consumers	1	1.6	2.66
Total		3.3	14.2	18

Example

In Cambodia, there is not always a strong link between type of farm and degree of agroecologisation

In Cambodia, as part of a study in the irrigated zone of Battambang, farms were broken down into three categories based on their level of agroecologisation: farms with a very low, low or moderate level of agroecological practices. As can be seen in Figure 2.5, although all the farms with a very low level of agroecological practices (in red) belong to two types (T1 and T2), there is no clear link between types of farms and level of agroecologisation: there are farms with a low level of agroecologisation (in orange) and a moderate level of agroecologisation (in yellow) belonging to all types.

Figure 2.5. Agricultural income (in dollars) versus farming area (ha) for different farms, with indication of the agroecolo-score
(source: Lucas and Mias, 2021).



Evaluating the **socio-economic effects** of agroecology requires combining the results of the evaluation of socio-economic performance with the level of agroecologisation. For production systems and farms:

- performance data for each type and sub-type of farm is considered alongside an agroecolo-score, and this is compared against the other types and sub-types;
- if, within a particular type, there are farms implementing specific agroecological systems, then the performance data for each farm is considered alongside that farm's agroecolo-score, and this is compared against the other farms of that particular type.

The example below shows the possibilities for comparison that can be made based on type of farm, level of agroecologisation and socio-economic performance.

Example

In Burkina Faso, there is a strong link between type of farm, degree of agroecologisation and economic performance

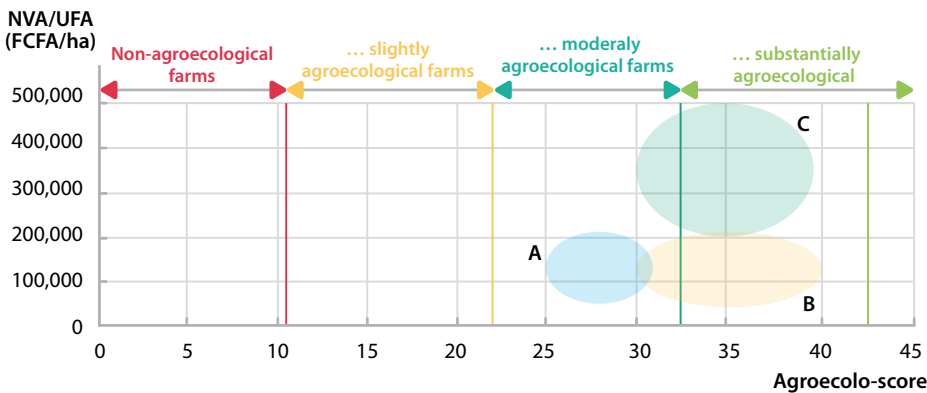
A study conducted in Burkina Faso's Guïè zone, in the Sahel region, showed that farms generating higher-than-average levels of value-added per unit of land area all had a higher degree of agroecologisation. They include:

- farms with strong agriculture-livestock integration, which is characteristic of two types of farms: large farms with a strong presence of livestock production, and small farms with predominant livestock production. So in this case, there is a strong link between type of farm, degree of agroecologisation and economic performance;
- farms that have part of their land in an agroecological bocage scheme promoted by an NGO. These farms belong to different types. In this particular case, there is no link between typology and level of agroecologisation; however, there is a link between level of agroecologisation and economic performance.

Figure 2.6 is a scatter plot comparing all 70 of the farms studied. The graph shows that there are ultimately three farm groups:

- Group A includes farms with a low agroecolo-score and low value-added per unit of land area;
- Group B includes farms with a higher agro-ecoloscope, but whose value-added is still low. This group comprises farms of a particular type: those with scarce resources (and a low level of livestock production) where the implementation of agroecological practices characteristic of the bocage scheme is insufficient in terms of improving their economic performance;
- Group C includes farms with a better agroecolo-score and better value-added per unit of land area, either because they belong to one of the two types characterised by a strong presence of livestock production, or because they have land in a bocage scheme.

Figure 2.6. Example of links between degree of agroecologisation and efficiency of land use in Burkina Faso: identification of three farm groups.



For specific crop- and livestock-production activities, performance can also be associated with a qualitative assessment (without using the agroecolo-score) of the degree to which agroecological practices are present, and then the farms may be compared among themselves.

The agroecolo-score was not designed to be calculated for a specific crop- or livestock-production activity.

The summary of results for the evaluation of the **conditions necessary for the development** of agroecology is based in part on information from the case studies, which makes it possible to verify, refine and expand on the hypotheses from Phase 1. Particular attention is given to the conditions necessary for the development of agroecology for types of farms where an agroecological transition appears to be a more suitable solution, given the problems affecting them.

This summarisation stage is also an opportunity to fill in, if need be, the **grid for identifying and describing agroecological practices** that was created in Phase 1.

Time required

We mentioned that the composition of the sample depends on how much diversity there is among the different types of farms, and on the available time and resources. If there are 25 to 30 case studies, two interviews lasting two to three hours each per case study (or three interviews per day) and one day of information-processing per case study, then the total time required is eight to ten weeks. In addition, an extra week must also be added for preparing the summary.

Associated evaluation sheets and tool sheets

- [Chapter 6](#), Evaluation of the conditions necessary for the development of agroecology.
- [Tool Sheet 5](#), Developing a typology of farms.
- [Tool Sheet 6](#), Information to gather during case studies and tools for formatting that information.
- [Tool Sheet 7](#), Presentation of the spreadsheet for automated economic calculation and its user manual.
- [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms.

The following evaluation sheets may also be used if the corresponding criteria are used for the evaluation.

- [Evaluation Sheet 3](#), Water-management performance at plot level.
- [Evaluation Sheet 4](#), Regulation of bio-aggressors.
- [Evaluation sheets 7 to 15](#), depending on the socio-economic evaluation criteria used.

Agro-environmental evaluations of sampled plots

This stage is included each time the evaluation features an agro-environmental evaluation of sampled plots, in addition to the socio-economic evaluation and evaluation of the conditions necessary for the development of agroecology.

Objective

In order to go further with the evaluation of the effects of agroecology, this stage aims to evaluate some of the agro-environmental effects of agroecological cropping practices and systems – and, in some cases, livestock-production systems. In addition to the economic results of these systems, their impact on the environment also needs to be taken into consideration.

Methodology

First of all, the agroecological practices and systems to be evaluated should be defined. Because of the finesse required for the operations and the amount of work involved in characterising these agro-environmental effects, as well as the wide array of effects depending on the pedoclimatic context, this evaluation is generally conducted on a selection of systems chosen from among those that are most frequently used or that are of particular use.

After the inventory and description of agroecological practices initiated in Stage 1c and continued in the farm case studies (Stage 2b), **samples of plots are selected** to compare with respect to:

- the choice of agroecological systems to evaluate: either a specific system, or a gradient of systems with varying degrees of agroecologisation. The degree of agroecologisation is defined based on the principles of agroecology used to calculate the agroecology-score. The systems can generally be broken down into two or three sub-groups;
- the choice of benchmark systems for making comparisons: depending on the preferred type of comparison, the system chosen is generally either a conventional local system, or a conventional intensive model based on the use of synthetic inputs. Depending on the diversity of pedoclimatic conditions covered by each type of system, 5 to 20 situations per group may be necessary. Sub-groups may be formed by type of conditions, or comparisons may focus on the most frequent type of conditions in the territory.

The cropping systems used are generally decided and implemented on farms. Agro-environmental evaluations may also, however, be conducted on common spaces if those spaces are subject to collective agroecological management (see Stage 2d, Complementary approaches in the territory).

Lastly, for each plot or cropping system evaluated, it is better to focus all observations on the same physical sampling plot (5 to 10 m²) identified at the start of the cycle, in order to take into account the specific interactions between practices, environments and results. If certain observations are made at plot or cropping-system level, then sampling should be done for some of the more one-off agro-environmental

measures in order to cover the biophysical diversity within that plot and make all the observations comparable at that level.

Time required

The time required is that of a crop cycle (generally four to six months). Under certain conditions, cycles continue one after another all year long (humid tropics or irrigated systems) or span the entire year (perennial cropping systems, livestock-production systems). Some agro-environmental characterisations are one-off (yields), while others may require regular or cumulative observations over the course of the cycle.

These studies are directly linked to the seasonality of agriculture and must therefore be organised accordingly. The team that is mobilised must, depending on the case, be available during the crop season or throughout the entire year.

Associated evaluation sheets

- [Evaluation Sheet 1](#), Crop yields (direct measurement).
- [Evaluation Sheet 2](#), Soil health.
- [Evaluation Sheet 3](#), Water-management performance at plot level.
- [Evaluation Sheet 4](#), Regulation of bio-aggressors.
- [Evaluation Sheet 5](#), Agricultural biodiversity.
- [Evaluation Sheet 6](#), Reducing exposure to pesticides.

Complementary approaches in the territory

The evaluation of certain criteria requires additional approaches to complement the case studies of farms and agro-environmental evaluations of sampled plots. These approaches, implemented at territorial level, are grouped together in this stage.

Objective

The objective of this stage is, on the one hand, to identify and analyse practices for the agroecological management of common spaces, and, on the other hand, to evaluate some of the socio-economic effects of agroecology in the territory to complement the work carried out for the case studies of farms (Stage 2b). Evaluations requiring a complementary approach at territorial level concern the effects on value chains, the effects on the attractiveness of agriculture for young people and the effects on employment.

Methodology

Practices for managing common spaces may be in part studied in the case studies of farms (Stage 2b), as long as the farms use those spaces. The conditions for using those spaces may be assessed, as well as how they are perceived by farmers. If, however, the common spaces are subject to collective agroecological management (agroecological investments made by the community for the benefit of the common spaces, collective rules in line with the principles of agroecology and that aim to ensure the sustainable management of the common spaces), it is helpful to study the history, conditions for implementation and results.

As a first step, any elements already collected during previous stages will be utilised (analysis of the landscape, historical surveys and surveys focusing on the current situation of the territory, in-depth case studies of farms): conditions for using the spaces, perception by farmers, impact on farms, etc. On this basis, it will be useful to gain a better understanding of these collective management practices through:

- specific interviews with the body in charge of management;
- group interviews with users;
- specific agro-environmental evaluations (see Stage 2c).

With regard to evaluating the **effects of agroecology on different aspects of the territory**, three evaluation sheets are proposed. These evaluation sheets make it possible to produce interview guides or identify which data to collect at territorial level. They are used when dealing with value chains and the organisation of trade ([Evaluation Sheet 10](#)), the attractiveness of agriculture for young people ([Evaluation Sheet 11](#)), and job retention and creation ([Evaluation Sheet 12](#)).

Important

Designing interview and facilitation guides

When designing the interview or facilitation guides, it is necessary to take into account what information you already have and who you plan to interview. It is necessary to clarify in advance what elements are needed.



Time required

One and a half weeks is needed for value chains. For the attractiveness of agriculture for young people or the analysis of common spaces, one week at most should be necessary. For job retention and creation, a few days is sufficient, as the evaluation is based in part on the evaluation of the effects on value chains and the organisation of trade.

This stage may be carried out at the same time as the case studies are being conducted and summarised.



Associated evaluation sheets

- [Evaluation Sheet 10](#), Value chains and organisation of trade.
- [Evaluation Sheet 11](#), Attractiveness of agriculture for young people.
- [Evaluation Sheet 12](#), Job retention and creation.



Stage 2e

Summary of results, discussion with stakeholders, finalisation of the report

This is the last stage of the evaluation.



Objective

The objective of this stage is to:

- summarise, share, clarify and confirm the results of the evaluation from the previous stages;
- finalise the study report.



Methodology

A **provisional summary** of the results from the previous stages is **presented and discussed at a meeting** with farmers and certain stakeholders from the territory. The discussion helps improve the summary (clarification, additional details, corrections). The stakeholders that are invited may be those who participated in the consultation phase, but the group may also be made up of people who were met with throughout the study. It is possible to plan several meetings with different groups of people if it helps facilitate discussion. Depending on who is in attendance, certain aspects may be developed to a greater extent. The meeting must not be seen as a meeting to validate the study, as the evaluator is still responsible for his/her own conclusions.

After the meeting, the evaluator finalises the **report**.

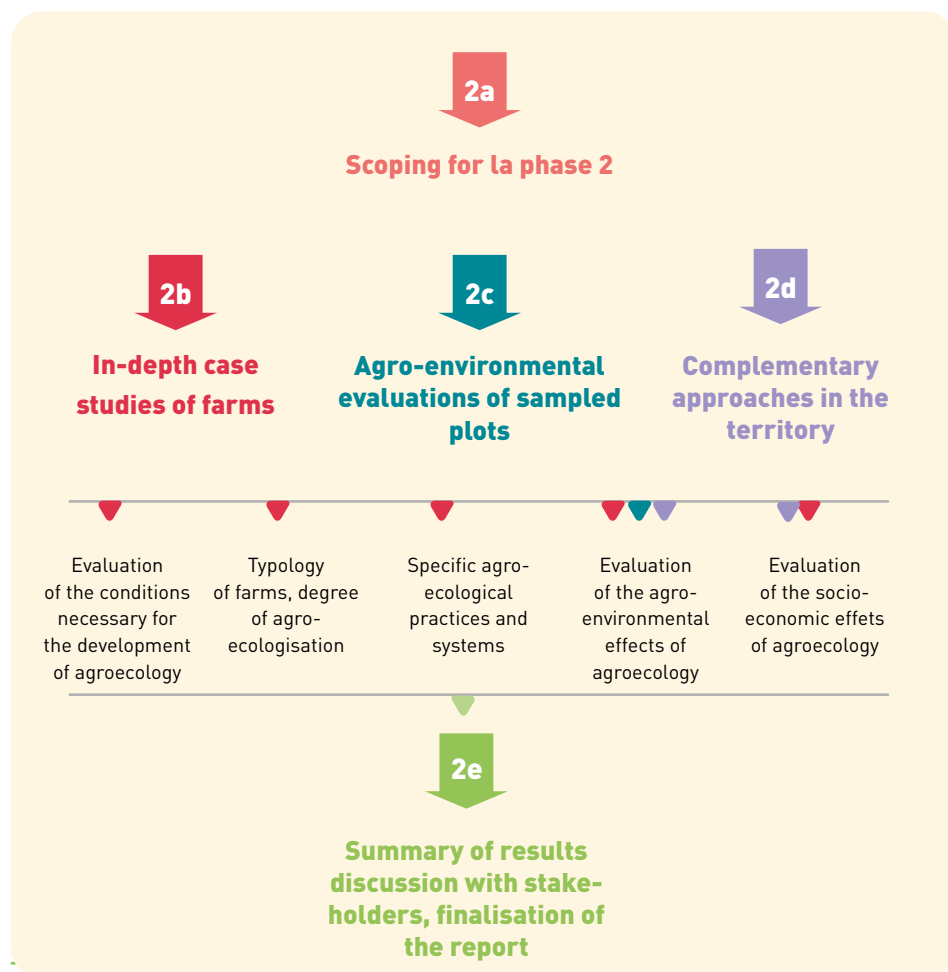
Figure 2.7 shows the connection between the different stages of Phase 2 and the results obtained.



Time required

It is necessary to allow for a few days for the presentation of the summary, and about one month for the drafting of the report.

Figure 2.7. Connections between the different stages of Phase 2 and the results obtained.



Further reading

- Cochet H., 2016. *Comparative Agriculture*, Éditions Quæ/Springer, 168 p.
- Devienne S., Garambois N., 2014. *La méthode du diagnostic agricole*. In M. Étienne (coord.), *Élevages et territoires. Concepts, méthodes, outils*, Inra FormaSciences, 97-108.
- Diepart J.-C., Allaverdian C., 2018. *Farming systems analysis. A guidebook for researchers and development practitioners in Myanmar*, Yangon, Gret-Yezin Agricultural University.

General approach for monitoring and evaluation



INTRODUCTION

The approach for monitoring and evaluation has a long-term focus. The monitoring-and-evaluation system involves:

- **one-off studies** (baseline situation, final situation, theme-based studies), which make it possible to establish benchmarks at a given time t ;
- **continuous updating of variables** (agro-environmental and socio-economic performance), which makes it possible to monitor changes and explain any differences observed between the initial situation and the final situation.

The monitoring-and-evaluation system is a tool that is used not only to evaluate agroecology, but also to **guide interventions** and inform decision-making for development stakeholders, policy decision-makers and farms themselves.

At farm level, changes depend on the performance of practices and systems, and on changes in the farm's economic, environmental and socio-cultural context. Monitoring and evaluation of agroecology focuses on three main areas: socio-economic results and effects, agro-environmental results and effects, and conditions necessary for development, i.e. the key factors that either facilitate or hinder the development of agroecology.

Objectives of a system for monitoring and evaluating agroecology

The purpose of a monitoring-and-evaluation system is to monitor the effects of agroecological practices and systems on farms and their environment versus an initial baseline situation. There are three specific objectives:

- **to monitor and measure technical and economic results**, and therefore farm performance, in order to help orient support for the agroecological transition;
- **to characterise economic, agro-environmental and social changes in the environment** in order to help farms adapt to those changes so that they can maintain or improve their performance (resilience);
- **to analyse the different levels of appropriation** of agroecological practices and systems in relation to their results and effects, and the (changing) characteristics of the environment, in order to adapt – or redefine – actions in support of the agroecological transition:
 - at farm level: technical and economic advice on integrating agroecological practices, management advice and strategic orientations for farms,

- at value-chain and market level (traders, processors, etc.): dynamisation of value chains and better performance pre- and post-production,
- at the level of stakeholders in the territory (decision-makers, decentralised technical services, etc.): orientation of general strategies to support the development of sustainable agricultural systems.

Focus

Complementarity between comparative analyses and analysis of trajectories

The use of both one-off studies and continuous data-gathering makes it possible to bring together several different methods of analysis:

- comparative analysis at a given time *t* between several groups of farms (within the same typology at the time of the baseline situation, or between farms that are beneficiaries of the intervention and farms that are not beneficiaries of the intervention at the time of the final situation);
- comparative analysis of a particular group between an initial situation and a final situation;
- analysis of trajectories of change for farms monitored as part of the monitoring-and-evaluation system.

These three methods of analysis complement each other:

- one-off studies make it possible to take into account non-beneficiary farms as a control group for the initial and final situations, whereas it is rarely possible to continuously gather data from them through monitoring and evaluation;
- continuous data-gathering, even though it concerns only beneficiary farms, makes it possible to explain how the differences between the baseline situation and final situation arose.

Setting up a monitoring-and-evaluation system

The monitoring-and-evaluation system is a participative framework where the intervention stakeholders work together as part of a co-learning process. The framework includes:

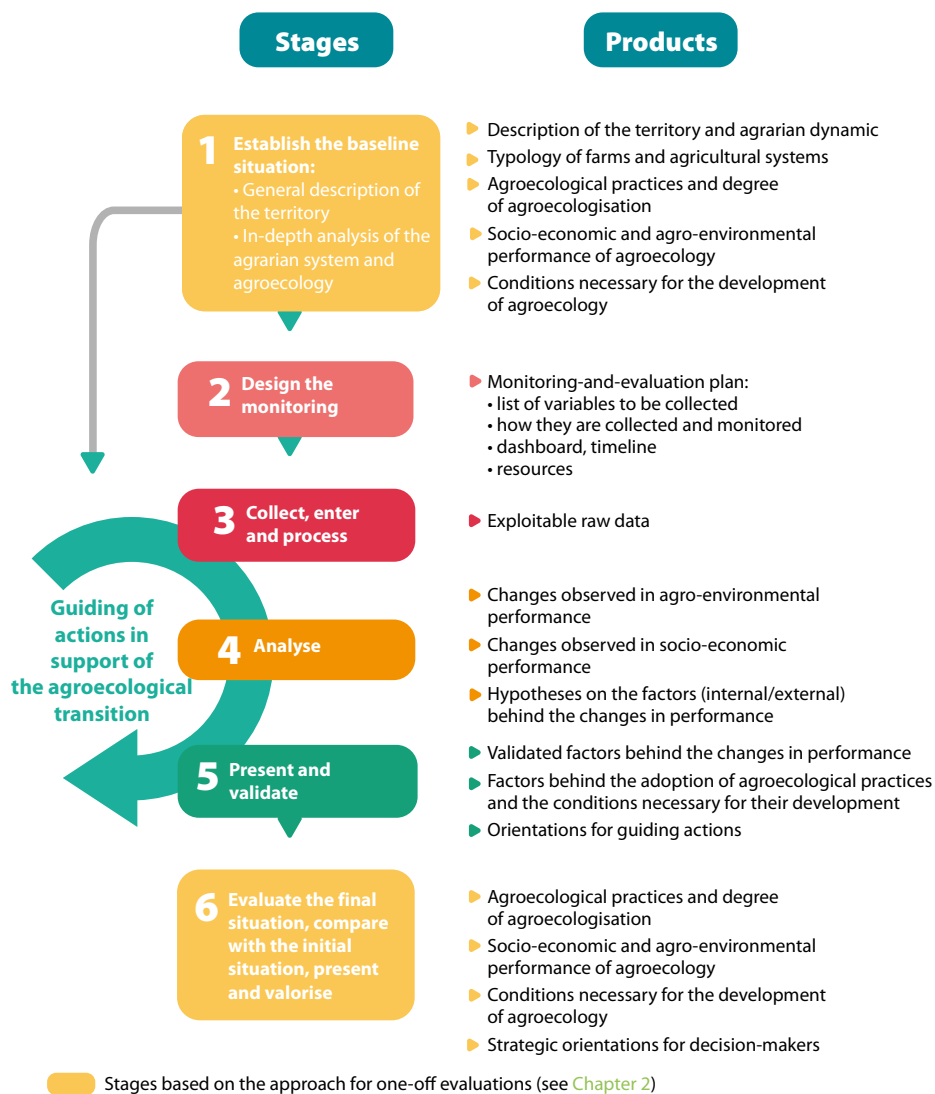
- a detailed **diagnosis and evaluation** of the **initial situation** (characterisation/baseline situation) and **final situation** (comparative evaluation¹). These two evaluations are carried out based on the approach for one-off evaluations (see [Chapter 2](#));
- a **monitoring phase** that involves collecting, processing and analysing qualitative and quantitative data throughout the intervention. The framework focuses mainly on the agro-environmental and socio-economic performance established in phase two of the one-off evaluation, but also concerns elements relating to the characterisation of agroecological practices and conditions necessary for development (in reference to certain aspects of the initial evaluation);
- key stages: **presentation** and **validation** by all stakeholders.

The framework is implemented at the start of the intervention or at the start of a new phase during the intervention. In order to facilitate actions coupled with analysis

1. Over a time period that is long enough to measure changes and significant differences.

and advice, monitoring and evaluation must be conducted by the team carrying out the intervention, with designation of a dedicated person or team².

Figure 3.1. Overview of the approach for monitoring and evaluation.



². To be calibrated depending on the size of the project and the expected level of precision for monitoring and evaluation.



Stage 1

Establish the baseline situation



Objectives

The objective of this stage is to describe the environment around the farms and the farms themselves before starting an intervention, in order to achieve the following two aims:

- **identify agroecological-transition issues** – i.e. the objectives and needs of farms that agroecology may help address, and the conditions necessary for farmers to be able to implement agroecological practices and systems – and the potential for farms to progress. This will make it possible to ensure that
- the intervention is relevant (targeting farms, defining the technical-support offer, etc.);
- **develop benchmarks for the performance** of farms in order to measure progress during and at the end of the intervention.



Methodology

The baseline situation is established by implementing the full approach for one-off evaluations (see [Chapter 2](#)), which should be adjusted during the scoping stages (stages 1a and 2a) depending on what is needed for monitoring and evaluation. When conducted as part of a monitoring-and-evaluation system, a one-off evaluation to establish the baseline situation must take into account several factors:

- the **intervention logic** (defined by the lead stakeholder or imposed by the sponsor), in order to accurately target the object of study and define differentiated degrees of analysis (e.g. for an intervention focusing on irrigated systems, the analysis of other farm cropping systems will be less detailed than that of irrigated cropping systems);
- the **zone of intervention**, in order to define the geographic scope of the study and which scales of analysis to prioritise;
- the **framework for implementing** the intervention, in order to tailor the scope of the study (variables studied) and how it is carried out (sampling strategy) based on what is feasible in terms of time and available resources;
- the **duration and schedule** for carrying out the intervention, in order to determine how much time is available at the start to characterise the baseline situation;
- the **complementarity** of the study of the baseline situation with the other tools and mechanisms of the monitoring-and-evaluation system (theme-based studies, data-gathering and analyses planned throughout the intervention), in order to avoid unnecessarily encumbering the study of the baseline situation with themes that will be dealt with or expanded on elsewhere;
- the **target beneficiaries** of the intervention, in order to define a sampling strategy that is adapted to the profile of farms targeted by the project.

Important

Monitoring a control group

The sampling strategy should take into account the usefulness and challenges of monitoring a control group as part of the intervention. It is often difficult to implement a control group outside the context of one-off studies (start/end of project), because non-beneficiary farmers can be reluctant to provide information to a project from which they are “excluded”. In order to work around the legitimate reluctance of the stakeholders in question, it is proposed that the control group be identified and evaluated only in the context of one-off evaluations for the initial and final situations. By contrast, for continuous monitoring and all the variables to consider, only beneficiaries will be part of the framework.

There are several possible scenarios for establishing the control group for the initial and final situations:

- if the project beneficiaries are known (new phase of a project that is already in progress), non-beneficiary farms may be included in the sample;
- if the project beneficiaries are not known, the control group may be identified a posteriori, at the time of the final evaluation, by searching through the farms from the initial sample to identify those that were not beneficiaries of the intervention.



Products

In Stage 1, different products are obtained that are needed for the rest of the monitoring-and-evaluation process. The purpose is to characterise the initial situation of the territory and the dynamics that are at work there:

- physical characteristics (zoning, relief, soil, water, etc.);
- agrarian history: land-use patterns, socio-economic environment, process for differentiating farms, factors facilitating or hindering the development of agroecology;
- types of stakeholders (farms and socio-economic and institutional environment, value chains, relations between stakeholders, socio-economic dynamic, main problems);
- agricultural and extra-agricultural activities, particularly elements relating to agroecology;
- agricultural activities/value chains and markets.

The typology of farms and degree of agroecologisation make it possible to guide the establishment of the sample of farms monitored over time.

The description of the agricultural production systems and associated practices, and the assessment of their socio-economic and agro-environmental performance, constitute the benchmark that makes it possible to measure progress.

Assessing the conditions necessary for the development of agroecology makes it possible to target factors external to farms that need to be monitored.



Associated evaluation sheets and tool sheets

Refer to the evaluation sheets and tool sheets mentioned in the different stages of the general approach for one-off evaluations.

Design the monitoring-and-evaluation framework

Objectives

In accordance with the objectives of monitoring and evaluation, the specific objective of this stage is to define:

- ➔ what will be monitored (**variables**) at the level of farms and their environment;
- ➔ how data will be **collected, processed and analysed** (where? who? when? how?);
- ➔ how the analyses will be **presented** depending on the targets (project team, farms, professional organisations, decision-makers) and uses (adaptation of the intervention, advisory services for family farms and professional organisations, advocacy).

The data from monitoring is less exhaustive than the data from the initial and final phases of the evaluation. The data must be easy for the monitoring team to collect on a regular basis.

Methodology

The methodology consists in identifying the variables (or elements) that will be monitored, defining how each variable will be monitored, and assembling the tools for guiding the monitoring-and-evaluation process.

Identifying the variables that will be monitored

Three types of variables are monitored:

- ➔ the **degree to which agroecology is implemented** by farms: this is essential in order to be able to correlate changes in performance to changes in practices. In the monitoring-and-evaluation process, the degree to which agroecology is implemented may be monitored using the tool for characterising the degree of agroecologisation of farms (see [Tool Sheet 8](#)), which was adapted to the territory's specific context during the baseline-situation study;
- ➔ the **elements, criteria and performance indicators** for agricultural practices and systems: they must be identified among the options proposed in the evaluation sheets (see [Chapter 4](#), Agro-environmental evaluation, and [Chapter 5](#), Socio-economic evaluation) and targeted in relation to the intervention logic, and potentially adjusted after the characterisation of the baseline situation, taking into account:
 - the crop- and livestock-production systems that will be monitored,
 - changes in practices proposed by the intervention for those systems,
 - the expected effects of the changes in practices (socio-economic and agro-environmental effects, both positive and negative);
- ➔ **external factors** that influence the practices and their expected effects: for each criterion and indicator, external factors whose effects can add to or take away from those of the agroecological practices or systems must be identified in order to refine the interpretation of the results (e.g. climate, which affects yield, or price fluctuations, which affect economic results). Depending on their degree of influence, they may require the creation of mechanisms for gathering specific data (climate monitoring, market monitoring, etc.).

Defining how each variable is monitored

For each variable (or group of variables), the following must be defined in detail:

- **timing**: frequency of monitoring (continuous, monthly, quarterly, annually, etc.) and seasonality (taking into account climate-related and social factors), duration of data-gathering (six months, one year, entire duration of the intervention) and frequency of analyses (taking into account objectives with regard to presentation, such as campaign assessments);
- **scale of analysis** (plot, crop- or livestock-production system, farm, territory covered by the intervention);
- **sampling strategy**: to reconcile reliability and feasibility, and depending on the objectives pursued, it is possible to use complementary methods:
 - statistical representativity based on the random selection of a sufficiently large representative sample: this is often difficult to achieve given the resources dedicated to monitoring and evaluation,
 - purposive sample based on sound knowledge of farms and context: this requires a quality baseline situation,
 - mixed sampling system: some data may be accessible based on purposive samples (e.g. operating results, yields, etc.), while other data may be collected based on statistical samples (e.g. quantities produced at territory level, market prices, flow of goods in value chains, etc.);
- **how data will be collected**: creation of tools/forms for gathering data, and analytical tools. In this regard, the evaluation sheets provide protocols for data-gathering corresponding to the different indicators;
- which **external skills** to mobilise (scientific expertise, statistical expertise, economic expertise, etc.), and how and when they should be mobilised (taking samples, helping analyse available data, theme-based study, etc.);
- the human, material and logistical **resources** required.

Important

Tools with multiple functions

Sometimes a single tool may be used to provide data for several indicators. For example, the farm monitoring notebook can provide data on yields and economic results.



Products

This stage leads to the creation of **a monitoring-and-evaluation plan**, which includes:

- a list of indicators specifying how the monitoring will be conducted;
- tools for collecting, entering and analysing data;
- a dashboard and timeline specifying the human and material resources mobilised, including external expertise.



Associated evaluation sheets and tool sheets

The decision as to which evaluation sheets to use depends on what is being monitored and evaluated. The evaluation sheets in [Chapter 4](#) (Agro-environmental evaluation) and [Chapter 5](#) (Socio-economic evaluation) may be referred to, where applicable.

Important

Designing the framework

- The management and operation of a monitoring-and-evaluation system can quickly become very onerous. It is therefore important to strive for effective simplicity rather than counterproductive complexity.
- “Too much information is equal to no information”: it is better to prioritise quality of information over quantity of information.
- Monitoring and evaluation is not just the responsibility of the person in charge of monitoring and evaluation. It is a team responsibility.



Stage 3

Collect, enter and process data



Objectives

The objective of this stage is to have quantitative and qualitative data that is useful for:

- describing the **changes** in practices on farms;
- evaluating the **performance** of farms;
- characterising **changes** in the environment.



Methodology

The quality of data collection is essential to ensuring that the data that will be analysed is reliable. Data is collected directly (actual measurement) or indirectly (based on what stakeholders say in interviews). Data may be collected by project officers in the field (technicians, project survey interviewers, monitoring-and-evaluation managers) or outsourced (to farmers, professional organisations, etc.). Regular checks must be carried out by the person in charge of monitoring and evaluation within the project.

The data collected must be regularly entered into a previously prepared **database** – an Excel spreadsheet will usually suffice – in order to avoid lengthy data entry at the end of the data-collection cycle. The use of automatic lists or filters is strongly recommended when creating databases.

Data is processed whenever necessary (key stages prior to presentations) using the appropriate tools (manual processing is time-consuming and prone to error). Pivot tables and charts should be used.



Products

This stage enables the creation of populated databases.



Associated evaluation sheets and tool sheets

The evaluation sheets and tool sheets are used in the previous scoping stage. In the stage for data collection, entry and processing, the tools designed during the previous stage are used.



Stage 4

Analyse data



Objectives

The objectives of Stage 4 are to:

- **define the socio-economic and agro-environmental performance** of the different groups within the monitored sample;
- **formulate hypotheses on the effects (both positive and negative)** that practices, changes in practices and systems, and changes in the environment have on performance;
- **measure changes in performance** compared with the baseline situation and previous analyses;
- **formulate hypotheses on the effects that changes in the environment have** on changes farmers make to their practices (effects linked to the conditions necessary for the development of agroecology).



Methodology

Data is analysed in two successive sub-stages:

- **computer analysis** of raw data by the person in charge of monitoring and evaluation (calculation of averages, standard deviations, etc.) to establish performance indicators;
- **team interpretation** of processed data to have elements from the field that explain the results observed.



Products

The products obtained at the end of this stage are updated tables of indicators and charts containing benchmarks on agro-environmental performance, socio-economic performance and the conditions necessary for the development of agroecology.



Associated evaluation sheets and tool sheets

Different evaluation sheets may be used depending on what is being monitored and evaluated. The evaluation sheets in [Chapter 4](#) (Agro-environmental evaluation) and [Chapter 5](#) (Socio-economic evaluation), and the tool sheets in [Chapter 6](#) (Evaluation of the conditions necessary for the development of agroecology), may be used as necessary.

Those evaluation sheets and tool sheets are used for analysing data.

Additional tools may be developed and used, such as pivot tables and charts, charts, diagrams, etc.

Important

Additional one-off studies

In addition to continuous data-gathering, a monitoring-and-evaluation system may also include one-off theme-based studies. These studies may be conducted:

- to monitor indicators that focus on long-term changes (e.g. changes in the physical and chemical characteristics of a particular soil);
- to develop a better understanding of the effects observed through monitoring and evaluation (e.g. value-chain/market study to analyse the improvement in economic performance).

In this case, specific methodologies will need to be defined.



Stage 5

Interim presentation, validation and valorisation of results



Objectives

The objectives of this stage are to:

- **compare the analyses** of the monitoring-and-evaluation system with the view-point of farms and their organisations;
- **validate, correct and refine the hypotheses** on how changes in practices and changes in the environment affect performance;
- **identify the conditions necessary for the development** of agroecological practices and systems.



Methodology

The analyses are validated in a concerted manner: project team, representatives of farmers and value-chain stakeholders, support-services officers. This consultation around the results and the effects observed following the implementation of practices is essential for the quality of future presentations and contributes to improving the monitoring-and-evaluation system. It makes use of presentation tools that are suited to the audience in question. Visual representations (posters, diagrams, simple tables, etc.) will be used for presentations to farmers and value-chain stakeholders. More complex formats may be used for “informed” audiences (NGOs, technical services, territorial-management and planning stakeholders, etc.).

The **interim presentation** and **validation** meetings are held during the intervention at key moments identified at the time the monitoring-and-evaluation system is designed. They may take several complementary forms:

- campaign assessments, which involve collectively presenting the analyses to professional organisations or groups of farmers in the territory;
- interprofessional workshops, which present the analyses to representatives of the different categories of stakeholders from a particular value chain;
- individual presentations to farms within the monitored sample, which make it possible to provide individualised advice to improve how the farm operates. These presentations help promote collaboration and inspire farmers to want to have reliable analyses (and therefore record and transmit reliable data).

At the end of the presentation meetings, the support materials are taken back to be corrected and expanded on by incorporating information from the meeting. They are also consolidated in a form that makes it possible to incorporate the conclusions of the analysis in the implementation of the intervention.

This methodology requires the use of **specific tools**:

- for the collective presentations: illustrated posters, graphics, diagrams, tables;
- for the individual presentations: form for individualised farm monitoring, income statement, etc.;
- for the orientation of the intervention and the monitoring of changes: interim report (campaign assessment, workshop minutes).



Products

The products obtained at the end of this stage are summaries on:

- changes in agro-environmental performance;
- changes in socio-economic performance;
- conditions necessary for the development of agroecology;
- orientations for the action.



Stage 6

Evaluation of the final situation (feedback loop) and strategic orientation

Conducting a new one-off evaluation study at the end of the intervention makes it possible to carry out a **comparative analysis between the initial and final situations**. In order to be able to compare changes in the situations of beneficiaries of the intervention with those of non-beneficiaries (control group) since the baseline situation, this new study is conducted using the same methodology as the initial study (and therefore as the one-off evaluation, see [Chapter 2](#)).

It is simplified, however, for certain aspects (zoning, agrarian history, exhaustiveness) and focuses more on the development of agroecology (identification of agro-ecological practices and systems), its effects (evaluation of performance) and the conditions that facilitated or hindered its development.

The comparative analysis draws on the observations made throughout the intervention through the monitoring-and-evaluation system. Those observations focus on two aspects: trajectories of change for farms, and changes in physical, economic and institutional environments.

This study is presented and valorised **for the purposes of strategic orientation** (decision-making support for technical and policy decision-makers) at presentation meetings organised for development partners:

- ➔ public organisations providing support: authorities in charge of planning and managing the development of territories, decentralised agriculture and rural-development services, environment services, trade services, etc;
- ➔ NGOs providing support, professional organisations (be aware that professional organisations can sometimes get lost in overly complex presentations).

Further reading

Agrisud International, 2015. *Conseil de gestion aux TPE agricoles familiales. Guide*, 173 p.

Fadear, 2014, *Agriculture paysanne. Le manuel*, 132 p.

Tourdonnet S. de, 2017. *Analyse des trajectoires d'écologisation des pratiques d'agriculteurs au sein des groupes CUMA : une méthode pour accompagner la transition agroécologique*. Capaccita project [Innovation Mixed Research Unit – FNCUMA].

PART 2

Evaluation sheets



Agro-environmental evaluation



This chapter comprises six evaluation sheets covering different areas where agro-ecology is likely to have an impact.

- ➔ Evaluation Sheet 1. Crop yields (direct measurement)..... 82
- ➔ Evaluation Sheet 2. Soil health..... 89
- ➔ Evaluation Sheet 3. Water-management performance at plot level..... 104
- ➔ Evaluation Sheet 4. Regulation of bio-aggressors..... 112
- ➔ Evaluation Sheet 5. Agricultural biodiversity 118
- ➔ Evaluation Sheet 6. Reducing exposure to pesticides..... 126

Each evaluation sheet provides: a definition of the area in question; an introduction explaining the different contexts in which the evaluation sheet may be useful; a table summarising the criteria, indicators, scale and technicity of the evaluation; the methodological approach for characterising a situation (one-off evaluation); potential supplements for monitoring and evaluation; and comments on technicity, human resources required and costs. Some documentary references are also proposed in the “Further reading” section for exploring certain aspects in greater depth.

Crop yields (direct measurement)

Definition

The yield of a crop is generally calculated relative to the cultivated area. It is the quantity of product obtained in a crop-production activity per unit of land area, taking into account that there may be multiple products. In agroecological systems in particular, a wide range of species may be present in a given plot in the form of associated crops, adventitious plants and ecological infrastructure (grass strips, hedges, trees combined with annual crops, etc.), whose biomass may be valorised (wood, fodder, picking) or restored to the soil. It is important for all of these products to be taken into account in the yield estimate for the plot.

Crop yields and yield regularity over a long period of time are two preferred indicators for gauging production performance and comparing that performance between different soils, techniques and regions, and for characterising and comparing agroecological cropping systems with “conventional” systems. Under certain conditions, it may be useful to calculate the yield of a particular crop relative to other production factors, such as the amount of work required or the quantity of seeds, manure or water used.

The estimate of the average level of crop yields and their interannual regularity is an essential component of agroecology’s approach for one-off evaluations and for monitoring and evaluation (as well as their dynamic over time). The evaluation according to stakeholders is presented in [Evaluation Sheet 7](#), Crop and livestock yields (estimate according to stakeholders). For monitoring and evaluation, complementing the analysis of yield according to stakeholders by directly measuring the yield makes it possible to obtain a more detailed analysis of yields for different cropping systems and agroecological practices, and – if the measurements are repeated – their interannual regularity. This is particularly useful for observing certain agro-environmental effects (see [Chapter 3](#), General approach for monitoring and evaluation). Direct measurement of yield may also be useful for a one-off evaluation, to complement the evaluation of certain agro-environmental criteria. It is conducted in Stage 2c, Agro-environmental evaluations of sampled plots (see [Chapter 2](#), General approach for one-off evaluations).

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Yield	Grain/tuber/fruit/wood yield	Production per production cycle per unit of land area, preferably expressed in dry matter (tons or kg per hectare)	Plot*	High
	Fodder/straw/crop-residue yield	Fodder production per production cycle per unit of land area, preferably expressed in dry matter (tons per hectare)	Plot	High
	Aboveground and underground biomass	Annual production per unit of land area, preferably expressed in dry matter (tons or kg per hectare)	Plot	High
Regularity of yield	Interannual variability	Coefficient of variation of the average yield (%)	Plot Farm	High

* Crop-production yield is measured at plot level, if possible including ecological infrastructure (hedges, trees, plant strips, etc.).

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

Farmers generally use their own perception of the level of yield for their plot to evaluate their technical decisions after the fact, and adapt them.

1. Preliminary observations

The purpose of evaluating yield is:

- to quantify the final yield in order to compare it between different scenarios (e.g. different techniques);
- to identify (where applicable) the reasons why the results failed to meet expectations, in order to propose strategies for improvement.

In the former case, the evaluation may just involve measuring the yield at harvest and briefly describing the cropping system and pedoclimate (soil temperature and moisture) associated with it. In the latter case, however, it may be necessary to also measure the status of the environment and crop over the growing season, and characterise the various technical choices that were made for the plots.

Yield is generally measured on sampling plots that are representative of the biophysical production conditions (techniques and environment) that are to be evaluated. These conditions may be for a single plot, several plots on a particular farm, or a region. The number of sampling plots to be used at each scale may be limited to a sample that is representative of the diversity of production conditions at that scale. For example, for agriculture in the Sahel, it may be useful to distinguish between sampling plots for millet grown on homefields and sampling plots for millet grown on outfields.

Yield may be measured for a single growing season or several seasons.

2. Information to be gathered

For annual crops, based on the identification of different ecological zones and cropping systems in the diagnostic analysis of the agrarian system, plots that are representative of the zones or practices that one wishes to evaluate are used to measure yields.

There are several stages that must be taken into account when collecting data.

● Visit to the plot, brief zoning and reconstitution of the crop-management sequence

The first stage involves a field tour in order to detect the spatial heterogeneity of the plot owing to possible variations in topography or soil type, which may have an effect on the status of plant communities (waterlogged areas, localised pest attacks, etc.). This zoning includes an estimate of the land area occupied by ecological infrastructure (trees, hedges, grass strips, stone barriers, etc.). For multi-species systems, it is also necessary to report on the heterogeneity of species spread in order to define the elementary area being estimated for the produce (can be extrapolated to the plot). The area of each identified zone is then estimated. This stage must also make it possible to reconstitute, with the farmer, what cultivation operations were conducted and the dates on which they were conducted, and to obtain climate data (daily or monthly rainfall, average temperatures) from the station closest to the site of observation.

Sampling the various harvest products

The sampling plots or sites chosen must be representative of the zones identified in the plot. Sites may be selected in the best and worst part of the plot, in order to calculate minimum and maximum yields. Three to five sites should be selected per field, depending on the heterogeneity and size of the plot (2 x 3 sites if two very distinct zones are identifiable).

● In order to allow for statistical processing of data, it is desirable to repeat comparisons in a variety of situations to evaluate the robustness of the differences observed. In this case, each monitored plot may be considered as a repetition.

The areas to be sampled for each site range from 2 to 10 m², depending on the crops and sowing techniques (sowing in drills, sowing in seed holes or broadcast sowing). Within this area, all plants of the same species are cut back to ground level and constitute a single sample, which will be identified specifically. For staggered-harvest crops, the sampling plots are properly identified, so that they can be regularly visited throughout the entire duration of harvesting.

Processing of samples

All the biomass samples are weighed wet. The grains, tubers, fruit, straw, twigs, leaves and roots are then weighed separately.

Calculation of yield

Yield per hectare is extrapolated from production-related elements on each sampling plot. If well-differentiated zones are identified on one hectare, averages are calculated for each zone and then extrapolated to hectare scale in proportion to the area of the zone.

Yield components

A more detailed analysis of yield, in connection with changes in agronomic conditions throughout the cropping cycle, may be made by calculating the yield components. The easiest to calculate are:

- for tillering cereals such as millet and rice: number of seed holes per hectare, number of ears per seed hole, number of grains per ear, and average weight of 1,000 grains;
- for legume crops such as groundnut: number of seed holes, number of plants per seed hole, number of pods per plant, number of grains per pod, and average weight of 1,000 grains;
- for root and tuber crops: number of plants per hectare, number of tubers per plant, average weight of a root or tuber.

Specific evaluation of ecological infrastructure and biomass restored to the soil

Grass strips, hedges, agroforestry park trees, etc., must be indicated during sampling, particularly to consider the impact of their presence on crop yield at plot level. Depending on the situation, these structures may have a highly variable effect (positive, negative or neutral) on the yields of associated crops.

For the evaluation of **perennial crops**, it is important to distinguish market production (fruit, sap, bark, etc.) from growth of biomass. Allometric techniques make it possible to measure this growth (Picard *et al.*, 2012).

3. Processing of data

Below is an example showing a system that may be used to collect evaluation data, and the results obtained.

Example

Comparison of rice yields for different planting densities in Haiti

Location: Cap-Haïtien, commune of Saint-Raphaël, 2021 data

Variety: Jaragua/irrigated rice (transplanted)

Standard density (D_0): 1,800,000 plants/ha

Density 1 (D_1): 400,000 plants/ha

Density 2 (D_2): 260,000 plants/ha

Density	Fertile tillers per seed hole	Paddy yield
Standard	9	5.2 t/ha
D_1	14	5.9 t/ha
D_2	15	7 t/ha



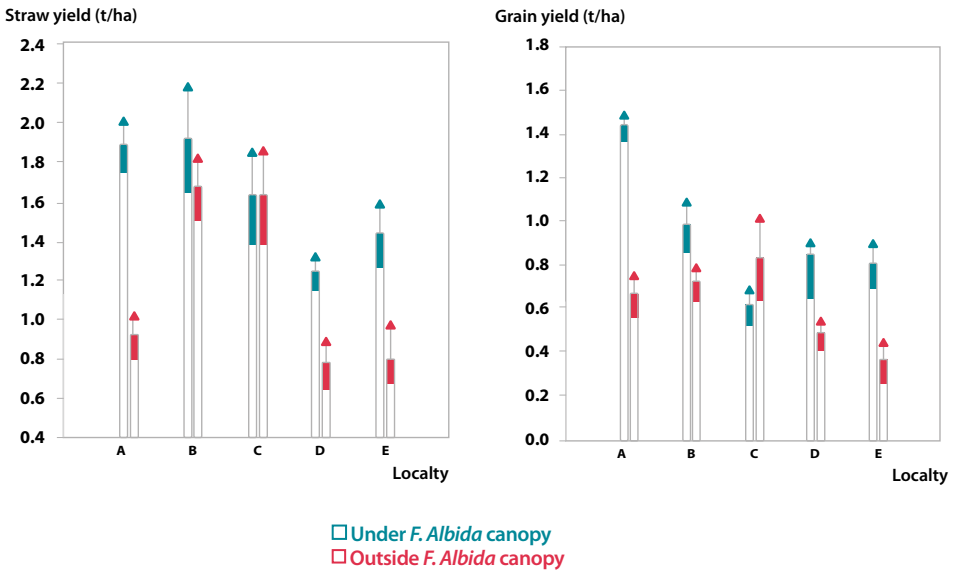
- 4 blocks, each with randomised configuration of the 3 planting densities
- 3 elementary plots monitored in each block (3 densities studied)
- D_0 : implemented by the farmers
- D_1 and D_2 : implemented by the monitoring team with the farmers

Block I	Block II	Block III	Block IV
D_0	D_1	D_1	D_2
D_1	D_0	D_2	D_0
D_2	D_2	D_0	D_1

The example below shows a possible interpretation of results from the evaluation of millet grain and straw yields depending on the presence or absence of *Faidherbia albida* (which is related to acacia and develops a large canopy that allows many crops to thrive, and that is a source of food for livestock during the dry season.)

Example

Comparison of millet yields for plants grown under and outside a *Faidherbia albida* canopy in Senegal (© Clermont-Dauphin)



3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

Measuring yield over several seasons makes it possible to better assess the effects of climate variability on yield, and therefore evaluate the criterion of yield regularity. It requires strengthening the monitoring-and-evaluation system to:

- improve climate-data accuracy, in particular by installing rain gauges near the observation sites;
- ensure that regular visits are made and operations are recorded, if possible by the farmer;
- measure succession-cropping yields, in comparison to other usual rotations or sole cropping;
- monitor changes in yield over time and changing trends;
- monitor adaptations and changes in practices, resulting either from improvement in the farmer's technical knowledge, or in response to specific biophysical and socio-economic constraints perceived by the farmer.

Ideally, it should be possible to repeat measurements on the same plots in order to reduce the risk of variations in yield caused by factors other than climate conditions. If this is not an option (e.g. in the case of long rotations), comparable plots may be selected to answer the question that was posed.

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

Evaluating the agronomic effects of agroecological practices requires specific skills and resources:

- agronomic-analysis skills;
- equipment for taking measurements: weighing scales, measuring tapes, GPS, etc.;
- access to climate data and possibly analysis of soils sufficiently close to the evaluation sites. Otherwise, it must be possible to take measurements *in situ*.

Further reading

- Cochet H., 2012. Productivité. *Les Mots de l'agronomie. Histoire et critique*, Inra-SAD (online dictionary). <https://mots-agronomie.inra.fr/index.php/Productivite%C3%A9>
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- Picard N., Saint-André L., Henry M., 2012. *Manuel de construction d'équations allométriques pour l'estimation du volume et la biomasse des arbres*. De la mesure de terrain à la prédiction, FAO/Cirad. <http://www.fao.org/3/i3058f/i3058f.pdf>

Soil health

Definition

Soil health is defined as the continuous capacity of soil to function as a living system in order to support productivity, promote air and water quality, and sustain plant, animal and human health*. This function has its origin in the assemblages of living organisms (microorganisms, soil fauna) that live in interaction with the physical and chemical habitat of the soil.

Evaluating soil health therefore consists in evaluating the functions driven by the interactions between biological assemblages and the soil mineral matrix. These functions underlie the provision of ecosystem services, including provisioning services (plant production), regulation services (e.g. carbon storage) and support services (cycle of nutrients) in agricultural systems. Soil health is therefore directly connected with the concept of soil multifunctionality, and this distinguishes it from the concept of fertility, which is only linked to the plant-production service.

There are four key soil functions:

- the soil's structural stability, which helps maintain biodiversity by preserving the habitat of organisms and encouraging the circulation of water, air and living organisms. It also defines the soil's resistance to erosion;
- decomposition of organic matter, which contributes to the flow of energy within the chain of soil organisms, the release of nutrients (e.g. nitrogen and phosphorus), and good soil structure (structural stability, retention of mineral elements, higher useful water reserve, etc.) through the formation of organo-mineral aggregates;
- recycling of nutrients, which is strongly linked to the activity of a trophic micro-network (bacteria, mushrooms, nematodes, protists, etc.) and which defines the conservation and availability of the nutritive elements necessary for plant production (mineralisation process);
- regulation of pathogens and diseases: the diversity of soil organisms linked to the maintenance of a good-quality "soil" habitat is a factor in reducing plants' sensitivity to pathogens (e.g. nematode-trapping fungi).

* Lehmann *et al.*, 2020.

Evaluation of soil health is useful when farmers modify their practices and when they want to measure the level of aggradation (or non-aggradation) of soil functionality (aggradation is the opposite of degradation). This is a measurement that is in line with the agroecological transition. Evaluation is particularly important in areas where crop pressure is high and where traces of soil degradation are visible. The evaluation may make it possible to inspire farmers to change their practices before reaching levels of degradation beyond recovery.

Evaluating the effects of agroecology on soil health is useful for farmers, because the level and regularity of production and future income are largely dependent on soil health. The effects of agroecology on soil health may be compared with effects on crop yields. Soil health – and therefore the soil’s productive potential – is of interest not only to farmers, but also to the general public.

The evaluation may be conducted as part of a one-off evaluation (see [Chapter 2](#), General approach for one-off evaluations, Stage 2c, Agro-environmental evaluations of sampled plots) or as part of monitoring and evaluation ([Chapter 3](#)).

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

The evaluation is based on qualitative or quantitative elements. Distinction is made between inherent properties that are not (or very exceptionally) affected by practices (texture, useful reserve, exchange capacity, soil depth), and dynamic properties (quantity of nutrients, structural stability, infiltration, organic matter) that are more directly linked to practices. The former are context-related variables, and the latter are the variables that will be used to measure soil health.

This guide favours criteria and indicators requiring methods that can be based on direct observations (e.g. assessing the texture or structure of a soil) or self-administered tests. The methods developed by laboratories are not always accessible (cost, infrastructure, equipment). They are, however, cited in the additional methods at the end of this evaluation sheet.

Criteria and sub-criteria		Indicators	Scale	Technicity
Maintenance of physical properties (water and soil conservation, circulation of air, water and nutrients)	Degree of soil compaction	“Ballpoint pen” penetration index, or use of a penetrometer	Plot	Low
	Water infiltration	Average infiltration speed of water poured into a cylinder	Plot	Low
	Structural status of a soil	Visual index of a soil’s structure: spade test	Plot	Low
Maintenance of biological activity in the soil	Biological activity in the soil	Bioturbation test and measurement of earthworms	Plot	Low
Decomposition of organic matter	Mesofaunal and microfaunal activity status	“Teabags” test	Plot	Low
Nutrient availability	Quantity and availability of nutrients for plants	Plant-colour index	Plot	Low

Evaluation of soil health is pertinent mainly at plot level, because agricultural practices apply at this level. Farmers act differently according to the potentiality of soils to produce. It is therefore important to first identify different types of plots in a village terroir.

2. METHODOLOGICAL APPROACH AND TOOLS

1. Preliminary observations

For a one-off evaluation, the measurements used for the evaluation must be made in accordance with an approach involving comparison of the effects of different practices at a given time t (e.g. synchronic comparison of agroecological practices vs conventional practices).

For monitoring and evaluation, the measurements used for the evaluation must be made within a defined time frame (often annual) that makes it possible to assess changes in soil health resulting from changes in practices.

Important

Sampling

Several indicators require soil-sample measurements that are representative of a plot.

- The depth the measurement is taken at is essentially between 10 cm and 30 cm (this generally corresponds to the depth of soil affected by annual plants and cultivation practices). However, depending on how difficult it is to collect samples (depends on soil type) and the amount of time spent collecting them, it may be better to take a greater number of measurements at 10 cm, rather than fewer measurements at 30 cm.
- For a cultivated plot measuring several hundred square metres, it is necessary to take at least three to five measurements.
- For monitoring and evaluation, it is essential to carefully note the locations where measurements are taken so that the action may be repeated.

2. Information to be gathered

In addition to taking measurements, it is also important to ask questions to farmers, who have empirical knowledge of the nature of their soil. They use indicators that are often based on soil colour or behaviour in a specific situation (heavy rains or drought), or on indicator plants.

Physical properties

The methods presented here are based on simple tests that can be conducted on the plot. They may be supplemented, if necessary, by laboratory tests or more complex analyses (texture analyses, porosity, aggregate stability test, etc.).

Soil surface status: the “ballpoint pen” test

Analysis of a soil’s surface status makes it possible to evaluate the level of a soil’s structural degradation, as well as runoff and erosion risks for that particular soil.

Place a taut 5 m rope on the ground of the plot. Every 5 cm, insert a ballpoint pen into the soil, applying equal pressure each time. You will feel more resistance or less resistance depending on the level of soil compaction:

- if the pen penetrates the soil effortlessly = little or no compaction;
- if the pen meets resistance but is still able to penetrate = average compaction;
- if the pen does not penetrate, or only penetrates very little despite the pressure applied = very high compaction.

To generate a single value representing the degree of surface soil compaction, just calculate the average.

Water infiltration: the “cylinder” test

Take a 1 kg food can and remove the lid and bottom. Then, insert the can into the ground to a depth of 3 cm. Place a graduated ruler on the edge of the can, with the 0 touching the surface of the soil. Then, pour the equivalent of 10 cm of water into the can. Using a timer and the ruler, record the water level in the can every minute. Record the total time the water takes to infiltrate the soil.

Table 4.1 Water-infiltration-speed references according to soil structure.

Speed of infiltration	Reference value	Soil characteristics
Fast	> 50 mm/hour	Soils that are resistant to heavy rains, with major infiltration. Lumpy structure*
Moderate	15 to 50 mm/hour	Soils tolerating moderate rainfall. Average infiltration with presence of runoff. Intermediary structure
Slow	< 15 mm/hour	Flooded soils with low-level infiltration and major runoff. Puddles of water form. Massive structure

* This test is not suitable for sandy soils (with mostly coarse-grained sand), which also have fast infiltration speeds (“structure with single non-aggregated grains”). In this case, refer to the methods proposed by BioFuncTool1.

Structural status: the spade test

Evaluation of the structural status of arable soil surface layers is an area of growing interest in terms of understanding (or assessing) the effects of the use of agricultural machines, which cause compaction, and various tillage practices (ploughing, no-till in conservation agriculture), which have a profound effect on the conditions for changing soil structure². The spade test³ makes it possible to diagnose the structural status of the soil.

1. Brauman and Thoumazeau, 2020.

2. Soil structure refers to the way in which sand, silt and clay particles are arranged in relation to one another.

3. See the BioFuncTool method (Brauman and Thoumazeau, 2020).

BioFuncTool: a set of in-field indicators to evaluate soil health

BioFuncTool was developed by IRD and CIRAD and is based on the use of nine simple and accessible in-field tools to measure the different functions driven by biological assemblages in the soil (bacteria, mushrooms, soil fauna) as they interact with the soil environment. BioFuncTool measures three key soil functions: structure maintenance, nutrient cycling, and carbon transformation. This tool can be very useful if you want to better quantify the measurement of soil health. Every year, CIRAD organises training sessions on how to use this tool⁴.

Processing of data

Soil structure (Sq) is rated from 1 to 5 using the VESS method⁵, which makes it possible to classify soil structure as belonging to one of five categories based on degree of compaction, size, appearance and porosity of clods and aggregates (see Table 4.2 on the next page). This method is based on observation of the different horizons of a 20 cm by 20 cm block of soil extracted using a spade.

Figure 4.1. Extraction of a soil block using a spade.



Sampling may be conducted following the standard procedure (three tests per plot), avoiding any non-representative areas (wheel tracks, mounds, etc.). If a plot is particularly heterogeneous, however, it is recommended that five to six soil blocks be extracted in a diagonal pattern in order to thoroughly cover the heterogeneity.

4. This method is presented in Brauman and Thoumazeau, 2020. See also <https://catalogue-formation.cirad.fr/recherche?keyword=biofuncntool-R&cpf=&address=&categorie=&filter=>

5. Baize *et al.*, 2018.

Table 4.2. Rating soil structure (Sq)
(source: Agro-Transfert Ressources et Territoires, 2018, p. 4, from the method of Ball *et al.*, translated by Baize *et al.*, 2018).

Structure quality	Aggregate size and appearance	Visible porosity and roots	Distinctive features	Appearance of aggregates or fragments ~ 1.5 cm in diameter
Sq1 – Friable Aggregates crumble very easily between fingers	Mostly < 0.6 cm	Roots fill the entire block Highly porous	Aggregates are fine and porous	Highly porous aggregates made up of smaller aggregates held together by the roots. They are for the most part directly obtained when extracting the block
Sq2 – Intact Aggregates crumble easily between fingers	Mixture of rounded aggregates from 2 mm to 7 mm	Roots fill the entire block Most aggregates are porous	High aggregate porosity	Rounded, fragile, porous aggregates that break easily
Sq3 – Firm Most aggregates crumble easily between fingers	Mixture of aggregates from 2 mm to 10 cm Less than 30% are < 1 cm Possible presence of non-porous clods	Porosity and roots within the aggregates Presence of visible macropores and cracks	Low aggregate porosity	Mostly rounded aggregates with few visible pores
Sq4 – Compact Non-porous clods rather difficult to break with one hand	Mainly subangular non-porous clods > 10 cm Possible lamellar structure Less than 30% are < 7 cm	Roots concentrated around the non-porous clods Few “visible macropores” and cracks	Roots in the visible macropores	These cubic fragments with angular edges and internal cracks are easy to obtain with wet soils
Sq5 – Very compact Non-porous clods very difficult to break with hands	Angular clods > 10 cm Very few measuring < 7 cm	Few or no roots Very few “visible macropores” and cracks May present anaerobic conditions	May have grey/blue colour	The soil may be broken up when wet, but may require considerable effort. Usually, no pores or cracks visible to the eye

A soil-structure score is attributed based on the reading of a table (see Table 4.2) defining various soil-structure parameters (degree of compaction, visible porosity and roots, aggregate shape and size, macroporosity, etc.).

For a sample extracted using a spade, the different horizons are identified and a score is attributed to each layer. The final score is calculated based on the score attributed to each layer (from 1 to 5), taking into account the thickness of the layer and the total depth of the extracted block.

The final score is determined using the following formula:

Final score =

$$\sum (\text{score attributed to layer} \times \text{thickness of layer in cm}) \div \text{total thickness of block}$$

Structure quality	Score
Friable	1
Intact	2
Firm	3
Compact	4

● **Biological activity in the soil**

The best way to evaluate biological activity in a particular soil is to observe the presence of earthworms (direct measurement of this fauna) and the soil’s bioturbation (work done by earthworms and visible in the soil⁶).

Measuring bioturbation

The soil block used in the spade test must be reused to take this measurement. The goal is to measure the biological activity of earthworms (bioturbation index) from traces of their activity: worm casts on the soil surface, and macroporosity created by earthworm galleries.

There are two scenarios:

- if the Sq (final score) is between 1 and 2 (horizon referred to as “non-cloddy”), grading is done within the entire block (Table 4.3);

Table 4.3. References for the measurement of bioturbation in the non-cloddy horizon
(source: Agro-Transfert Ressources et Territoires, 2018, p. 5).

	B- Little or no bioturbation	B+ Major bioturbation
Distinctive features for recognition	Mainly angular aggregates resulting from the action of climate or tillage Few or no biological aggregates	Mainly rounded aggregates resulting from biological activity Few or no angular aggregates

6. This method is from the methodological guide by Agro-Transfert Ressources (Agro-Transfert Ressources et Territoires, 2018).

- if the Sq (final score) is between 3 and 5 (horizon referred to as “cloddy”), grading is done on the clods in each horizon (Table 4.4.).

Table 4.4. References for the measurement of bioturbation in the cloddy horizon
(source: Agro-Transfert Ressources et Territoires, 2018, p. 5).

	B- Little or no bioturbation	B+ Little bioturbation	B2 Undergoing regeneration
Distinctive features for recognition	Total absence of traces of bioturbation	A few traces of bioturbation, particularly macropores	Many traces, particularly located on the periphery of the clod Presence of compacted portion(s) with no bioturbation of significant size (3-5 cm)

Important

Coupling of scores

Coupling the scores for structure (spade test) and bioturbation makes it possible to conduct a more detailed analysis of the structural status of the soil, particularly for Sq scores between 3 and 4. Coupling makes it possible to produce a table to assist in deciding whether or not it is necessary to intervene in terms of tillage.

Sampling must be based on the spade test. It consists in extracting six soil blocks. These soil blocks are then sifted through manually to recover earthworms. This procedure does not require much equipment and is particularly suitable for observations covering small areas. It should be conducted preferably when biological activity is at its peak, i.e. in spring for temperate countries and at the end of the rainy season for tropical countries. It is preferable to do this counting before any agricultural intervention (tillage, fertilisation). Otherwise, you will need to wait several weeks before it may be done. The soil must be wet, but not waterlogged (e.g. two days after heavy rain), or dry, or frozen, or too hot (< 12°C or 50°F). It must also have few or no stones and be deep enough to insert a spade to a depth of 25 cm (if not, indicate the soil depth on the field sheets).

Important

Earthworm spade test

The earthworm spade test may be time-consuming and complicated if the soil has a high clay content or is too wet. It is relatively time-consuming in any case (three hours for one person working alone, or about 30 to 45 minutes per soil block).

Table 4.5. Decision-making tool for mechanical or manual intervention
[source: Agro-Transfert Ressources et Territoires, 2018, p. 7].

	Bioturbation in the soil blocks			
Sq score	B-, B0 or B1		B+ or B2	
	Observation	Interpretation	Observation	Interpretation
5	Compaction with little or no fragmentation by tillage, and little or no biological regeneration	→ Recent compaction with little fragmentation and biology insufficient over the short term; or old compaction with lack of biological and climate-driven regeneration	–	–
4			Compaction with little or no loosening through tillage; presence of biological activity	→ Compaction with little fragmentation but impacted by biological activity for over one year; biological regeneration over the medium term
3	Assemblage of compacted clods and porous aggregates; little or no biological activity	→ Plot suffered compaction, which was loosened through tillage and climate; lack of biological regeneration	Assemblage of compacted clods and porous aggregates; presence of biological activity	→ Plot suffered compaction, which was loosened through biological activity, the action of the climate or tillage; biological regeneration possible over the short and medium terms
2	Assemblage of porous aggregates; little or no biological activity	→ Plot did not suffer compaction recently; structure obtained mainly by tillage and climate	Assemblage of porous aggregates; presence of biological activity	→ Plot did not suffer compaction recently; structure maintained by biological activity
1	Assemblage of very porous aggregates and fine earth; little or no biological activity	→ Structure obtained mainly by tillage or climate	Assemblage of very porous aggregates and fine earth; presence of biological activity	→ Maintenance of favourable structure by tillage, biological regeneration and climate

	Mechanical intervention recommended
	Mechanical intervention recommended before sensitive crops and crops with a strong need for root conformation
	No mechanical intervention necessary

Procedure

 **Step 1.** Identify zones for block extraction following the procedure for the spade test: each extracted block is assigned a score before counting. Do not walk in the designated zone before extracting the block.

 **Step 2.** Each block must be extracted quickly in order to minimise the number of earthworms that escape, as earthworms are sensitive to vibrations in the ground. The surface area of each block must be 20 cm × 20 cm (width of the spade) for a depth of 25 cm. It is important to insert the spade as vertically as possible in order to extract the correct volume of soil. The six soil blocks are extracted one after another and placed in trays or on a tarp (be sure to cover them if it rains in order to facilitate manual sifting and the procedure for rating soil structure).

 **Step 3.** Collecting earthworms. For each soil block, break apart the clods to collect the earthworms. Put the earthworms in a container filled with water. The process is completed when the diameter of the clods is less than 1 cm. Count the earthworms and, if possible, weigh them and take a photo of them for subsequent identification. Then, release them back into their environment.

 **Step 4 (optional).** It is possible to go further and identify the earthworms following the procedure described by the University of Rennes ¹⁷.

Figure 4.2. Image of the counting process.

Photos from the Observatoire des Vers de Terre of the University of Rennes, France.



7. https://ecobiosoil.univ-rennes1.fr/e107_files/downloads/OPVT_Cle_Identification_2015.pdf

Figure 4.2. (following)



● **Decomposition of organic matter: the teabags test**

The purpose of this test is to study the biological activity of soils by observing how much mass teabags lose after one, two and three months, using green tea and rooibos (initial weight known, including teabag and label) as a control. Comparisons must be made using teabags of the same brand, making sure to use nylon teabags (otherwise they decompose too fast).

Depending on the activity of the soil and soil organisms, the teabag may have lost roughly half of its initial mass after three months. The greater the loss of mass, the more active the soil organisms are.

The teabags test is conducted as follows:

- identify three sampling plots in the plot(s). In each sampling plot, dig three holes roughly 10 cm deep, and place a teabag in each hole. Backfill the hole, and mark the spot with a stake. Repeat the same operation for the other sampling plots. The teabags will be dug up on $d + 30$, $d + 60$ and $d + 90$ to evaluate their degradation over time;
- the differential in biological activity for decomposition of organic matter can be analysed either by plot (analysis based on pedological heterogeneity, occupation of the plot, etc.) or between plots (analysis based on toposequence, cropping systems or cultivation practices, etc.).

It should be noted that this test is easy to conduct in temperate environments, but may present problems in tropical environments, particularly owing to attacks by termites or other decomposers that destroy the teabags. In such conditions, the rooibos is also often degraded. It is recommended to use the teabags described on the Teabags website⁸, or to order some.

8. <http://www.teatime4science.org/method/availability-of-tea/>

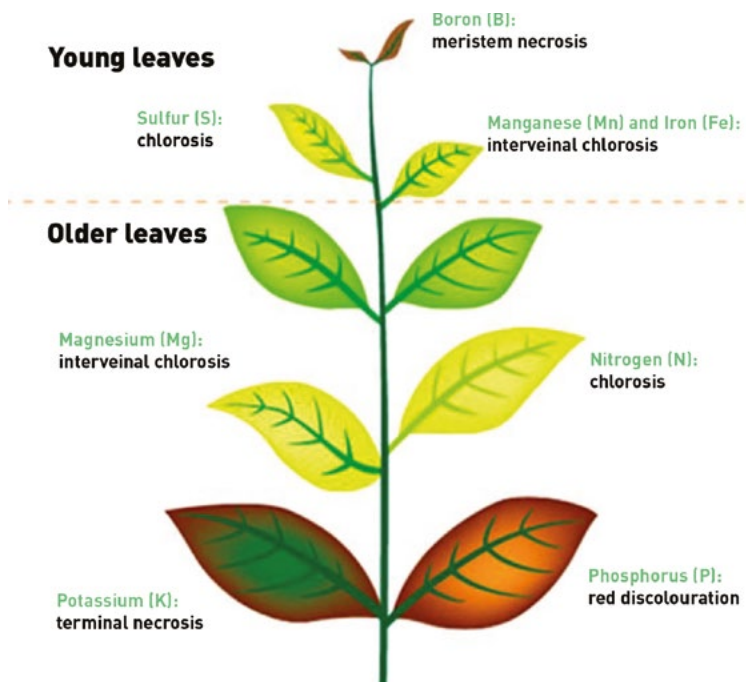
Nutrient availability for crops

Leaf-colour index for cultivated plants: direct observation

A plant's colour is a good indicator of its nutritional status and may reveal a deficiency or excess of certain elements. These observations may therefore be pertinent in order to qualitatively evaluate the bio-availability of certain nutritive elements, whether macroelements (N, P, K, etc.) or micronutrients (see Figure 4.3). The interpretation of these indicators, however, depends on the agroecological context. It is therefore necessary to establish with farmers a list of indicators that can be used to broadly evaluate the availability of nutritive elements for plants depending on the soil type.

Figure 4.3. Indicators of plant deficiencies.

[source: from <https://more.groww.fr/reconnaitre-carences-plantes/>]



Additional analyses and methods

Texture approach: the “jar” test

This measurement makes it possible to analyse the texture of a soil. Fill a clear glass or plastic jar (roughly one litre in size) about halfway up with dry soil collected from 0-15 cm below the soil surface, and then pour water into the jar until it is almost filled to the top. Shake the mixture vigorously for a few minutes until the aggregates have dissolved, and then let it sit for at least 24 hours. The clay particles may take several days to settle, but adding two teaspoons of table salt will speed up the process.

After 24 to 48 hours, the mixture will have separated into a series of layers: sand settles at the bottom of the jar, silt forms the middle layer, and clay settles on top.

The percentage of each component is estimated based on the thickness of the layers:

- % sand: (thickness of sand layer × 100) ÷ total thickness of all layers combined;
- % silt: (thickness of silt layer × 100) ÷ total thickness of all layers combined;
- % clay: (thickness of clay layer × 100) ÷ total thickness of all layers combined.

The soil-texture triangle in Figure 4.4 may be used to name the texture. In this example, the soil is “sandy loam” (30% silt, 60% sand, 10% clay).

This field measurement, however, is particularly suitable for sandy soils or loamy-sand soils with a coarse structure. For clayey or very clayey soils, the sausage test⁹ appears to be more suitable.

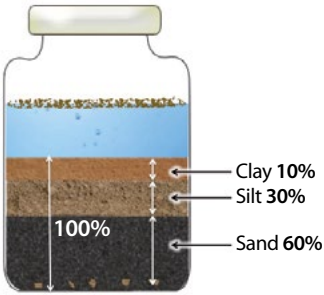
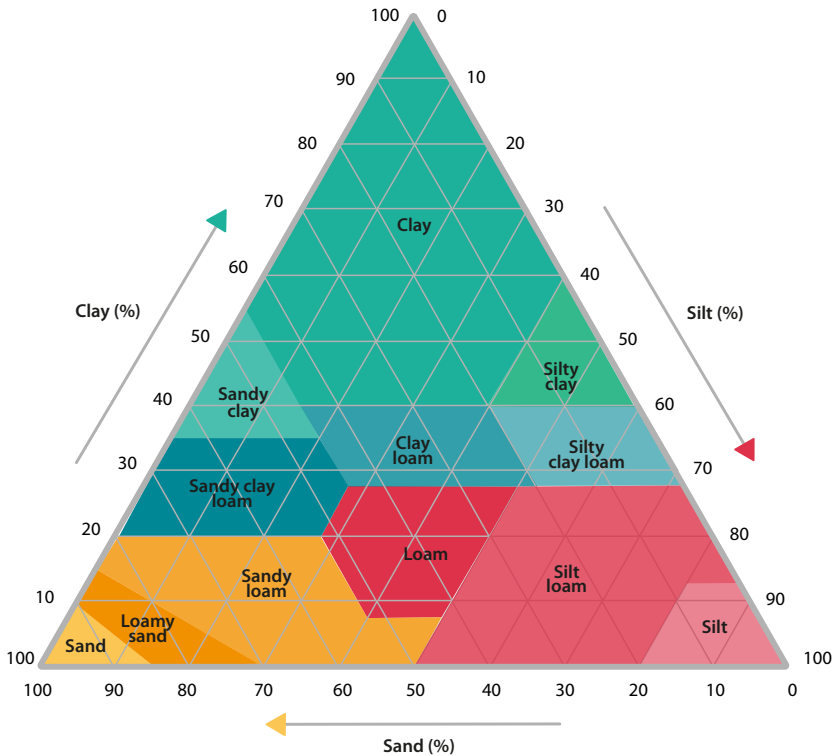


Figure 4.4. Soil-texture triangle
[source: Richer-de-Forges *et al.*, 2008].



9. For the sausage test, see: Richer-de-Forges *et al.*, 2023.

Table 4.6. Relationships between textures, soil characteristics and tillage.

Common types of texture	Soil characteristics	Consequences for tillage
Clayey	Heavy soil	Difficult to work Risk of compaction
Sandy	Light soil with loose structure	Easy to work Not very stable
Sandy clay loam	Stable, structured soil	Easy to work
Sandy loam	Stable but fragile soil	Easy to work, but precautions should be taken

Laboratory soil analyses: basic physical and chemical properties

More accurate evaluation of chemical-element content or of certain physical indicators may be carried out by service laboratories. However, the cost of analyses and the presence of a reliable laboratory nearby may be major constraints. Given how difficult it is to interpret certain chemical indicators, the analysis must be conducted by an experienced soil scientist.

Focus

Additional components that may be analysed in a laboratory

- Texture.
- pH (measured in water or in a potassium-chloride solution, which makes it possible to flocculate the clay particles for a cleaner solution).
- Organic matter: there are few or no direct and easy methods for evaluating the organic-matter content of a soil. Organic matter is measured through a chemical analysis of soil-organic-carbon content, using the NF ISO 14235 international standardised method. The level of organic matter is calculated by multiplying the organic-carbon content by a stable coefficient in cultivated soils, fixed at 1.72 ($OM = C \times 1.72$).
- Total carbon and nitrogen.
- Available phosphorus.
- Nitrogen content (NO_3^- , NH_4^+).
- Exchangeable base cations (Ca/Mg/Na/K) and cation exchange capacity (CEC).
- Soil moisture.
- Soil temperature.

3. Processing of data

The quality of a particular soil may be highly variable (even from one metre to the next) and may be highly dependent on the local context and climate conditions.

- For a one-off evaluation, a comparative study may be conducted between different plots on which agroecological practices have or have not been applied, recently or for a certain number of years.

- For monitoring and evaluation the initial status is determined, and the final status will be compared to the initial status. Given the slow evolution of certain soil properties (e.g. organic-carbon content), certain measurements will only provide reliable indications after a few years. For other properties (pH, physical properties of soil surfaces, nitrate or assimilable phosphorous content, and biological properties), however, indicators change quickly and should be evaluated after a few years.

3. COMPLEXITY, HUMAN RESOURCES REQUIRED, COSTS

Evaluating soil health requires specific skills and resources:

- agropedological analysis skills, to be mobilised in partnership with research institutions if possible;
- equipment for taking measurements in the field: weighing scales, measuring tape, tools, etc.

Further reading

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Tresch S., Fliessbach A., 2017. FiBL. *Étude de la décomposition de matière organique par l'utilisation de sachets de thé*. <https://orprints.org/id/eprint/32466/1/tresch-fliessbach-2017-teabag-french.pdf>

Water-management performance at plot level

In order to provide information on the effectiveness of agroecological practices in terms of improving water-management performance at plot level, it is important to focus on water productivity as well as the quantity and quality of runoff.

Définitions

Water productivity is defined as the ratio between net profit and the quantity of water used in the production process (units of product per cubic meter of water)*. This reflects the objective of boosting production while minimising the use or deterioration of water resources.

Runoff water in a cultivated plot is water that flows over the ground surface, carrying away soil and nutrients. This results in less water for crops, with adverse effects on their water supply. The quantity and quality of runoff water on plots (nutrient and pesticide load) may also be important factors to take into account in a territorial approach to water contamination or when evaluating an area that presents major challenges in terms of combating erosion, given soil's ability to retain water with the implementation of agroecological practices.

* GWP, Technical Committee (TEC), 2006.

These indicators, and in particular the economic productivity of water, are especially relevant if farmers have made an economic investment (improvement of plots, soil cover, irrigation equipment, etc.). This may also help steer land-use policies (water management at watershed level, management of an irrigation system or irrigated scheme).

In the case of a one-off evaluation, the evaluation must be conducted on plots with identical crops but different practices, in order to estimate the impact of agroecological practices. In the case of monitoring and evaluation, it is useful to measure changes in these indicators for agroecological plots growing identical crops (and, if possible, compare water productivity with conventional plots growing identical crops).

1. CRITERIA, INDICATORS AND VARIABLES, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Water productivity in rainfed agriculture	Rainwater productivity	Production (in kg) ÷ total rainfall over the crop cycle (in mm)	Plot	Average
Water productivity in irrigated agriculture	Productivity of water applied to the plot	Production (in kg) ÷ volume of water (in m3) supplied to the plot during the production cycle (irrigation and rainfall)	Plot	Average
Economic productivity of water		Gross value-added (GVA) ÷ volume of water applied and rainwater (in m³)	Plot	Average
Quantity and quality of runoff water	Quantity of runoff water*	Runoff coefficient	Plot	Average
	Sediment load in water	Quantity of sediment per volume of runoff water (in litres)	Plot	Average
	Chemical-input load in water	Toxicity of runoff water in terms of pesticides	Plot	High

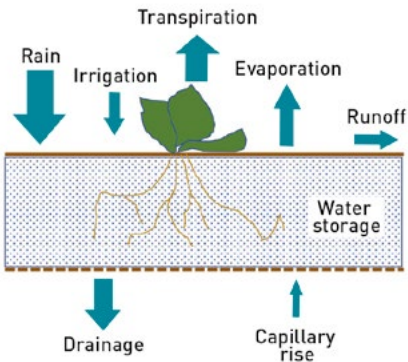
* Relevant only for surface irrigation.

2. METHODOLOGICAL APPROACH AND TOOLS

1. Preliminary observations, conditions for implementation

In order to better understand the issues around water management, it is important to know the water balance at plot level, which is a tool for dealing with situations of water deficit and excess.

Figure 4.5. Diagram of the water balance at plot level
 (source: Leenhardt *et al.*, 2020, p. 22).



The water balance is calculated based on:

- demand for water due to climate or specific to the crop (E = evaporation, T = transpiration);
- supply of water through rain (P = precipitation received between two dates) and irrigation if there is any (I = water applied through irrigation);
- loss due to runoff (R = water loss through surface runoff) and drainage (D) under the area of ground used by the crop;
- variation of water in the soil (dS).

The amount of water required is calculated as follows:

$$P + I = E + T + R + D + dS$$

It is important to clearly distinguish between water-management issues that apply to rainfed agriculture and those that apply to irrigated agriculture.

Rainfed agriculture:

- in **dry zones**, it is considered that losses via deep infiltration of water (below the root zone of crops) are not significant. In this case, it is necessary to estimate the average runoff rate. Any action affecting the runoff/infiltration ratio (surface status, runoff barrier, dead plant cover or modification of topography, etc.) has a significant impact on rainwater productivity and erosion. In these dry zones, the crop cycle calendar, and in particular early sowing, is a decisive factor for improving rainwater productivity;
- in **wet zones**, rainwater productivity is less dependent on runoff rate, because of the abundance of rain. Reducing the runoff rate is still important in order to minimise water erosion, which can have a longer-term impact on production. Limitation of the runoff rate generally results in direct increase of deep infiltration, and therefore a higher risk of mobile nitrogen (nitrates) dissolution through the slow infiltration of water into the soil. In wet zones, the cycle calendar and sowing dates are less of an impediment for crop productivity. Good use of the entire crop cycle through succession or relay cropping makes it possible to increase the total biomass produced, and therefore improve overall efficiency over the entire rainy season;
- in **intermediate situations**, there are risks of loss through both runoff and deep infiltration. The structure and composition of the soil have a big effect on the availability of water for crops, and therefore on water productivity. The soil's water storage capacity and the availability of water for crops are often dependent on the level of organic matter. It may be supposed that water productivity also depends on this water storage capacity (see [Evaluation Sheet 2](#), Soil health).

In **irrigated systems**, the goal is to respond to crops' water needs by compensating for rainfall shortages. Performance gains lead to higher volumes of water used by the plant, i.e. stored in the root zone and transpired by the plant, and also lead to lower losses at plot level (deep percolation, surface runoff, evaporation). This balance depends on:

- the type of irrigation (gravity, localised, sprinkler);
- organisation for using and maintaining the equipment;

- irrigation practices (schedule, doses applied, agronomic practices), which are highly dependent on decision-making resources (coordination tools, climate data, agronomic methods, etc.) and the availability of users.

Preliminary stage 1. Identify agricultural practices

- Cycle calendar: in rainfed cultivation in dry zones, it is necessary to examine whether certain agroecological practices enable earlier sowing dates and therefore better water productivity.
- Presence of best agricultural practices making it possible to avoid losses through runoff or deep infiltration and to keep water in the soil: mulching crops in the dry season, contour cropping on slopes, organic matter in the soil, soil cover, etc. This non-exhaustive list depends on the cropping system and context (dry or wet zones). It is then possible to determine which indicators should be taken into account, and which method should be used to estimate the impact of those practices. For example, the purpose of covering the soil with crop residue is to limit evaporation and runoff, while improving the soil's water storage capacity. Therefore, in addition to measuring the degree of soil cover, comparative measurements must be taken to compare runoff and soil-moisture levels between control plots and covered plots.

Preliminary stage 2. Determine the production to be measured

- Production of grains, roots or tubers, fodder (cultivated only).
- Potentially total production of biomass, including the different products and sub-products of the plot (biomass). The measurements are more complex, however, as it is necessary to use sampling and identify each category of product (example for rainfed associated crops of millet and cowpea: millet grains + cowpea grains + millet stems for fodder + cowpea haulms for fodder, etc.).

2. Information to be gathered

Rainwater productivity

Rainwater productivity is calculated as follows:

$$\text{Production (in kg)} \div \text{total rainfall over the crop cycle}$$

The quantity of rainwater will be expressed in millimetres of rainfall over the period, but may also be understood as volume of water per reference area (1 mm of rainwater = 1 l/m²).

To measure rainfall, a rain gauge may be installed on the plot, or climate data may be obtained from a nearby station. It will be necessary to verify that the rainfall at this station is representative of the rainfall at the plot.

Productivity of water applied to the plot in irrigated systems

To measure the productivity of water applied to the plot in an irrigated system, it is necessary to know the yields at plot level and the volume of water entering the plot:

- water productivity at plot level (WP) is calculated as follows:

$$\text{WP (in kg/m}^3\text{)} = \text{yield(s)} \div \text{water supplied to the crop (V)}$$

- yield is the sum of the yields of all crops grown on the plot;
- volume of water (V) supplied to the crop may be estimated in different ways depending on the irrigation system used. In irrigated systems, it is broken down into rainwater (R) and gross irrigation-water dose (I = total quantity of irrigation water supplied to the plot). It is calculated as follows:

$$V = R + I$$

To measure rainfall, a rain gauge may be installed on the plot, or climate data may be obtained from a nearby station. In arid and semi-arid zones, R is often negligible in relation to I.

There are many different methods for estimating the gross irrigation-water dose for the plot. Some of the simpler and lower-cost methods are listed in Table 4.7.

There is some variability in the measurements, so it is recommended that several measurements be taken in order to reduce the uncertainty linked to that variability (e.g. if flow is highly variable, favour regular measurements over a limited number of measurements).

Flow is often expressed in m³/s or, for smaller systems, in m³/h or l/h.

Economic productivity of water

In order to optimise water use in an agricultural production system, it may be useful to study the economic productivity of water, i.e. the gross value-added (GVA) of a particular crop in relation to the volume of water applied (irrigation) or received (rainfed systems). It is calculated as follows:

$$\text{Economic productivity} = \text{GVA} \div \text{volume of water applied or rainfall}$$

Quantity and quality of runoff water

The quantity of runoff water may be determined by the runoff coefficient (Cr), which is calculated as follows:

$$Cr = \text{volume of runoff water} \div \text{volume of applied water}$$

The quantity of runoff water may be obtained by collecting surface water from a given area. This is achieved by isolating that water from the rest of the plot using a tarp or small ditches made of sheet metal or plastic, and then weighing the receptacle that collects the runoff water.

The quality of runoff water may be broken down into the following components:

- sediment load: this is the quantity of sediments carried away by the water running off a plot. It may be measured by letting one litre of water settle, and then drying and weighing the sediment deposited,
- pesticide load: this is the amount of toxic materials from pesticides used in the current or previous crop cycle, carried away by the runoff water. To measure pesticide load, a sample of runoff water must be collected and analysed in a laboratory.

Table 4.7. Methods for estimating the different components of water productivity at plot level
(© Leauthaud C.).

Variables calculated	Type of irrigation system	Method of calculation	Quality of the measurement
Measurements of flow (Q)	Pressurised, localised irrigation with drip feed	Cup technique: measure how long it takes to fill the cup (knowing its volume) at several drip emitters placed at different locations within the plot. Flow Q into the cup is calculated as follows: $Q = V \div t$ (V: volume ; t: filling time). Then, estimate the number of emitters on the plot	++
		Measure how long it takes to fill a bucket placed under several sprinklers. Knowing the range of the sprinkler and the size of the bucket, it is possible to determine the volume of water applied and the irrigation dose or flow	
	Pressurised, localised irrigation with sprinklers	Measure the flow through the pipe at the point of entry to the plot using a flowmeter (this should be done several times, if possible, over the course of the crop cycle)	+++
		Know the specifications of the installed pump (bearing diameter, motor rotation speed, pumping height), as the theoretical flow may be written on the plates showing the specifications of the pump, and the theoretical flow is provided by the maker/supplier	++
	Pressurised irrigation pumped from a well	$Q = (\text{height of water in well before pumping} - \text{height in well after pumping}) \div \text{duration of pumping}$	
		$Q = V \times \text{cross-sectional area } A \text{ (m)}^2$. If the channel is rectangular, $A = \text{width} \times \text{height of water}$	+
	Gravity irrigation featuring stone channel with known specifications (length, width, height, slope, etc.)	Measure water speed by floating a bottle over a fixed distance (repeat the measurement several times)*	+++
		If there is a waterfall (or if one may be installed) in the channel: use the spillway method (charts provide height-flow relationships depending on the configuration of the spillways)	++
		Some channel managers know the flow rate at the top of the plot	++
	Gravity irrigation with non-stone channel at the top of the plot or ridge	Install a 3 m gutter at the top of the plot, measure the time it takes to fill a receptacle, and then measure its volume	++

Variables calculated	Type of irrigation system	Method of calculation	Quality of the measurement
Gross irrigation-water dose (I)	Pressurised system	Access to data from a meter at the point of entry to the plot (meter already installed or to be installed temporarily)	+++
	Any system	Indirect calculation: $I = \text{duration of irrigation} \times \text{flow (F)}$ **	
	Any system	Qualitative assessment through an interview, asking the person in charge of irrigation if gross irrigation doses differ depending on the practice used (in agroecological and non-agroecological systems)	-
	Rice field	Volume of water infiltrated at flooding (V_{inf}) + volume corresponding to the layer of water covering the field at flooding (V_{in}) + sum of volumes at each irrigation (V_{irrig}) Initial volume for flooding the plot: $V_{in} = \text{length} \times \text{width} \times \text{height of the layer of water covering the field}$ Volumes supplied at each irrigation: $V_{irrig} = \text{length} \times \text{width} \times \text{difference in water height in the plot before and after irrigation}$ Volume infiltrated at flooding: $V_{inf} = \text{time needed for the layer of water to appear on the plot (impermeabilisation of the plot), and at the same time measure the flow (F) at the point of entry to the plot. Depending on the terrain, one may also choose to disregard infiltration during irrigation}$	+
Duration of irrigation		Access to electricity-consumption data for the plot, and knowing the pump's output	+++
		Monitoring irrigation management through observation (interviewer or farmer)	++
		Temperature sensor installed on the main pipe, measuring the increase or decrease in the pipe's temperature as irrigation water is passing through, or sensors measuring the presence or absence of water for gravity irrigation	+++

* This method provides an approximative measurement, as there is actually a difference in speed between the speed at the centre of the channel and the average speed for the cross-sectional area of the channel.

** It should be noted that durations and flows vary over the course of the crop cycle, especially in gravity irrigation systems.

3. Processing of data

Data will be processed using Excel spreadsheets for water productivity, quantity of runoff water and sediment load.

For monitoring and evaluation, it is important to take measurements before the start of the intervention, and then again at the end of the intervention, in order to evaluate how water productivity changed as a result of the implementation of agro-ecological practices.

Data on the pesticide load of runoff water is processed at a soil and water analysis laboratory.

3. SKILLS, HUMAN RESOURCES AND EQUIPMENT

Making estimates and taking simple measurements is within the reach of all agronomists. When greater precision is needed, it is necessary to call on specialists (research centres, technical hydraulic and hydrological services, weather stations, analysis laboratories, etc.) and to have more advanced measuring equipment.

For monitoring and evaluation, it may be necessary to equip the monitored plots with rain gauges (several plots if rainfall throughout the cropping season is highly variable, otherwise just one plot), which will be read regularly. Regional weather data (when is it accessible) does not necessarily reflect local situations.

For irrigated plots, it may be useful to install water meters and other measuring equipment, as proposed in Table 4.7 outlining different methods of calculation for different types of irrigation.

Further reading

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Regulation of bio-aggressors

Definition

A bio-aggressor is any living organism that can cause damage to crops. Examples include pests (P: insects, mites, nematodes), disease pathogens (DP: mushrooms, viruses, bacteria) and adventitious and parasitic plants (A).

To conduct this evaluation, different criteria must be taken into account: effectiveness of the control method (natural or chemical), farmers' ability to adapt their control practices, and maintenance of biodiversity. Maintenance of biodiversity is covered in [Evaluation Sheet 5](#), Agricultural biodiversity.

For various reasons (mechanisation, simplification of crop rotations, choice of crops based on market signals, choice of uniform varieties, often clones, based on demand from value chains, etc.), many farmers have oversimplified their production system, which has encouraged the rapid development of bio-aggressors and resistance to certain pesticides that are applied too often (e.g. adventitious plants that become tolerant to herbicides).

Overly frequent application of pesticides has a paradoxical effect: it instantly reduces pest populations but may also cause a decrease in populations of competitor, predator and parasitic insects, which then results in an increase of the pest population.

Moreover, the increase in pesticide consumption and the often alarming ways in which pesticides are used, particularly in the Global South, have worrying effects on human and animal health, and on the environment (see [Evaluation Sheet 6](#), Reducing exposure to pesticides).

Bio-aggressors are a major problem for food security. Whether during crop cycles or after harvest, they can reduce, or even destroy, a harvest or food stocks and cause severe food shortages. That is why their regulation is a major challenge to ensure healthy and remunerative agricultural production for producers, and substantial availability of food. Evaluating the effects of agroecology on the effectiveness of the fight against bio-aggressors is therefore very important, from the point of view of both the farmer and the public interest, in cases where bio-aggressors pose a major problem for agriculture.

An evaluation of the effectiveness of bio-aggressor regulation may be conducted as part of a one-off evaluation (see [Chapter 2](#), General approach for one-off evaluations, Stage 2c, Agro-environmental evaluations of sampled plots) or as part of monitoring and evaluation (see [Chapter 3](#)).

Which agroecological practices should be developed to reduce pesticide applications?

It is often the overall design of the production system that makes it possible to limit the impact of bio-aggressors and, at the same time, reduce the use of pesticides and biopesticides. For annual crops, efforts will be made to increase cultivated biodiversity by growing many different cultivated species in long rotations, selecting hardy varieties and crop associations. Plant health and soil health are generally correlated. A plant that is well fed through effective management of soil fertility and water is more resilient to pest attacks.

At the same time, hedges, grass strips, small plots and sound management of landscapes may also help protect, maintain and increase populations of crop auxiliaries (biological control through conservation) and reduce damage caused by certain bio-aggressors in order to naturally regulate them.

This knowledge is not easy to acquire. It requires a very good understanding of the environment, which takes time, particularly for young farmers and external participants.

When the above practices do not suffice, there are also other methods for biological control, such as:

- applications of biopesticides and natural preparations of low concern;
- biological control through the introduction of a predator, parasite or pathogen;
- “inundative” biological control with massive and seasonal releases of auxiliaries;
- microbiological control (*Bacillus thuringiensis* for example, which produces a toxin);
- “autocidal” control through the introduction of sterilised males.

Implementation of these methods, however, is only possible if the products they use are sold at a price that is accessible for farmers, and if sales networks are put in place. As a last resort, in order to regulate particularly invasive bio-aggressors with the potential to destroy a harvest, some of the least-toxic pesticides may be used.

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Effectiveness of bio-aggressor control	Level of crop infestation (parasitism rate)	(P): % of plants attacked (DP): % of diseased plants (A): % of soil covered by adventitious plants, parasitic plants, or their biomass	Plot	Average
	Risks of damage	(P-DP-A): % of yield-loss risks Damage less than cost of treatment (low-impact bio-aggressors) Damage greater than cost of treatment (dominant bio-aggressors)	Plot	Average
	Presence of auxiliary insects	(P): diversity and number of auxiliary insects	Plot	Average
Farmers' capacities	Capacities acquired	% of farmers able to identify the main bio-aggressors in their crops (P-DP-A and auxiliary insects)	Farm	Average
		% of farmers able to evaluate risks (predictive capacity)	Farm	Average
		% of farmers able to decide autonomously whether or not to treat (non-systematic character) according to level of infestation (P-DP-A)	Farm	Average
		% of farmers able to define production systems that reduce the impacts of bio-aggressors, and able to apply alternative control methods, prophylactic measures, mechanical hoeing, etc.	Farm	Average

P: pests; DP: disease pathogens; A: adventitious and parasitic plants.

2. METHODOLOGICAL APPROACH AND TOOLS

1. Information to be gathered

To evaluate the regulation of bio-aggressors on the farms that are being studied, it is necessary to focus on the technical aspects of regulation through the methods used and results obtained on the farm (levels of infestation, risk and auxiliary insects), and on farmers' capacities in this regard (and therefore identify possible scope for improvement).

● Effectiveness of bio-aggressor control

Level of crop infestation (parasitism rate)

The level of crop infestation is measured through observations and counting at plot level. This is an essential stage before measuring damage levels. The main indicators are:

- (P): % of plants attacked. Visual observation of leaves, roots, stems and fruits;
- (DP): % of diseased plants. Visual observation of leaves, roots, stems and fruits;
- (A): presence of adventitious plants (parasitic or not). Visual observation of adventitious-plant cover on the plot, and measurement of their biomass.

Evaluation of the risk of damage

The rate of damage observed and the risk of damage encountered in crops by bio-aggressors is measured by the percentage of crops destroyed or whose development has been significantly limited. This calculation results from observations of the plot and makes it possible to orient farmers' decisions in terms of intervention, according to their production choices (conventional or agroecological).

- When the damage observed or risks of damage are lower than the cost of treatment because the bio-aggressors are "not dominant", the farmer can refrain from intervening (manually, mechanically or chemically) and thereby limit his/her cropping costs.
- When the damage observed or risks of damage are higher than the cost of treatment, the farmer must intervene to save his/her produce and adopt the most opportune mode of intervention in light of his/her financial resources and available human resources.

Presence of auxiliary insects

The presence of auxiliary insects is an essential criterion in terms of agroecological control, particularly for the biological control of pests. Observation of the presence of these auxiliary insects on plots makes it possible to assess whether cropping and farm-improvement practices (hedges, grass strips, maintenance of trees and natural vegetation) favour the development and action of this auxiliary fauna, which is vital to biological control.

The following methods are used to evaluate the quantity of auxiliary insects and pests:

- harvest of auxiliaries and non-flying pests by threshing of plants chosen randomly on the plot, then visual counting¹⁰;
- harvest of auxiliaries and flying pests by covering the chosen plants with a sufficiently fine net, or by other methods, such as bowls containing soap or various traps (sticky boards, pheromone traps, etc.), then counting.

These observations and counts make it possible for producers to easily make comparisons between agroecological practices and practices based on systematic chemical treatments. Acquiring this skill is an essential stage in the agroecological transition.

10. Guide for identifying auxiliary insects: <http://ephytia.inra.fr>

Farmers' acquired capacities

The basic principle of any bio-aggressor control intervention is to enable rural families to become more autonomous vis-à-vis external agricultural advice, which is often linked to projects and value chains, or lacks sufficient resources to ensure an effective and permanent presence.

It is therefore possible to train farmers how to control bio-aggressors, and then measure the percentage of people able to conduct actions on their own for agro-ecological control of bio-aggressors.

The main indicators enable measurement of the percentage of farms with at least one person able to:

- identify the main bio-aggressors in their crops (P-DP-A);
- evaluate risks (predictive capacity);
- decide autonomously whether or not to treat (non-systematic character) based on risk (P-DP-A);
- understand and apply alternative control methods and prophylactic measures through cropping practices.

2. Processing of data

Evaluating the level of infestation for a particular crop and the effectiveness of measures to control the main bio-aggressors requires agronomic monitoring with comparison, whenever possible, between untreated control plots, plots with conventional practices relying mainly on the use of chemical pesticides, and plots with agroecological protection. This monitoring should be coupled with measurement of yield and, more generally, agronomic monitoring of plots throughout the crop cycle, integrating the measurement of yield (see [Evaluation Sheet 1](#), Crop yields – direct measurement) as well as socio-economic indicators such as the arduousness of certain tasks and the margins generated.

This monitoring and evaluation may also include indicators that make it possible to assess the impacts of an intervention on producers' ability to carry out actions, either individually or as a network, for more effective agroecological control of the main bio-aggressors. This requires also measuring changes in farmers' capacities.

3. COMPLEXITY, HUMAN RESOURCES REQUIRED, COSTS

It may be necessary to call on specialists (botanists, ecologists, etc.), farmers and highly experienced practitioners to train other farmers, agricultural technicians and agronomists to identify host plants and crop auxiliaries.

Agroecological or biological bio-aggressor control is not an obvious choice and is not easy to implement because it requires a lot of knowledge, technicity and know-how to adapt the various technical options to the specific conditions of different ecosystems. This type of control makes it possible to reduce pressure but does not always succeed in exterminating bio-aggressors, and the risk may therefore remain – just as it also remains in conventional crop-management sequences, where resistance to pesticides is observed more and more frequently.

The main costs of this evaluation are those related to the time required for monitoring plots and making observations, and to the hiring of practitioners and specialists (particularly entomologists) to train advisors and facilitators who will be responsible for working with producers.

Further reading

Aupois A., Méndez T., Mathieu B., 2022. *Quelle place pour l'agroécologie dans l'agriculture irriguée des Andes équatoriennes ?* Overview of the study evaluating the effects and conditions necessary for the development of agroecology in the territory of the northern branch of Pillaro (province of Tungurahua), AVSF.

AVSF, 2021. *Guide de formation. L'agroécologie pour sortir des pesticides. Réduire l'utilisation et les risques des pesticides et produits vétérinaires par des pratiques alternatives viables*, AVSF-AFD, 186 p. https://www.avsf.org/app/uploads/2023/12/avsf-guidepesticides-def-web_ok.pdf

CIRAD: Programme in partnership with Divecosys. Design of agroecological systems for managing bio-aggressors and utilising organic residues. <https://www.divecosys.org/>

Réseau mixte technologique Biodiversité et Agriculture. <http://www.rmt-biodiversite-agriculture.fr/>

Agricultural biodiversity

Definition

In order to characterise agricultural biodiversity, we focus on biodiversity in:

- perennial plant communities;
 - annual or semi-perennial cropping systems;
 - livestock-production systems.
-

Agricultural biodiversity and the maintenance, restoration and improvement of agricultural biodiversity are key components of agroecological systems. “Biodiversified” farms benefit from this diversity in a number of ways. Diversity makes it possible to create synergies within cropping systems and between cropping and livestock-production systems, and to generate various positive effects:

- diversification of income, and securing of overall farm income;
- reduction of vulnerability to climate hazards and risks;
- integrated control of bio-aggressors, and preservation of auxiliaries that are useful for regulating bio-aggressors;
- restoration, maintenance and improvement of the fertility of cultivated spaces;
- preservation and improvement of the efficiency of water resources.

In general, biodiversity helps ensure the productivity of agricultural systems and the autonomy of farmers. It can be analysed at plot level, farm level and territory level. Agroecological practices and systems aim to maintain – and even improve or restore – natural and cultivated biodiversity. Valorisation of local genetics is also an important aspect that is intrinsically linked to agroecology.

Evaluation of the effects of agroecology on biodiversity is analysed:

- as part of a general approach for one-off evaluations (see [Chapter 2](#), Stage 2c, Agro-environmental evaluations of sampled plots) in contexts where the aim is to compare biodiversity between different types of farms and depending on whether or not they employ agroecological practices;
- as part of monitoring and evaluation (see [Chapter 3](#)), any time an intervention seeks to promote the development of agroecological practices in crop- or livestock-production activities.

1. CRITERIA, INDICATORS AND VARIABLES, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Biodiversity in perennial plant communities	Level of development for natural and cultivated ecological infrastructure	% of farming area occupied by a perennial plant community on a particular farm	Farm	Average
		Number and prevalence of wild and cultivated perennial plant species on the farm	Farm	Average
		Length of ecological infrastructure in linear metres (hedgerows and windbreaks)	Farm	Low
		% of larger agricultural area (watershed, lowlands, irrigated zone, etc.) occupied by perennial communities	Territory	Average
Biodiversity in annual/ semi-perennial cropping systems	Cultivated biodiversity	Number of cultivated plant species and varieties in cropping systems	Farm	Low
	Importance of crop associations	% of farming area occupied by associated crops on a particular farm	Farm	Average
Biodiversity in livestock-production systems (including pastoralism)	Biodiversity in livestock-production activities	Number of livestock-production activities in production and size (number of animals, number of breeds per activity, surface area of fish ponds, number of hives, etc.)	Farm	Low
	Valorisation of local breeds on the farm	% of local-breed animals per livestock-production activity	Farm	Low
	Importance of livestock-production activities in the territory	Diversity of livestock production in the territory (number of different types of livestock production)	Territory	Average
		% of livestock farms, polyculture/livestock farms, and polyculture farms without livestock	Territory	Average

2. METHODOLOGICAL APPROACH AND TOOLS

The purpose of evaluating and conducting monitoring and evaluation of agricultural biodiversity is not to follow a scientific approach in the strict sense of the term, but rather to estimate a level of biodiversity managed on particular farms and within particular agricultural areas (territories).

It has therefore been decided to target agricultural biodiversity (cultivated or wild) in polyculture and livestock-production systems that is directly associated with those systems. The question therefore is what positioning to adopt depending on the context: highly anthropised agro-ecosystems, activities in or near protected natural spaces, etc.

1. Preliminary observations

In order to calibrate the evaluation work, it is therefore necessary to clearly define the scope of the studies:

- identify, for each agricultural area, which cultivated and wild species would be useful to monitor. The purpose is to create a comprehensive documented inventory of only species that are “indicators of biodiversity”, or that are useful for the agro-ecosystem;
- scale the study to fit the specificities of each context (level of depth);
- verify, if necessary, the possibility of mobilising the skills of specialists (botany, forestry, ecology, etc.) and any necessary material or financial resources.

2. Information to be gathered

When evaluating biodiversity on farms, the focus is on perennial plant communities, annual and semi-perennial crops, and animal biodiversity in connection with livestock-production activities.

● Biodiversity and perennial plant communities

Importance of perennial plant communities on farms

Indicator: percentage of farming area occupied by the perennial plant community on a particular farm.

Communities may include forest micro-stands, agroforestry plots, orchards, isolated trees, hedges (fences, anti-erosion protections, etc.) and windbreaks.

In concrete terms, the purpose is to:

- select farms that are representative of the previously established typology (purposive sample);
- estimate what percentage of area is covered by perennial species on each type of plot on the farm, by examining satellite images or measurements made directly in the field, and based on the zoning of the farm;
- extrapolate the estimates, weight them and relate them to the farm’s total farming area.

Table 4.8. Example of reference table showing perennial-communities coverage by farm type.

Farm type	Perennial-communities coverage (PCC)
Farms with sparse hedging	$2\% \leq \text{PCC} \leq 5\%$ of total farming area (TFA)*
Farms with average amount of hedging	$5\% < \text{PCC} \leq 10\%$
Farms with hedging	$10\% < \text{PCC} \leq 15\%$
Farms with substantial hedging (significant presence of orchards, agroforestry plots, etc.)	$15\% < \text{PCC} \leq 30\%$
Farms where agroforestry is predominant	$30\% < \text{PCC} \leq 70\%$

*Not including forest micro-stands. Note: for plots containing isolated trees, the crown area of each tree projected to the ground will be used (e.g. *Faidherbia albida* in plots used for rainfed cultivation in West Africa).

Stand diversity on farms

Indicator: number and prevalence of wild and cultivated perennial plant species present on the farm.

The number of perennial species present on the farm is determined based on the previously conducted inventory. This figure may be counted in the same manner as before:

- select farms that are representative of the previously established typology (purposive sample);
- estimate, based on the zoning of the farm, the number and prevalence of perennial species for each type of plot on the farm;
- extrapolate the estimates after weighting by the area of each type of plot present.

 Note: for fruit orchards (including coffee plantations, cocoa plantations, etc.), it may be useful to identify the number and prevalence of cultivated varieties.

Importance of maintaining barriers around cultivated plots

Indicator: length (in linear metres) of hedgerows and windbreaks.

Stands planted linearly along the perimeter of or on cultivated plots form the basis of substantial hedging infrastructure (which must be maintained with regular trimming):

- low or mid-sized perimeter hedging;
- windbreaks;
- anti-erosion belts on slopes.

A well-hedged plot has hedgerows growing along its perimeter covering 2% to 5% of its surface area.

On anti-erosion protections, stabilised contours, or alley-cropping systems, hedging may cover 15% to 30% of the total area of the improved plot.

Importance of perennial communities in agricultural landscapes

Indicator: surface area occupied by perennial communities within the larger agricultural area.

Beyond the scale of the farm, it may be useful to estimate the importance of perennial plant communities in larger agricultural areas (watershed, lowlands, irrigated zone, etc.).

Doing so involves employing techniques that make use of satellite images. There are two methods of analysis:

- remote detection requires special expertise, and costs to obtain significant precision may be prohibitive (shooting of aerial images by drones or purchase of satellite images for resolution of less than 10 m);
- photo-interpretation is more accessible in terms of technicity (cutting out wooded areas on the screen) and cost (possible use of Google Earth images), but time-consuming for large areas.

Here again, an estimate of the coverage observed in the different sections of the landscape (green corridor) will suffice:

- percentage of areas with few or no perennial plant communities (e.g. shrub savannahs);
- percentage of areas that are totally covered (e.g. copses and forest stands, agroforests);
- percentage of areas that are partially covered (e.g. plots surrounded by hedges, agroforestry);
- percentage of areas with scattered communities (e.g. tree savannahs with *Faidherbia albida*).

If the importance of perennial plant communities – ecologically, agronomically and economically (sometimes socially) – is well-established, each agro-ecosystem will find its balance in different proportions of space occupied by the perennial communities. While characterising forest cover in agricultural areas is important in the diagnostic phase (production of knowledge), it is particularly useful to monitor changes in plant communities over time (monitoring and evaluation).

Biodiversity and annual and semi-perennial cropping systems

Diversity of crop-production activities

Indicator: number of cultivated plant species and varieties in the cropping systems.

The indicator for the number of species and varieties present in cropping systems is determined for the current year of observation, as the crop rotations and cropping systems used on different soils can change quickly. The inventory focuses on plant species and varieties that are deliberately planted or maintained by the farmer on the plots. The plots may be used for production (food, fodder, fibres, etc.) or not (green manures, cover crops, host or insect-repellent plants, etc.).

For monitoring and evaluation, it is useful to take into account changes in this diversity.

Importance of crop associations

Indicator: proportion of farming area used for associated crops on a particular farm. This indicator takes into account all types of crop associations: between-row intercropping, freely mixed intercropping, alternating bands, associations around the edges of crop beds, interspersed plants, etc.

Important

Catch-crop systems are not taken into account, as they are more closely aligned with successional cropping than with associations, even though synergies may be generated before the first crop is harvested.

Intercropping with fruit trees and certain agroforestry systems (e.g. Creole gardens) may be taken into account, but must be specifically identified in the analyses.

Biodiversity and livestock-production systems

Diversity of livestock-production activities

Indicator: number of livestock-production activities in production and their main characteristics.

This indicator is determined in a manner similar to conducting an inventory. For each livestock-production activity, a simple description of the livestock-production system is provided: number of animals, number of breeds per activity, surface area of fish ponds, number of hives.

For each activity, identify whether it is increasing, stable or decreasing. Those changes may be documented through monitoring and evaluation.

Valorisation of local breeds on the farm

Indicator: presence of local breeds and number of animals for each breed (proportion of total herd):

- average (or median) percentage of local-breed animals per livestock-production activity;
- prevalence of livestock-production activities on the farm with over 75% local breeds; between 75% and 50% local breeds; between 50% and 25% local breeds; less than 25% local breeds.

Agroecological systems are often characterised by a greater presence of local breeds, which are better adapted to local conditions (climate, food, disease pressure, etc.).

Important

Questions regarding the productivity of livestock-production activities will not be addressed in this part of the study.

Animals that are F1 crosses (or “F1 hybrids”, i.e. a first-generation cross between two genetically distinct breeds) between local breeds and “imported” breeds may be taken into account and identified specifically in analyses (this is common in pig or poultry farming).

Importance of livestock-production activities in the territory

Indicator: diversity of livestock production in the territory, and prevalence of different types of farm depending on the degree to which they incorporate livestock production (percentage of farms solely dedicated to livestock production, farms combining polyculture with livestock production, and polyculture farms with no livestock production).

The size of the territory taken into consideration must not be too big. Most of the time, the size is equivalent to that of a commune or village terroir. Analysis at a larger scale quickly becomes tricky to implement.

Characterisation of the diversity of livestock production takes into account, in addition to a strict inventory, a simple characterisation of livestock-production systems, as those systems may have very different characteristics within a single production (e.g. dairy cattle in confinement, on rangelands, on permanent prairies, on harvested plots, etc.).

It is also important to take into account the prevalence of different types of farm, as agricultural biodiversity is not managed the same way on farms that combine polyculture and livestock production or in addition to activities within territories (access to food for animals, production of organic matter, etc.).

Important**Transhumance situations; links between animal-feed production and cropping systems**

- In the territories where transhumance is practised, this aspect will need to be addressed in a differentiated manner (management of space, seasonality, etc.).
- The link between production of animal feed (grains, fodder, tubers, etc., by-products) and diversity of cropping systems will be included in the analysis.

3. Processing of data

Although most of the criteria and indicators used are relatively easy to record, the desired levels of depth may require calling on specialists (botany, forestry, ecology, silviculture, zootechnics, etc.).

Various databases will need to be created in Excel, differentiating between criteria and indicators addressed at each different scale: plot, farm and territory.

Processing and analysis of data may be complemented, if necessary, by specific studies requiring special attention on key points (e.g. botanical inventory on wild perennial plant communities incorporated into cropping systems).

3. SKILLS, HUMAN RESOURCES AND EQUIPMENT

While it is necessary to call on people with specialised skills to carry out an evaluation or monitoring and evaluation, it is important to consider which resources will need to be mobilised in order to conduct the studies, as well as which types of collaboration to initiate.

Further reading

The Agriculture de Conservation website (agriculture-de-conservation.com): portal for environmentally friendly farming systems. <https://agriculture-de-conservation.com/Repensons-l-amenagement-de-nos-agroecosystemes.html>

Agrisud International, 2020. *Guide L'agro-écologie en pratiques*, Agrisud International, 212 p.

French Foundation for Biodiversity Research (FRB). Biodiversity Challenges. <https://www.fondationbiodiversite.fr/en/biodiversity-challenges/biodiversity-and-agriculture/>

United Nations, 1992. *United Nations Convention on Biological Diversity*. <https://www.cbd.int/doc/legal/cbd-en.pdf>

Réseau mixte technologique Biodiversité et Agriculture. <http://www.rmt-biodiversite-agriculture.fr/>

Reducing exposure to pesticides

Definition

Chemical pesticides are synthetic substances used in agriculture to control different types of pests. Their names are derived from what they target (insecticides target insects, fungicides target mushrooms, herbicides target adventitious plants). Distinction is made between pesticides on the one hand, and biopesticides and natural preparations of low concern on the other, which are made by farmers from plants and other ingredients that are naturally present in their environment. Biopesticides and natural preparations of low concern differ from one another in a number of important ways. Both are preparations made from natural ingredients, but they differ in terms of toxicity for humans and for the environment. Natural preparations of low concern are not phytopharmaceutical products and do not require marketing authorisation (MA), which facilitates their on-farm production and consequently helps farmers become more autonomous. Biopesticides generally require MA because they are capable of killing insects, mushrooms, etc. (which explains the suffix “-cide”) and may, beyond a certain dose, have harmful effects on human health as well as on pollinators and other useful insects.

For various reasons (mechanisation, simplification of crop rotations, choice of crops based on market signals, choice of uniform varieties – often clones – based on demand from value chains, etc.), many farmers have oversimplified their production system, which has encouraged the rapid proliferation of bio-aggressors and greater use of various pesticides (insecticides, fungicides, herbicides).

This increase in pesticide consumption and the often alarming ways in which pesticides are used, particularly in the Global South, have worrying effects on human and animal health, and on the environment. Producers, farming families and consumers (residues in food) can be exposed regularly to pesticides that may be acutely toxic (immediate effects) or chronically toxic (long-term effects after repeated exposure).

Evaluation of the effects of agroecology in terms of reducing exposure to pesticides is therefore relevant in all situations where their use is substantial and where agricultural workers and the general public are presumed to be exposed to pesticides. This evaluation is important from the point of view of both the farmer and the public interest.

An evaluation may be conducted as part of a one-off evaluation (see [Chapter 2](#), General approach for one-off evaluations, Stage 2c, Agro-environmental evaluations of sampled plots) or as part of monitoring and evaluation (see [Chapter 3](#)).

Which agroecological practices should be developed to reduce exposure to pesticide?

It is often the overall design of the production system that makes it possible to reduce the use of pesticides and biopesticides (see [Evaluation Sheet 4](#), Regulation of bio-aggressors). When the use of pesticides cannot be avoided, certain knowledge and certain practices can be applied to help limit users' exposure and therefore reduce the health risks.

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Exposure to pesticides	Level of pesticide use	Treatment frequency indicator (TFI)	Plot Group of plots Farm Territory	Average
	Pesticide toxicity	Level of acute toxicity and chronic toxicity of the pesticides used	Farm	Average
	Conditions of use for pesticides	Protection measures at all stages of handling these products (preparation, spraying, storage)	Plot Farm	Average
	Reduction of pesticide use	Use of biopesticides or natural preparations of low concern Cultivation practices to prevent the build-up of pests, and natural-regulation practices	Plot Farm	Average

2. METHODOLOGICAL APPROACH AND TOOLS

1. Information to be gathered

The information to be collected, mainly at farm level, includes a description of the main synthetic pesticides used, how they are used and how packaging is managed, and the identification of alternative practices that can be employed instead of using pesticides.

The description of the main synthetic pesticides used includes: name of the commercial products, name of the active ingredients contained in those products, quantity of product used, surface area and crop treated, and targeted bio-aggressors.

A large amount of additional information may be gleaned from labels on the packaging of pesticides provided by farmers or available at agricultural input shops and

periodic markets in the area covered by the study: concentration of the active ingredient, acute toxicity category based on the WHO classification and, most importantly, the “hazard statements” of the CLP (Classification, Labelling, Packaging) international classification¹¹.

As the labels do not always mention the potential dangers (this is particularly common in the Global South), there are online databases that list the active ingredients¹², and make it possible to identify how dangerous they are and define their toxicity (acute and chronic), particularly for pesticides recognised as “CMR” (carcinogenic, mutagenic or reprotoxic). Among the CMR pesticides are those that are banned under international conventions but that are unfortunately found at periodic markets in countries where regulations are less strict or not complied with.

The way in which pesticides are used and the way in which packaging is managed on the farm are also very important for the evaluation of exposure to pesticides. Identification of the existence or not of mitigation measures to minimise exposure to pesticides is essential: type of device used (e.g. with manual spraying in front of or behind the sprayer, which reduces contamination), how it is applied and conditions for its application (depending on wind direction), basic protection equipment (goggles, simple mask, gloves and boots), etc. Ask yourself following questions: Are these precautionary principles used at each stage in the handling of the products (preparation, spraying, storage)? Are treated plots visibly marked for family members and neighbours in order to avoid accidental contamination of people or livestock? Are pesticide containers, bottles and packets eliminated or stored safely after use? What percentage of this packaging is left in the field, burned or reused? What percentage is returned to the sellers, who should be required to recycle them (which is the case under European regulations, for example)?

The purpose of **identifying alternative practices** to use instead of pesticides is to identify practices that could be used to agroecologically manage the pests mentioned in the introduction.

2. Processing of data

Survey data linked to the evaluation of exposure to pesticides makes it possible to determine the treatment frequency indicator (TFI) as well as a pesticide-exposure indicator.

The TFI counts the number of reference doses used per hectare during a growing season¹³. This indicator may be calculated for a single plot, a group of plots, a farm or a territory. It is calculated as follows:

$$\text{TFI for a single plot} = \frac{\text{Applied dose} \times \text{area treated}}{\text{Reference dose} \times \text{total plot area}}$$

11. These databases catalogue active ingredients in line with the Globally Harmonised System of Classification and Labelling of Chemicals developed at international level, with classification according to toxicological risks for health (H3) and for the environment (H4), which is now mandatory for pesticide labelling in the European Union (AVSF, 2020).

12. <https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/active-substances/?event=search.as>

13. French Ministry of Agriculture and Food, 2018.

The reference dose for the crop or target is usually indicated on the product labels (approved dose). To determine the TFI for the plot, add up the TFIs of all the treatments applied from the previous harvest to the following harvest. In the case of seed treatment, add 1 to the TFI.

Calculated for a crop or for the whole farm, the TFI may be compared to a reference value determined based on surveys reflecting cultivation practices at territorial or regional scale. By comparing the TFI with that of other farms or with the reference TFI for the territory, farmers can situate their practices and identify possible scope for progress in terms of reducing pesticide use.

An indicator for exposure to pesticides may also be established from data collected on the acute and chronic toxicity of products, the conditions of use for pesticides and the implementation of alternatives (Table 4.9).

Table 4.9. Characterisation of a synthetic indicator for exposure to pesticides
(source: adapted from FAO, 2021, p. 35).

Red (not sustainable)	Yellow (acceptable)	Green (desirable)
Producers are using pesticides that are extremely dangerous (Class I) or illegal or CMR OR Producers are using Class II or Class III pesticides (moderately hazardous, and slightly hazardous or relatively non-hazardous), and fewer than four mitigation measures are implemented when applying pesticides OR Producers are using chemical pesticides from any class AND No alternative (biopesticides, natural preparations of low concern, biological control) is implemented.	The quantity of synthetic pesticides used is greater than the quantity of biopesticides and natural preparations of low concern AND Producers are not using pesticides that are Class I or illegal or CMR AND At least four of the identified mitigation measures are implemented when applying chemical pesticides AND Alternatives (biopesticides, natural preparations of low concern, biological control) are also used	The quantity of biopesticides and natural preparations of low concern used is greater than the quantity of synthetic pesticides AND Class I and Class II pesticides or CMR pesticides are not used AND At least four mitigation measures are implemented when applying pesticides OR Chemical pesticides are not used at all AND Alternatives (biopesticides, natural preparations of low concern, biological control) are used.

Example

Analysis of exposure to pesticides for potato cultivation in the Ecuadorian Andes

A study evaluating agroecology in an area of irrigated agriculture in the Ecuadorian Andes sought to measure farmers’ exposure to pesticides*. The development of irrigation in recent decades has favoured the intensification of agricultural production, with a strong increase in the use of pesticides.

In the case of potato cultivation, an increase in the use of pesticides has been observed, particularly to combat certain pests, such as mildew (*Phytophthora infestans*) and *paratrioza* (*Bactericera cockerelli*), an insect of the Hemiptera order that causes direct and indirect damage by transmitting a viral disease.

The level of losses is such that the technical advisors at local input shops recommend, for example, preventively applying a mix of fungicides (mancozeb-metalaxyl) and insecticides (thiamethoxam-lambda-cyhalothrin) at least every 12 days until the fifth month of the growing period (six-month cycle). Most of the farmers surveyed rely on this advice concerning the choice of products and the dose. Few of them control or make note of the quantity of product used. Considering that they apply at least the reference dose indicated on the label, the TFI varies from 13 to 18 (spraying every 8 to 12 days) depending on the farm and the plot. For certain producers, the frequency of potato treatment was less than 5 in the early 2000s, which shows that the TFI has increased greatly even though the products used and the doses were different twenty years ago.

Among the active ingredients currently used for potatoes, three are no longer approved in the European Union, and four are recognised as CMR or are potentially CMR. Mancozeb, for example, is a widely used fungicide with low acute toxicity (category U in the WHO classification), even though it is recognised as an endocrine disruptor and probable carcinogen, and is banned for sale in the European Union. Moreover, identification of hazard statements shows that all the active ingredients used have negative effects on the environment, particularly for aquatic life (H400 to H413: danger for aquatic life).

Some producers have begun producing potatoes using agroecological practices, which requires selecting varieties that are more resistant to pests and applying a mix of biofertilisers and biopesticides (natural preparation made from garlic, chilli pepper and other plants and ingredients available in the area) every 8 to 12 days, just like for conventionally grown crops. These practices, however, are still used by only a minority of farmers, as the indicator of exposure to pesticides shows that only 11% of farmers believe it is desirable to reduce pesticide use.

* Au pois *et al.*, 2022.

3. COMPLEXITY, HUMAN RESOURCES REQUIRED, COSTS

To evaluate exposure to pesticides, technicians must have previous training, or must at least have completed self-directed training in pesticide identification¹⁴. The main costs for this evaluation are therefore linked to the training (if necessary) of these technicians.

This evaluation would also require measuring pesticide residues in consumed crops in order to assess consumers' level of exposure.

14. AVSF, 2020.

Table 4.10. Main active ingredients applied on potato plots in the Ecuadorian Andes.

Product name	Active ingredient(s)	Acute toxicity		CLP hazard statements	Chronic toxicity (CMR) and other observations
		Colour	WHO class		
Koctel 720 (fungicide)	 + Mancozeb metalaxyl	Blue ["caution"]	Mcz: U	Mcz: H317 H361d H400	Mancozeb: endocrine disruptor, probable carcinogen
			Mty: II	Mty: H302 H317 H412	Mty: harmful if swallowed, and toxic for aquatic organisms
Moskation (insecticide)	Malathion	Blue	III	H302 H317 H400 H410	Probable carcinogen. Very toxic for bees
Oncol (insecticide)	 Benfuracarb	Yellow ["danger"]		H302 H331 H361f H400 H410	Toxic if inhaled. Affects fertility
Engeo (insecticide)	 + Thiamethoxam lambda-cyhalothrin	Yellow	Th1: III	Thi: H302 H400 H410	Thi: endocrine disruptor
			Ldc: II	Ldc: H301 H312 H330 H400 H410	Ldc: potential carcinogen and endocrine disruptor
Fungicide	Hexythiazox	Blue		H400 H410	Danger for aquatic life

 Active ingredient banned in the European Union. WHO classification: I, very hazardous; II, moderately hazardous; III, slightly hazardous; U, unlikely to present acute hazard.

Further reading

AVSF, 2020. Training Guide: Agroecology as a Substitute for Pesticides. Reducing the use and risks of pesticides and veterinary products using viable alternative practices, AVSF-AFD, 186 p. <https://www.avsf.org/en/posts/2663/full/training-guide-agroecology-as-a-substitute-for-pesticides>

French Ministry of Agriculture and Food, 2018. *Indicateur de fréquence de traitements phytopharmaceutiques (IFT). Guide méthodologique*. <https://agriculture.gouv.fr/indicateur-de-frequence-de-traitements-phytosanitaires-ift>

Socio-economic evaluation



This chapter comprises nine evaluation sheets covering various aspects that are likely to be impacted by agroecology.

- ➔ Evaluation Sheet 7. Crop and livestock yields (estimate according to stakeholders) 136
- ➔ Evaluation Sheet 8. Economic performance from the farmer’s point of view (crop- and livestock-production activities) 148
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Each evaluation sheet provides: a definition of the aspect covered by the sheet; an introduction explaining the contexts in which the evaluation sheet may be useful; a table summarising the criteria, indicators, scale and technicity of the evaluation; the methodological approach for characterising a situation (for a one-off evaluation); potential supplements for monitoring and evaluation; and notes on technicity, human resources required and costs. A few documentary references are also proposed in the “Further reading” section for exploring certain aspects in greater depth. Where relevant, indicators broken down by gender or relating to gender equality should be included.



Crop and livestock yields

(estimate according to stakeholders)

Definitions

Crop yield represents the quantity of product obtained in a crop-production activity per unit of land area, taking into account that there may be multiple products.

Livestock yield – or zootechnical yield – represents the total volume of production obtained in a livestock-production activity over the course of a year per unit of main forage area (MFA), or per head of animal or per animal unit (AU).

Yield regularity over time represents the variability of yield from one year to another.

Yield dynamic represents the change in average-yield trends over time.

Estimating the average level of crop and livestock yields, their year-to-year regularity and their dynamic over time is a key part of one-off evaluations of agroecology, and monitoring and evaluation of agroecology. In general, measuring yield directly is difficult, time-consuming and too demanding in terms of resources. Estimating yields according to stakeholders is even the only way to reconstitute past yields (and therefore calculate an average, evaluate yield regularity and assess yield dynamic over time), except in exceptional cases where past yields were recorded. Volume of agricultural production is an essential element for farmers in terms of obtaining value-added and agricultural income, and for food-security reasons (see [evaluation sheets 8 and 9](#), Economic performance from the farmer's point of view – crop- and livestock-production activities, and agricultural production system, and [Evaluation Sheet 14](#), Food security). It is therefore important to estimate these average production volumes and relate them to the farming area to calculate an **average yield**. Comparing average yields between systems with varying degrees of agroecologisation also contributes to the evaluation of the effects of agroecology on well-being and the attractiveness of agriculture for young people (see [Evaluation Sheet 11](#)) and on the autonomy of farms (see [Evaluation Sheet 13](#)). In so far as agricultural production contributes to the creation of economic wealth in general and to feeding other sectors of the population, yield estimates are also necessary for evaluating the effects of agroecology on the economic development and food security of the national community as a whole.

Estimating **yield regularity** over time is useful in areas where yield variability has been identified as a problem creating a major risk for certain farms. Yield irregularity creates uncertainty in terms of agricultural income and food supply, and therefore in terms of food security (see [Evaluation Sheet 14](#), Food security). Agroecology may have a positive or negative impact on yield regularity.

Important

Yield components

For a more detailed analysis of yield and the factors behind differences in yield, it is necessary to focus on the components of crop and livestock yield. For example, in the case of a cereal crop, one may focus on the number of plants per unit of land area, number of ears per plant, number of grains per ear and weight of a thousand grains. Likewise, in the case of livestock production, one may calculate different components corresponding to zootechnical indicators (prolificity, mortality, etc.). This is the case in a monitoring-and-evaluation system. Yield components differ depending on the type of crop, and even more depending on the type of livestock production (animal species and purpose of production). This level of analysis is not addressed in this guide.

The evaluation of **yield dynamic** contributes to the assessment of the farm's economic dynamic and viability over the medium term (see [Evaluation Sheet 9](#), Economic performance from the farmer's point of view – agricultural production system) and to the attractiveness of agriculture for young people (see [Evaluation Sheet 11](#)). It also reveals changes in soil fertility and in the productive potential of the cultivated ecosystem, as well as the existence of changes in the climate. Agroecology often has an impact on trends in crop and livestock yields.

Important

Yield dynamic and changes in cropping practices

Often, yields remain stable over time, but at the cost of greater and greater use of fertilisers and pesticides. These rising input applications therefore conceal a soil-fertility crisis and degradation of the cultivated ecosystem. Assessment of the dynamic of the productive potential of soils and the ecosystem cannot therefore be based solely on observing changes in yield. It must also take into account changes in cropping practices.

Estimating yield according to stakeholders is necessary for one-off evaluations as part of the in-depth case studies of farms (see [Chapter 2](#), Stage 2b), and for monitoring-and-evaluation systems (see [Chapter 3](#)).

Important

An additional tool: direct measurements of yield

In certain situations, it is useful and feasible to make direct measurements of yield. The corresponding method is presented in [Evaluation Sheet 1](#), Crop yields (direct measurement).

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria	Indicators	Scale	Technicity
Average crop yield	Quantity of crops per unit of area per production cycle during an average year (generally in t/ha)	Plot Group of plots ¹	Average
	Quantity of by-products per unit of farming area per production cycle (generally in t/ha)	Farm Group of plots ¹	Average
Average livestock yield	Quantity of animal products per unit of MFA	Herd-group of plots ²	Average
	Quantity of animal products per head or per AU over the course of a year or production cycle (lactation, etc.)	Herd ²	Average
	Quantity of by-products per unit of MFA, per head or per AU	Herd-group of plots	Average
Yield regularity	Levels of average yield, standard deviation, yield during a bad year and during a good year; deviations between these values; risk of yield being below a certain level	Farm Group of plots ¹ Herd-group of plots Herd ^{1, 2}	Average
Yield dynamic over time	Change and rate of change (%) of average yield over 5 or 10 years	Farm Group of plots ¹ Herd-group of plots ²	Average

MFA: main forage area; AU: animal unit.

¹ **In the case of a one-off evaluation**, the evaluation of crop yields is conducted: – for all of the farm's plots where crops are grown. An average, representative plot may serve as a reference to facilitate exchanges with the farmer;

– if there are significant heterogeneities in terms of agro-climatic conditions or types of practices (irrigated cropping, rainfed cropping, succession cropping, short/long cycles, practices with varying degrees of agro-ecologisation, etc.), the evaluation must differentiate between these types of situation.

In the case of a monitoring-and-evaluation system, the yield estimate also focuses on a specific selection of plots where changes in yield are monitored.

² The estimate of livestock yield is made for the entire herd.

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

1. Data collection

When estimating **yield for a crop-production activity**, all production – and in particular all associated crops – obtained from the area in question must be included. The overall yield of the plot is therefore in reality made up of a list of yields, for example x tons of corn per hectare + y tons of beans per hectare. It is also important to include the production of intra-unit consumption, i.e. products that are reused in another production cycle (e.g. the portion of the corn harvest that is saved for seed) or for another production activity (e.g. the portion of the corn harvest used for animal feed on the farm).

The yield estimate is made for each in-depth farm case study (see [Chapter 2](#), General approach for one-off evaluations, Stage 2b, In-depth case studies of farms).

In some cases, production data or yield data were recorded by the farmer. This information must, of course, be utilised. This is generally not the case, however, and questions therefore need to be posed to the farmer. Questions are asked for the entire farm or, if marked heterogeneities exist, for all plots belonging to each type of plot or cropping system. It may be easier to estimate yield during a field visit, based on a specific plot that is representative of the average.

In reality, several scenarios exist, according to the degree to which the farmer manages the areas, production levels and yields themselves, keeping in mind that the estimate is made first and foremost based on the information provided by the farmer, with possible complementary calculations.

If a farmer has good knowledge of the yields obtained, he/she is successively asked:

- the yield from the last harvest (or, in the case of associated crops, yields from the last harvests of each crop in the association);
- his/her opinion on this harvest: was it an average, good or bad harvest?;
- the yield in previous years (2 years ago, 3 years ago, etc.). The idea is to start with events that should be clearest in the farmer's memory. If the farmer can provide information on yields from the previous five years, it is possible to calculate a standard deviation;
- in addition, the yield from one or two exceptional years (one that was exceptionally good, and one that was exceptionally bad). For this, it is useful to have collected climate data in Phase 1 of the evaluation, and to have identified very good and very bad agricultural years during interviews. It is then possible to make direct reference to those exceptional years in case studies;
- his/her assessment of the yield for each year (good, average, bad);
- the average yield on this same plot when he/she started working on it, or when he/she started using it with this crop (and the corresponding date), and, where applicable, his/her opinion on the causes of the changes observed over time. This information is useful for calculating an average rate of annual change based on the initial average yield and the current average yield;
- the yield of by-products, such as quantity of rice straw collected per unit of land area after the harvest. This estimate is only useful if the by-product is valorised outside the plot (rice straw is used as cattle fodder, for instance). If the by-product is not valorised (if the rice straw is left on-site or burned, for instance), then it is not a final output of the activity. Moreover, the farmer is in this case unlikely to know its yield.

If the farmer does not know the yields obtained but does know the production volumes and area of the plot, group of plots or farm, then the same questions are asked but focusing on production volumes. If the farmer only knows the farm's total production, then it is not possible to perform the calculation for each cropping system. It should be noted that using a GPS enables easy measurement of the area of each plot.

Important**Limitations of using GPS to measure land area**

If GPS is used to measure the area of a plot, it is important to be aware that this tool is not accurate enough to measure very small areas (e.g. small garden for on-farm consumption).

If yield or production-volume estimates are made using units of measurement other than quintals or tons (bags, crates, etc.), then the questions must be based on the units used by the farmer, because these are the ones he/she knows and with which he/she can reason. It will be necessary, however, to raise the question of equivalence in weight to be able to make comparisons. The same applies to units of measurement for land area. Sometimes, the farmer may not be familiar with these equivalences. If this is the case, information on these equivalences should be obtained during the study period (in some cases, a measurement should be taken).

Yield assessment is more difficult when harvests are spread over time and not stored, but consumed or sold gradually (fruits and vegetables, especially leafy vegetables). Several methods may be used to evaluate the quantity of crops harvested:

- based on the number of days or weeks of harvesting, and the harvest quantity per day or per week;
- based on the number of trees and the estimated number of fruits produced per tree;
- based on the quantity consumed, in cases where production is intended for consumption.

For **dairy farming**, two approaches may be used:

- one approach focuses on the herd's daily production (excluding milk consumed directly by the calf, which is not part of the herd's final output) after obtaining information on the total production curve for the year, i.e. the curve representing production at various times of the year. In this case, the farmer is asked to provide the day's production on the day of the survey, daily production during the month situated at the top of the curve, daily production during the month situated at the bottom of the curve, and daily production at a key point on the curve (see Figure 5.1);
- the other approach focuses on milk production during lactation. In this case, the farmer is asked the duration of lactation (in months) and the daily production per animal from milking (excluding milk consumed directly by the calf). This data may be compared with data generated from information obtained by asking the following questions: the day's total production and the number of lactating cows; approximate total production curve for the year; month with highest production, total volume and number of cows milked; month with lowest production, total volume and number of cows milked.

For **other types of livestock production**, the evaluation method depends on the type of production. Yield strictly speaking (e.g. carcass yield per unit of land area), however, is not generally calculated. Gross product is calculated directly instead (see [Evaluation Sheet 8](#), Economic performance from the farmer’s point of view – crop- and livestock-production activities), except in the case of more detailed zootechnical analyses. Likewise, for certain intensive livestock-production operations, although it is fairly easy to calculate physical production (number of eggs, chickens, etc.), this is not referred to as yield as there is no main forage area. Specific zootechnical yields (annual number of eggs per hen, annual number of piglets per sow, etc.) may be calculated, however, as part of more detailed zootechnical analyses.

2. Processing of data

All data obtained during the case studies is then broken down by type of farm and entered into a table. If significant heterogeneities regarding agro-climatic conditions have been identified, it is necessary to differentiate the data by agro-climatic zone. The following information is therefore recorded for each farm: most recent yield, average yield, yield in a good year and in a bad year, change in yield (based on average change in yield over five years). Average results (or ranges of results if there are significant deviations for a single type of system) and standard deviations can be calculated for each type of production or cropping system.

Example

Presentation of yield data in table form

As part of a study to evaluate agroecology in the Central Plateau region of Burkina Faso (village of Guiè), the average yields of the 21 farms from the sample in good and bad years were recorded in Table 5.1, specifying the type of farm in each case. Two types of associations were taken into consideration: sorghum + cowpea, and millet + cowpea. The analysis made it possible to observe clear differences between the different types. The start of the table (the first eight farms) is presented below.

Lactation data is also presented in a table, where it is broken down by type of production system and livestock-production system.

Classification of data makes it possible therefore to compare results for different types of crop or livestock production, and for cropping and livestock-production systems with varying degrees of agroecologisation.

Overall production volume
(litres/day)

January: 70 (known)	February: 75 (estimated)	March: 80 (known)
April: 140 (estimated)	May: 200 (known)	June: 170 (estimated)
July: 150 (estimated)	August: 130 (estimated)	September: 110 (known)
October: 105 (estimated)	November: 90 (estimated)	December: 80 (estimated)
		► Annual average: roughly 111 litres/day
		► Annual production: roughly 40,000 litres

Table 5.1. Examples of average, low and high yields of various farms of different types in Burkina Faso
[source: Ouedraogo and Levard, 2022].

Farm	Type of farm	Crop	Yield in kg/ha (calculation based on gross data in yorubas/ha)		
			Average	Low	High
Farm 1	Type 3	White sorghum	1,080	720	1,440
		Associated cowpea	240	240	240
		Millet	720	480	960
		Associated cowpea	240	240	240
Farm 2	Type 3	White sorghum	810	540	1,080
		Associated cowpea	180	180	240
		Millet	960	720	1,200
		Associated cowpea	120	120	120
		Associated cowpea	160	80	240
		Millet	480	240	720
		Associated cowpea	180	180	180
Farm 4	Type 3	White sorghum	1,260	720	1,800
		Associated cowpea	240	120	360
		Millet	900	600	1,200
		Associated cowpea	120	120	120
Farm 5	Type 3	White sorghum	1,440	1,080	1,800
		Associated cowpea	180	120	240
		Millet	480	240	240
		Associated cowpea	60	60	60
Farm 6	Type 4	White sorghum	480	252	720
		Associated cowpea	60	45	75
		Millet	900	450	1,350
		Associated cowpea	60	30	30
Farm 7	Type 5	White sorghum	1,440	1,080	2,160
		Associated cowpea	45	45	45
		Millet	720	360	1,080
		Associated cowpea	60	60	60
Farm 8	Type 4	White sorghum	240	160	320
		Associated cowpea	80	40	120
		Millet	240	180	300
		Associated cowpea	120	120	120

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

For monitoring-and-evaluation systems, certain particularities must be taken into account.

- When constructing the baseline situation, and for each plot or set of plots included in the monitoring-and-evaluation sampling, the farmer will be asked about the yield obtained during the last two harvests, which makes it possible to obtain a baseline situation including two consecutive years (it should be noted that the harvest following the start of the intervention may generally also be considered as a baseline year, as the effects of the intervention do not yet exist, which makes it possible to have a third year for characterising the baseline situation).
- During or at the end of an intervention, the farmer is asked about the yields obtained for each year since the beginning of the intervention, starting with the most recent year (which is freshest in the farmer's memory) and going back over time. This may bring to light different trajectories for changes in yield depending on the situation.
- Sometimes it is possible to monitor yields on certain plots using measurements of production. This is addressed in [Evaluation Sheet 1](#), Crop yields (direct measurement).
- Regardless of whether yields are evaluated according to farmers or using measurements, all data is broken down by type of farm/production system, type of plot/crop- or livestock-production activity, potentially by agro-climatic zone and by the degree to which the agroecological practices promoted by the intervention have been implemented. Several groups can be made up, for which averages and ranges of results are calculated:
 - a control group comprising, for a given activity (and potentially an agro-climatic zone), plots unaffected by the intervention (farms that are non-beneficiaries of the intervention, and farms that are beneficiaries but that have not implemented the promoted practices);
 - a group comprising, for a particular activity (and potentially an agro-climatic zone), plots on which the practices promoted by the intervention have been implemented.
- The average yield (together with a standard deviation, and a range in the case of substantial heterogeneity) is calculated for each group and each year (average of the two or three years for the initial reference, then each of the following years). The curves traced from this data make it possible to assess whether trends observed in the control group and in the group(s) that implemented agroecological practices are similar or different. It is recommended that both the curve of annual averages observed and the corresponding straight line illustrating the trend be traced for each group. The straight line, which is obtained by linear regression (automatic function available on computer spreadsheet software), illustrates the evolutionary trend and must be used to observe differences in average yield. For each year, calculation of standard deviations in yield within each group is necessary for the interpretation of results. In Figure 5.2, the difference between A6 and B6 indicates the difference in yield (1 t/ha) between the group that implemented practices and the

control group six years after the start of the intervention. Furthermore, it should be considered whether or not there are other causes that might explain the difference, regardless of whether they are related to the intervention, before attributing the difference exclusively to the implementation of agroecological practices.

There may be an initial difference between the average yield of the two groups, as illustrated in Figure 5.2. This results from the diversity that exists between farms, variation in soil fertility or differences in cropping practices. The final difference in yield (A6-B6) may be partly due to the existence of a difference that already existed at the start of the intervention or to factors other than the implementation or not of agroecological practices. In the example in Figure 5.3, there is an initial difference in yield of 1 t/ha between the group of farms benefiting from the intervention and the control group (A0 - B0 = 6.0 - 5.0). The final difference in yield is 2 t/ha (A6 - B6 = 7.5 - 5.5). The effect attributable to the implementation of agroecological practices between the initial situation and the final situation is:

$$(A6-B6) - (A0-B0), \text{ or } 2.0 - 1.0 = 1 \text{ t/ha.}$$

Important

Longer-term effects on yield

The effect of the implementation of agroecological practices is often time-delayed (which is illustrated in Figure 5.2, where the difference between the groups only appears from the fourth year). The longer-term effect, “at cruising speed”, can be more important than the effect measured at the end of the intervention.

With regard to the evaluation of effects on **yield regularity**, the reconstitution of series of data may bring to light an effect of the implementation of agroecological practices. This can be seen in Figure 5.3, where the yield is more regular with implementation of agroecological practices. Deviations in yield between the two groups are particularly pronounced in years when harvests are not as good, as the decrease in yield is a lot more visible in the control group's plots (years 4 and 6). For each year, calculation of standard deviations in yield within each group is also useful for the interpretation of results. For fundamental food crops (cereals in particular), the risk of obtaining a yield lower than a certain threshold may be assessed taking into account the family's food needs. For example, if a family's annual food needs are estimated at one ton of cereals, and the family grows two hectares of cereals, then 0.5 t/ha is the yield threshold below which the family's food security is in danger. Analysis of a series of several years of yield data makes it possible to show the probability, and therefore the risk, of a family finding itself in this type of critical situation. Assessment is complex, however, because the family's different food sources should be taken into account.

With regard to the evaluation of effects on **yield dynamic** over time, the evolution observed in the group of plots where agroecological practices are implemented should be considered, and an annual rate of evolution should be calculated. By comparing the evolution of these plots with that of the control group, and with the

Figure 5.2. Evolution of crop yield (t/ha) over the years following an intervention.

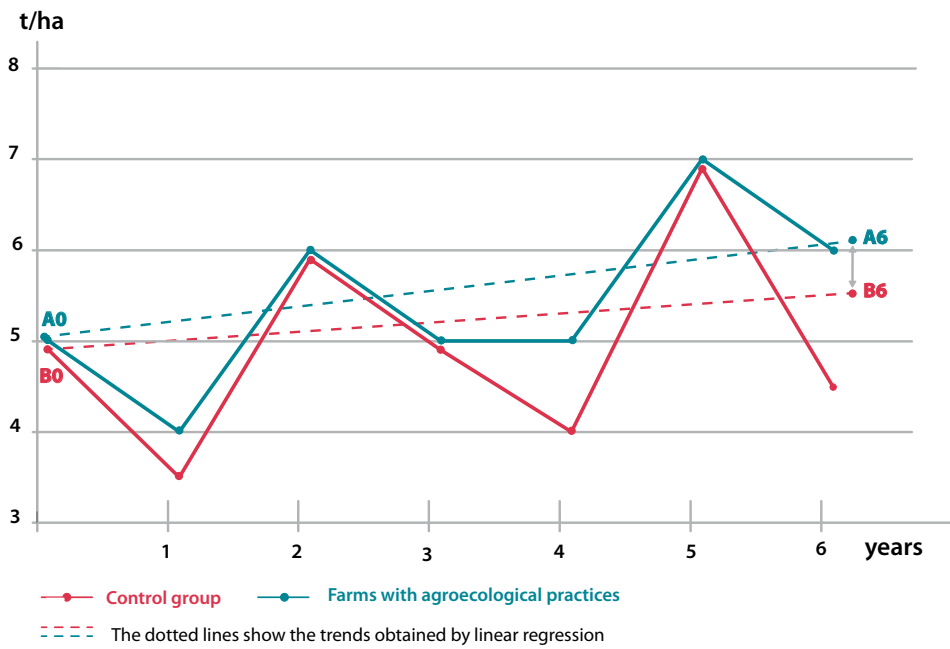
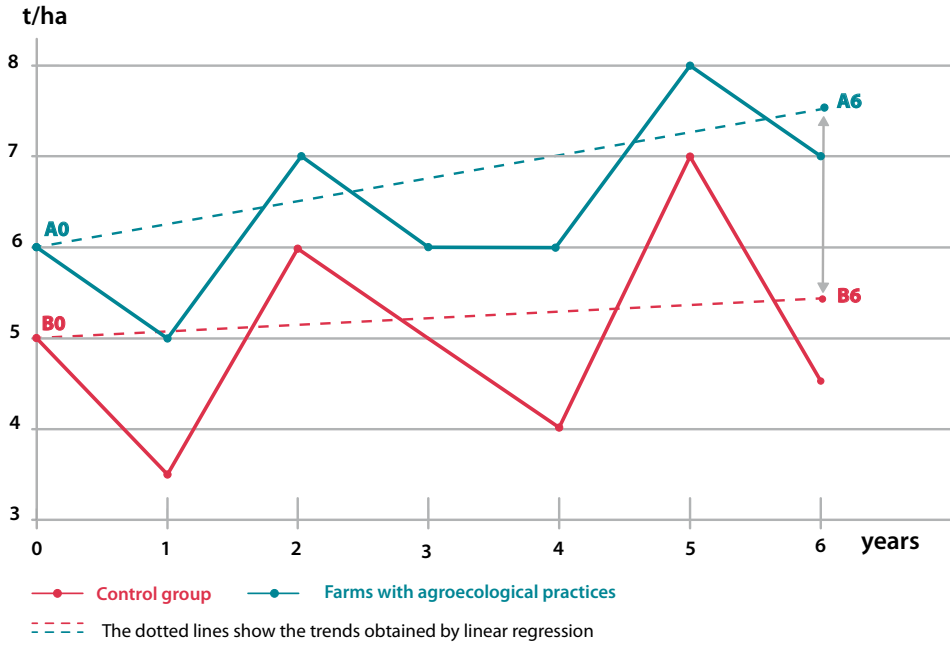


Figure 5.3. Evolution of crop yield (t/ha) over the years following an intervention (with initial difference).



is possible to assess a potential effect of agroecology on yield dynamic over time. To compare the medium- or long-term evolution “at cruising speed” with the evolution of plots with no agroecological practices, however, a period of time much longer than that of the intervention would be necessary.

Ultimately, to evaluate the effect of agroecological practices on the evolutionary dynamic of yields over time (which partly reflects the evolution of the cultivated ecosystem’s fertility and the ability to adapt to climate change), both short-term and longer-term effects should be considered. The short term may, for example, correspond to a phase of fertility restoration and yield improvement, as well as a phase where technical knowledge of agroecological systems is acquired.

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

Evaluating yield is relatively complex, as the interviews with farmers must be conducted with the utmost rigour. In order to obtain reliable data, it is important for the farmer to fully understand the evaluator’s expectations and be willing to cooperate. In the case of a monitoring-and-evaluation system, it is possible to ask farmers who are beneficiaries of the intervention to make a written note of the yields obtained. It is also often useful to complement this information by yield measurements (see [Evaluation Sheet 1](#), Crop yields – direct measurement).



Economic performance from the farmer's point of view

(crop- and livestock-production activities)

Définition

The **economic performance of crop- and livestock-production activities from the farmer's point of view** includes:

- the technical and economic efficiency of these activities (value-added per unit of the type of production factor used);
 - their profitability (gross margin per unit of the type of production factor used).
-

The economic performance of each crop- and livestock-production activity is an important criterion in the evaluation of agroecological practices and systems from the farmer's point of view. The farm's overall economic performance (value-added of the agricultural production system, agricultural income) – see [Evaluation Sheet 9](#), Economic performance from the farmer's point of view (agricultural production system) – is based largely on the performance of each of its crop- and livestock-production activities.

The evaluation of the effects of agroecology on the economic performance of crop- and livestock-production activities from the farmer's point of view may be conducted:

- in a one-off evaluation as part of the in-depth case studies of farms (see [Chapter 2](#), Stage 2b), in cases where comparison is sought between the economic performance of a particular activity (corn cultivation, dairy farming, etc.) when agroecological practices are used and the economic performance of that same activity when agroecological practices are not used;
- in monitoring and evaluation (see [Chapter 3](#)), any time an intervention seeks to promote the development of agroecological practices in crop- or livestock-production activities.

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Technical and economic efficiency of a crop-production activity	Efficiency of land use	Gross value-added per unit of land area (GVA/A)	Plot Group of plots	Average
	Gross daily labour productivity	Gross value-added per day of work (GVA/WD)	Plot Group of plots	Average
	Efficiency of herd use	Annual gross value-added per head (GVA/head/year) or per animal unit (GVA/AU/year)	Herd	Average
	Efficiency of land use	Gross value-added per unit of main forage area per year (GVA/MFA/year)	Group of plots	Average
Profitability of a crop- or livestock-production activity	Gross daily labour productivity	Gross value-added per day of work (GVA/WD)	Group of plots	Average
	Profitability of land use	Annual gross margin per unit of land area (GM/A for crop production, GM/MFA/year for livestock production)	Plot Group of plots	Average
	Profitability of use of family workforce	Annual gross margin per day of family work (GM/WDfam)	Plot Group of plots Herd	Average
Regularity of efficiency or profitability ¹		Deviation between GVA or GM in an average, good or bad year	Plot Group of plots Herd	Average

¹ The evaluation method is not proposed in this sheet, as the evaluation of the interannual regularity of agricultural production is already addressed for yield ([Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders), and for agricultural income ([Evaluation Sheet 9](#), Economic performance from the farmer's point of view – agricultural production system).

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

The evaluation of the economic performance of a crop- or livestock-production activity is conducted for a plot or group of plots that are relatively homogeneous in terms of their agronomic characteristics and technical management of crops.

For the economic calculation, the evaluator may use the Excel spreadsheet for automated calculation and its user manual, which are proposed as a supplement to this guide and presented in **Tool Sheet 7**.



Important

Calculating the results for an average year

The calculation must correspond to an average year, whether in terms of crop and zootechnical yields, practices (and therefore costs) or prices. If the previous year can be a starting point for the collection of technical data from the farmer, data (yields, practices, prices) from an average year should be used for the economic calculation.

3. TECHNICAL AND ECONOMIC EFFICIENCY OF A CROP- OR LIVESTOCK-PRODUCTION ACTIVITY

In the case of livestock production, the economic calculation can be made for each type of animal species, as well as for all ruminants, particularly when they are managed jointly and use the same forage area.

1. Creation of wealth: calculation of gross product and gross value-added

Gross product

The gross product (GP) is the economic value of production. It is calculated by multiplying the quantity of produce obtained during an average year (see [Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders) by the average unit price. The entire production, regardless of its end use, is taken into account in the calculation of gross product. Production includes what is sold, what is for the family's consumption (on-farm consumption), what is for another activity in the production system (intra-unit consumption) and what is stored temporarily.

The annual gross product of a **crop-production activity** is therefore the sum of each type of product obtained, multiplied by its specific unit price:

$$GP = \sum (\text{quantity of product} \times \text{specific unit price})$$

For a **livestock-production activity**, it is also necessary to subtract animal purchases and take into account annual change in the value of the herd over the course of the year, measured by the change in inventory value (ΔINV). This change in the value of the herd is a product of the livestock-production activity, even though no animals were sold or consumed. The change in inventory value is calculated by subtracting the inventory value at the start of the year from the inventory value at the end of the year. The change may be positive or negative. So, in the case of livestock production:

$$GP = \text{sale of animals} - \text{purchase of animals} + \Delta INV + \text{other products}$$

where: $\Delta INV = (\text{inventory value at end of year}) - (\text{inventory value at start of year})$

Focus

Valuation of agricultural products from the farmer's point of view

Economic calculation at farm level requires a value to be given to products from the farmer's point of view.

If the product is for sale, the average selling price is used (the price may vary over the course of the year depending on the type of buyer or market).

If the product is intended for on-farm consumption by the family, then the opportunity cost is used – i.e. the price the farmer would have had to pay for the product if he/she had not produced it (market price).

If the product of an activity A is intended for another activity B in the production system (intra-unit consumption), then the opportunity cost is also used.

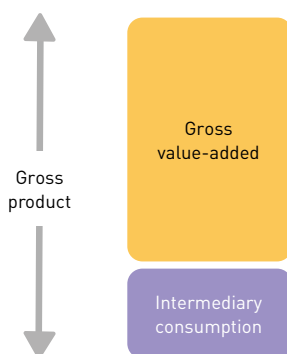
If there are several different types of products on the same plot – e.g. sorghum (main product), straw for cattle feed (by-products), beans (associated crop) – then the value of those different products is calculated. The average unit price will be different depending on the type of product. A particular product may be valued at different prices depending on its quality, its use (for sale or on-farm consumption) or the type of market in which it is sold. In this case, the average unit price is evaluated taking into account these differences in price.

● Gross value-added

Gross value-added (GVA) is the gross economic wealth created by the productive activity. It is calculated by subtracting the value of intermediary consumption (IC) used in the production process (inputs and services) from the gross product (GP). Inputs may have been purchased outside the farm or may come from another activity in the agricultural production system (intra-unit consumption: grain consumed by animals, manure enabling plots to be fertilised, etc.). It is qualified as gross, and not net, because the depreciation of equipment used in the production process is not deducted. The calculation is therefore:

$$GVA = GP - IC$$

Figure 5.4. Calculation of the gross value-added of a crop- or livestock-production activity.



2. Efficiency of land use

Efficiency of land use for a **crop-production activity** is measured as the gross value-added obtained per unit of land area (GVA/A).

For **livestock production**, gross efficiency of land use is measured as the gross value-added obtained annually per unit of main forage area (MFA) (GVA/MFA/year). The main forage area is the area intended mainly for forage production (area grazed or harvested with a view to future feeding). It therefore does not include the secondary forage area, which is made up of plots where only part of the production is intended for feed (crop residues). While this indicator is useful in some situations, it is of no use in others. It is not useful, for example, in cases where there is no MFA and where herds are fed exclusively with purchased feeds and by-products (straw), or in cases where animals are fed on rangelands shared with other users.

Agroecology is likely to have a positive impact on the efficiency of land use if it leads to higher yields or lower input costs. If yields fall, however, agroecology may result in less efficient land use.

3. Gross daily labour productivity

Gross daily labour productivity is measured as gross value-added per day of work (WD) devoted to the activity (GVA/WD). Its calculation therefore requires identifying all the labour devoted to the activity during the year. For livestock production, labour devoted to the herd must be included as well as labour devoted to the main forage area.

Agroecology may have a positive or negative effect on this indicator, depending on the relative importance of the effects in terms of value-added and labour.

4. Zootechnical efficiency

A livestock-production activity's performance may be evaluated by calculating the annual gross value-added per animal head (GVA/head/year) or per animal unit (GVA/AU/year). Using animal units makes it possible to convert different types of animals (cattle of different ages, small ruminants) to an adult-cow equivalent (one adult cow = one animal unit) using equivalences.

Calculating animal units

In a given region, an animal unit corresponds to one adult cow. It is important to note that food requirements may differ greatly from region to region depending on the breed and physiological characteristics of the animals. There are different methods for estimating animal units. Table 5.2 presents average figures for each general category of animal.

Table 5.2. Figures expressed in animal units for different categories of livestock animals.

Animal category	Number of animal units (AU)
Adult cow	1
Heifer or male, 24 to 36 months old	0.80
Heifer or male, 12 to 24 months old	0.60
Calf less than 12 months old	0.25
Bull or steer, average size	1.50
Bull or steer, large size	2
Goat	0.18
Ewe	0.14
Horse	1
Mule	0.70
Pig	0.20
Poultry	0.01

For more information, see Benoit and Veysset, 2021, p. 3.

Calculating net value-added

Net value-added – i.e. value-added after deducting depreciation of equipment, infrastructure and plantations – is generally not calculated for each crop- and livestock-production activity, but directly for the entire agricultural production system. When a piece of equipment or infrastructure (e.g. a building or fence) is used for several activities, it is not necessarily relevant to allocate a portion of depreciation to a specific activity. In other cases, dividing the total depreciation for a piece of equipment (e.g. tractor or cart) between several activities requires estimating the amount of time it was used for each activity, which can be quite tedious. In certain situations, however, it seems justified to do this and to provide the means of calculating the net value-added for each activity. Allocating annual depreciation to specific activities also seems justified for equipment or infrastructure that is specific to the activity in question, for instance milking equipment for a dairy-farming enterprise. Likewise, depreciation of a plantation may be allocated to the crop-production activity in question if one wishes to calculate the net value-added of that plantation. The method for calculating

depreciation is presented in [Evaluation Sheet 9](#), Economic performance from the farmer's point of view (agricultural production system).

If one wishes to calculate the net value-added of different activities, it is necessary to ensure that all of the depreciations can be allocated to the different activities.

If calculating net value-added, it is possible to calculate:

- net daily labour productivity, by dividing the net value-added by the number of days of work used for the activity (NVA/WD). For livestock production, labour devoted to the main forage area must be included;
- net efficiency of land use, by dividing the net value-added by the land area used for the activity (NVA/A and NVA/MFA/year for livestock production).

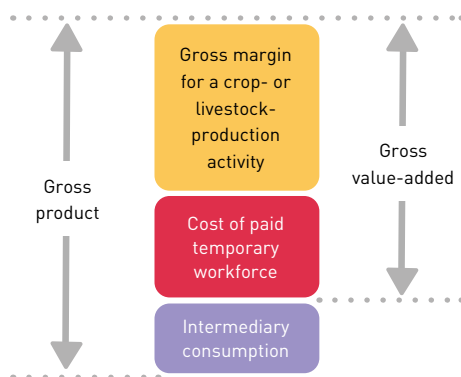
5. Profitability of agricultural and livestock-production activities

The profitability of an agricultural or livestock-production activity from the farmer's point of view is evaluated using gross margin (GM). Unlike gross value-added, gross margin does not represent creation of wealth, but rather the portion of value-added that goes to the farmer after deducting the remuneration of the paid temporary workforce. Calculating gross margin is therefore particularly relevant for farmers who use paid temporary workers.

It is calculated as follows:

$$\text{GM} = \text{GVA} - \text{cost of paid temporary workforce}$$

Figure 5.5. Calculation of gross margin for an agricultural or livestock-production activity.



It is then possible to calculate:

- the gross profitability of a crop- or livestock-production activity per unit of land area, i.e. the gross margin obtained for each unit of land area used (GM/A/year and GM/MFA/year for livestock production);
- the gross profitability of a crop- or livestock-production activity per day of family work, i.e. the gross margin obtained for each day of family work (GM/WDfam).

Calculating net margin

If net value-added (NVA) is also calculated for each activity, it is possible to calculate net margin (NM) by subtracting the cost of paid temporary workforce (WF_{paidtemp}) from the net value-added. So:

$$NM = NVA - WF_{paidtemp}$$

It is then possible to calculate:

- the net profitability of the activity per unit of land area, by dividing the net margin by the land area used (NM/A/year and NM/MFA/year for livestock production);
- the net profitability of the activity per day of family work, by dividing the net margin by the number of days of family work used for the activity (NM/WD_{fam}).

Two other possible intermediate evaluations

Between the economic evaluation of each crop-production activity and the economic evaluation of the entire agricultural production system, it is also possible to conduct two other intermediate evaluations, which, in the interest of simplification, are not presented in this guide. They are:

- economic evaluation of all the crop-production activities carried out on a particular plot (or group of plots) over the course of a year. This makes it possible to take into account the existence of several cropping cycles over the course of the same year;
- economic evaluation of each cropping system, which involves:
 - prior identification of the cropping system's characteristic crop succession (e.g. sorghum-beans association in year 1; groundnuts and vegetable catch crop in year 2),
 - evaluating, for each year of succession cropping, the economic performance of all the crop cycles grown during the year on the plot or group of plots,
 - calculating an average for the different years of succession cropping.

4. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

In the case of an evaluation conducted as part of a monitoring-and-evaluation system, annual monitoring is carried out only for crop- and livestock-production activities that are affected by the implementation of agroecological practices.

5. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

The economic evaluation is relatively complex. It requires a good understanding of the indicators and their meaning, and rigorous collection of data from farmers.

Further reading

- Cochet H., 2016, *Comparative Agriculture*, Éditions Quæ/Springer, 168 p.
- Cochet H., Devienne S., 2006. Fonctionnement et performances économiques des systèmes de production agricole : une démarche à l'échelle régionale. *Cahiers Agricultures*, 15 (6), 578-583.
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Economic performance from the farmer's point of view (agricultural production system)

Definition

The economic performance of the agricultural production system from the farmer's point of view includes:

- the technical and economic efficiency of the production system (value-added per unit of the type of production factor used);
- its profitability (agricultural income per unit of the type of production factor used).

The evaluation of the effects of agroecology on the economic performance of the agricultural production system from the farmer's point of view is an essential component of the evaluation. The farm's production of economic wealth (value-added) and agricultural income are essential elements for the farmer. Given the unified management of the agricultural production system, it is at this global level that the evaluation makes the most sense (as opposed to a single activity).

Because of the central role of agriculture in the economic and social development, food security and environmental preservation of most rural territories and countries, this evaluation is also relevant from the point of view of communities and the national public interest. The wealth created by a farm (value-added) measures that farm's contribution to the creation of value in a territory or in the country. The way in which value-added is distributed and the way in which income is created determine the ability of the agricultural population of the territory or country to improve its standard of living, invest, create jobs and indirectly stimulate the development of other economic activities.

More specifically:

- the evaluation of annual agricultural labour productivity (NVA/ALU) and efficiency of land use ($NVA/UFA/year$) is essential for comparing and analysing the economic performance of production systems with varying degrees of agroecologisation. The other criteria based on value-added provide additional elements of analysis;
- for all peasant or family farms where family workforce constitutes most of the labour used, the evaluation of remuneration of family labour ($AI/FALU$) is essential for comparing the relative usefulness of systems with varying degrees of agroecologisation from the farmer's point of view. The various criteria relating to the generation of agricultural income (distribution of value-added, constitutive elements of agricultural income), and the profitability of land use ($AI/UFA/year$), make it possible to analyse and therefore explain the differences in income;
- the profitability of capital advanced (AI/K) is a criterion that is specific to capitalist farms, where the workforce is for the most part paid;

- the graphic representation of agricultural income per family worker for different types of farms – and different individual farms – depending on the availability of land per family worker is useful for interpreting their economic situation, particularly with respect to the extreme poverty threshold;
- regularity of agricultural income is an important criterion in all contexts where there is high variability in yields or in market prices, and where farmers are looking to minimise risks.

The evaluation of the effects of agroecology on the economic performance of the agricultural production system from the farmer's point of view is conducted in one-off evaluations as part of the in-depth case studies of farms (see [Chapter 2](#), Stage 2b) and in monitoring-and-evaluation systems (see [Chapter 3](#)).

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Technical and economic efficiency of the agricultural production system	Creation of wealth	Net value-added (NVA)	Farm	Average
	Annual labour productivity	Net value-added per agricultural labour unit (NVA/ALU)	Farm	Average
	Daily labour productivity	Net value-added per day of work (NVA/WD)	Farm	Average
	Efficiency of land use	Net value-added per unit of land area (NVA/UFA)	Farm	Average
	Efficiency of the use of capital consumed	$NVA \div (\text{intermediary consumption (IC)} + \text{depreciations (d)})$	Farm	Average
Generation of agricultural income and remuneration of family work	Distribution of value-added	Distribution (%) of net value-added: -rents -interest on loans, taxes and levies -remuneration of paid workforce -family agricultural income	Farm	Average
	Generation of agricultural income	Constitutive elements of agricultural income (%): portion of agricultural value-added, direct subsidies	Farm	Average
	Remuneration of family workforce	Agricultural income per family agricultural labour unit (AI/FALU)	Farm	Average

Criteria and sub-criteria		Indicators	Scale	Technicity
Profitability of land use and capital	Profitability of land use	Agricultural income per unit of land area (AI/UFA)	Farm	Average
	Rate of profit	Agricultural income per unit of capital advanced (AI/K)	Farm	Average
Graphic representation and interpretation of agricultural income	Graphic representation of agricultural income per family worker based on land area per family worker	Function and graphic visualisation	Farm	Average
	Situation of agricultural income in relation to certain income thresholds	Comparison and graphic visualisation	Farm	Average
Regularity of agricultural income		Deviations between income in an average, good, and bad year	Farm	Average
		Risk of generating income below the extreme poverty threshold	Farm	Average

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

 For the economic calculation, the evaluator may use the Excel spreadsheet for automated calculation and its user manual, which are proposed as a supplement to this guide and presented in **Tool Sheet 7**.

The evaluation of the economic performance of the agricultural production system is partly based on the economic evaluation of each of the different crop- and livestock-production activities, the procedure of which was presented in [Evaluation Sheet 8](#). Additional steps, however, are necessary.

1. Technical and economic efficiency of the agricultural production system

Creation of wealth

The net value-added of the agricultural production system (NVA_{PS}) represents the annual creation of wealth obtained through this system. Before calculating it, it is

necessary to calculate the gross product (GP_{PS}), gross value-added (GVA_{PS}) and depreciation (d) of equipment, infrastructure and plantations.

Gross product

The gross product of the agricultural production system (GP_{PS}) represents the annual economic value of the final output, i.e. excluding production intended for other activities in the system, which comprises intra-unit consumption (straw for animal feed, manure for fertilisation of agricultural plots, etc.). It is calculated by adding up the gross products of each crop- and livestock-production activity, and then subtracting production for use within the production system (intra-unit consumption). The formula is therefore:

$$GP_{PS} = \sum (GP_{\text{Crop- and livestock-production activities}}) - \sum (\text{intra-unit consumption})$$

Important

Do not forget on-farm consumption

The gross product of the production system includes production consumed by the farmer and his/her family (on-farm consumption), as it is a final output of the agricultural production system. While the family is part of the farm, they are not part of the agricultural production system per se.

Gross value-added

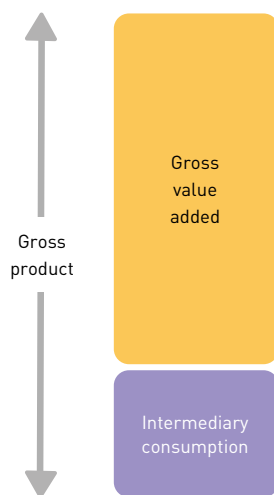
The production system's gross value-added (GVA_{PS}) is the gross value generated by all of its productive activities. This figure is obtained by subtracting intermediary consumption acquired outside the production system (IC_{PS}), which comprises inputs and services (equipment rental, electricity, etc.), from the gross product of the production system. It is calculated as follows:

$$GVA_{PS} = GP_{PS} - IC_{PS}$$

If the economic calculation has been made for each crop- and livestock-production activity (see [Evaluation Sheet 8](#), Economic performance from the farmer's point of view – crop- and livestock-production activities), the production system's gross value-added may be calculated more directly by adding up the gross value-added of each activity and subtracting intermediary consumption not specifically allocated to these activities (unallocated IC: small equipment, electricity, etc.). It is calculated as follows:

$$GVA_{PS} = \sum (GVA_{\text{Crop- and livestock-production activities}}) - \text{Unallocated IC}$$

Figure 5.6 Calculation of gross value-added for the agricultural production system.



Depreciation

Depreciation of equipment, infrastructure and plantations corresponds to their “use” or loss of value over the course of the year. The term *depreciation*¹ is synonymous with “annual consumption of fixed capital”. For equipment (all equipment, machines and tools with the exception of small equipment re-purchased every year, which is regarded as inputs) and infrastructure (fence, building, etc.), annual depreciation (d) is calculated based on the equipment’s purchase value (value when new, V_n), the number of years of useful life (n) and the value at the end of its useful life, which is also referred to as its residual value (V_{res}).

“Useful life” corresponds to the duration during which it is considered that the equipment or infrastructure may be used without generating significant maintenance and repair costs.

It is often considered to have residual value, which corresponds to the fact that it can still be used for a number of years, paying larger maintenance and repair costs, or that it can be sold or reused for other purposes (recovery of wood, spare parts, etc.).

The following formula is used to calculate annual depreciation:

$$d = (V_n - V_{res}) \div n$$

It is sometimes pertinent to calculate depreciation of a plantation during its production phase, which corresponds to its useful life (n). In this case, the initial value of the

¹ Depreciation must not be confused with accounting amortisation, which is calculated in reference to current tax and accounting rules without taking into account the actual duration of equipment.

plantation (V_n , in reality its value at the start of the production phase) is calculated by adding up all of the production costs incurred during the phase of setting up and developing the plantation, before it starts to produce. However, in the case of a regularly renewed plantation – i.e. when part of the plantation (the part that has reached the end of its useful life) is cut down each year and replanted with new trees – depreciation is not calculated. The depreciation of the overall plantation is compensated by annual renewal of one of its parts.

In general, animals are not depreciated. Any change (positive or negative) in the value of an animal is already reflected in the change in inventory value (ΔINV). In specific cases (particularly draught animals and breeding stock), the calculation of annual depreciation may be justified for calculating the change in the animals' value during the year.

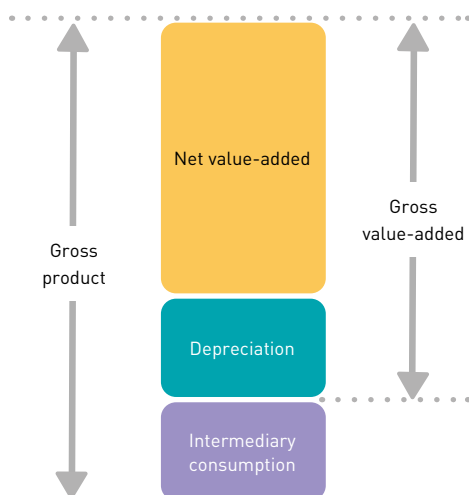
It should be noted that depreciation is generally calculated for the entire agricultural production system and not for each crop- or livestock-production activity, as equipment is shared among different activities, and it is difficult (sometimes impossible) to allocate a portion of depreciation to a specific activity. However, calculation of depreciation for a specific activity may sometimes be justified if the equipment is specific to the activity (milking equipment for dairy farming, hives for beekeeping, etc.). This is also the case for depreciation of a plantation, which is by nature specific to an activity.

Net value-added

The production system's net value-added (NVA_{ps}) is calculated by subtracting total depreciation (d) from gross value-added. It is calculated as follows:

$$NVA_{ps} = GVA_{ps} - d$$

Figure 5.7. Calculation of net value-added for the agricultural production system.



● Annual labour productivity

The annual labour productivity for the entire agricultural production system (NVA_{ps}/ALU) is measured through the production system's net value-added (NVA_{ps}) per agricultural worker or agricultural labour unit (ALU). An agricultural worker represents a person who is fully available all year round for the farm's agricultural activities, and may be a family worker or a paid permanent worker. Fractions of ALUs may be used to account for family workers who are available only part of the time (partial availability) or who have limited efficiency (e.g. work carried out by children for the harvest). The decision as to which ALUs to take into account must be made on a case-by-case basis (work carried out by children, work carried out by older people, notion of availability for agricultural activities). In some cases, it may be useful to make several calculations for each of the different possible choices.

● Daily labour productivity

The daily labour productivity of the agricultural production system (NVA_{ps}/WD) is measured by dividing the production system's net value-added (NVA_{ps}) by the number of days of agricultural work (WD), including work carried out by family workers and paid workers (permanent and temporary). It is necessary therefore to take into account all labour for the different crop- and livestock-production activities, including "transversal" labour on the farm (maintenance and repairs, etc.).

● Efficiency of land use

The efficiency of land use for the agricultural production system (NVA_{ps}/UFA) is measured by dividing the production system's annual net value-added (NVA_{ps}) by the land area actually used by the farm (useful farming area, UFA).

● Efficiency of the use of operating capital consumed

The efficiency of the use of operating capital consumed within the agricultural production system ($NVA_{ps} \div (IC + d) = NVA_{ps} \div OC$) is measured by dividing the net value-added of the production system (NVA_{ps}) by each unit of operating capital consumed (OC) in the year (intermediary consumption, or "IC", and depreciation, or "d").

● Overall autonomy of the production system

The overall autonomy of the production system may be evaluated by calculating the portion of gross product corresponding to the net value-added ($NVA_{ps} \div GP_{ps}$), expressed as a percentage. The degree of autonomy is:

- a characteristic of the production system. Autonomy is one of the principles of agroecology. This is why the degree of autonomy is one of the sub-criteria used to calculate the agroecology-score (see [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms);
- a criterion of economic performance for the production system. It is directly linked to the net efficiency of the operating capital consumed: the more efficient it is, the more autonomous the production system is.

2. Generation of agricultural income and remuneration of family work

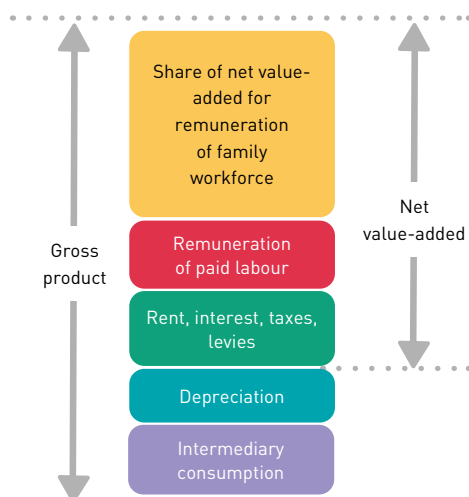
● Distribution of net value-added

Net agricultural value-added is distributed between:

- payment of rent, interest, taxes and levies;
- remuneration of paid workforce;
- remuneration of family workforce. In the absence of subsidies, this corresponds to agricultural income (AI, see below).

Each portion can be calculated in absolute value and in relative value (% of NVA).

Figure 5.8. Distribution of net value-added.



● Make-up of agricultural income

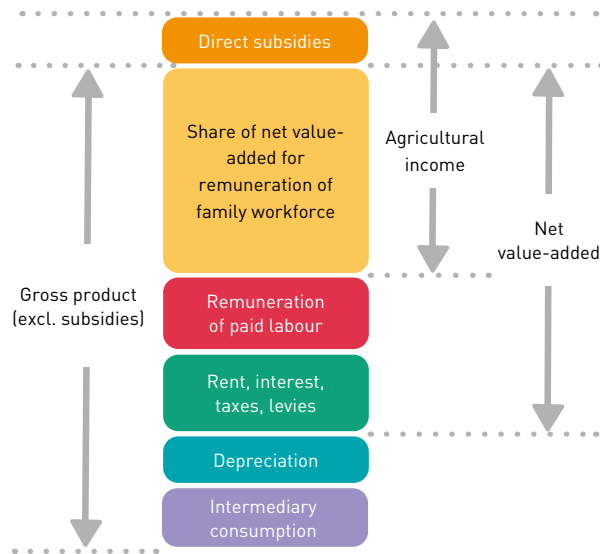
Agricultural income (AI) is made up of the portion of net value-added for remuneration of family workforce and direct agricultural subsidies received.

Remuneration of family workforce

Remuneration of family agricultural labour (AI/FALU) is calculated by dividing agricultural income by the number of family workers or family agricultural labour units (FALU). A family agricultural worker represents a person from the family who is fully available all year round for the farm's agricultural activities. As mentioned previously, fractions of FALUs may be used for family workers who are available only part of the time or who have limited efficiency (e.g. work carried out by children for the harvest).

If part of the family income comes from extra-agricultural activities, it is pertinent to also calculate the family's total income (TI), the agricultural activity's contribution to the total income (AI/TI, expressed as a %) and the total income per family worker (TI/FLU, where FLU = family labour unit, including agricultural workers and workers involved in extra-agricultural activities).

Figure 5.9. Make-up of agricultural income.



3. Profitability of land use and capital

● Annual profitability of land use

The annual profitability of land use for the agricultural production system (AI/UFA) is measured through agricultural income per unit of land area actually used by the farm (UFA).

● Annual profitability of capital

On family farms, agricultural income remunerates the family workforce. Capitalist farms, however, are different. On capitalist farms, agricultural income remunerates the shareholder(s). Profitability of capital is therefore a performance criterion for capitalist farms. Several indicators – some of which we will not expand on here – may be used to calculate annual profitability of capital. An initial simple calculation consists of comparing agricultural income quantitatively to the overall value of capital advanced in production by the shareholder or shareholders (K): cost of purchase of agricultural land if the company owns it; value of equipment, infrastructure, animals and plantations at start of year; monetary costs for purchase of intermediary consumption, payment of rent, interest and taxes, and remuneration of paid workforce. In this way it is possible to calculate the annual profitability of capital, or rate of annual profit, as a percentage using the following formula: $AI \div K \times 100$.

It should be noted that, in the case of rapid rotation of capital during the year (several production cycles), all of the monetary costs are not necessarily advanced because some of these may be covered by revenue generated by the company during the year.

4. Regularity of agricultural income

From the evaluation of crop yields and yield regularity (see [Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders), it is possible to calculate the agricultural income of the typical farm not only in an average year, but also in a good or bad year. It is important, however, to take into account the fact that a bad year does not necessarily affect all crops on the farm in the same way. It is also possible to estimate the probability of income being below the simple reproduction threshold, and thus leading to extreme poverty (failure to meet basic social needs) and decapitalisation of the farm.

Focus

Portion of income managed by women

The portion of the farm's agricultural income and total income managed by women is an indicator of how empowered women are. A large portion of the income managed by women may also have a positive impact on the family's food security, if it means that a larger portion of income is devoted to food and to a selection of higher-quality products (see [Evaluation Sheet 14](#), Food security). Estimating the portion of income managed by women requires asking specific questions about who decides how the farm's income is used. Situations may vary greatly: all income managed by men, all income managed by women, income from certain specific activities managed by women, etc.

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

In a monitoring-and-evaluation system, annual monitoring may be simplified:

- by conducting the detailed economic calculation only for crops and livestock-production activities affected by the implementation of agroecological practices;
- by calculating, at farm level, only value-added and agricultural income per family worker and per unit of land area. This farm-level evaluation is not always necessary for each year of monitoring.

For the final evaluation, however, it is important to use all of the indicators from the initial evaluation.

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

The economic evaluation is relatively complex. It requires a good understanding of the indicators and their meaning, and rigorous collection of data from farmers.

Further reading

- Cochet H., 2016, *Comparative Agriculture*, Éditions Quæ/Springer, 168 p.
- Cochet H., Devienne S., 2006. Fonctionnement et performances économiques des systèmes de production agricole : *une démarche à l'échelle régionale*. *Cahiers Agricultures*, 15 (6), 578-583.
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Value chains and organisation of trade

Definition

A value chain comprises all the activities and processes carried out by various interconnected economic operators, from production of raw materials, marketing and storage, to preservation, processing, transport and distribution to end users. In agriculture, there are downstream value chains, which cover agricultural production through final distribution of products, and upstream value chains, which cover the manufacture of production resources (equipment and inputs) through their use in agricultural production.

Organisation of trade comprises all the stakeholders, activities and operating and decision-making rules that make it possible to market agricultural products.

The effects of agroecology on value chains and the organisation of trade may be felt upstream (manufacture of production resources) and downstream (marketing, storage, preservation, processing, packaging, transport and distribution of products) of agricultural production: creation of new market outlets, new value chains, value-added, income and jobs; distribution of value-added; organisation of value chains; farmer participation and influence in decision-making. Evaluating the effects of agroecology on value chains and the organisation of trade is pertinent from the farmer's point of view, as changes in value chains and the organisation of trade may impact farmers (positively or negatively). Apart from the effects felt by farmers, and because of the potential impacts on the development of territories and the national economy, this evaluation may also be pertinent from the point of view of communities and the public interest.

The evaluation of the effects of agroecology on the number of market outlets for farmers may be conducted for a one-off evaluation, as part of the in-depth case studies of farms (see [Chapter 2](#), Stage 2b). For a more thorough evaluation of the effects on value chains and the organisation of trade, a specific study must be conducted including individual interviews with the main stakeholders in question, during Stage 2d, Complementary approaches in the territory, of the one-off evaluation. The evaluation may also be useful in the initial and final evaluations of a monitoring-and-evaluation system for an intervention that aims to bring about changes in value chains (see [Chapter 3](#), General approach for monitoring and evaluation).

Important

The importance of social dynamics with respect to change

Changes in value chains often result not so much from the development of agro-ecological practices and systems as from social dynamics (organisation of producers, participation in value chains, etc.) that support and enable that development.

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria	Indicators	Scale	Technicity
Market outlets for farmers	Number of market outlets	Farm	Low
Development and functioning of value chains	Number of value chains (agricultural products and supplies)	Value chain	Low
	Stakeholders involved, technical operations, market outlets, decision-making and regulation mechanisms	Value chain	Average
	Role and influence of farmers in decision-making mechanisms	Value chain	Average
Creation of wealth and jobs	Turnover, value-added in value chains, employment and distribution of value-added	Value chain	High

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

1. Market outlets for farmers

The focus here is on the produce sold and the diversity of market outlets for farmers (direct sales on the farm, at the client's premises or at markets; sale to retailers, wholesalers or processors). Having a diverse range of market outlets ensures a certain degree of security against uncertainties linked to relationships with operators and to price volatility. Agroecological practices and systems may enable diversification of market outlets because of the existence of new products, the possibility of highlighting the agroecological nature of production (signs of recognition, higher prices) or new forms of organisation implemented in connection with the development of agroecology. Farmers' market outlets are first identified during the interviews on the situation in the territory (see [Chapter 2](#), General approach for one-off evaluations, Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory), and then during the case studies of farms (see [Chapter 2](#), Stage 2b).

2. Development and functioning of value chains

Apart from the number of market outlets for farmers, the development of agroecological systems and practices may be accompanied by the development of new value chains resulting from:

- the existence of new products;
- the promotion of the distinctiveness of agroecological products (signs of recognition, unique market outlets);
- the existence of new means of production (equipment and inputs) that are specific to agroecological production;

- the implementation of new forms of organisation linked to the development of agroecology.

These emerging value chains may include new processing activities, new distribution channels (including short value chains) and new consumption markets (local, regional, national, international).

Because of the existence of new forms of organisation implemented in relation to the development of agroecology, existing value chains may also experience changes relating to the stakeholders involved, technical operations, market outlets, and decision-making and regulation mechanisms concerning volumes, product quality, prices, relationships between stakeholders and contractualisation.

Focus will be placed in particular on the way farmers are organised within value chains and their capacity to take action and influence product prices and how value chains function.

To evaluate how the development of agroecological practices and systems affects value chains, an additional simplified study of the value chains in question needs to be conducted.

3. Creation of wealth and jobs

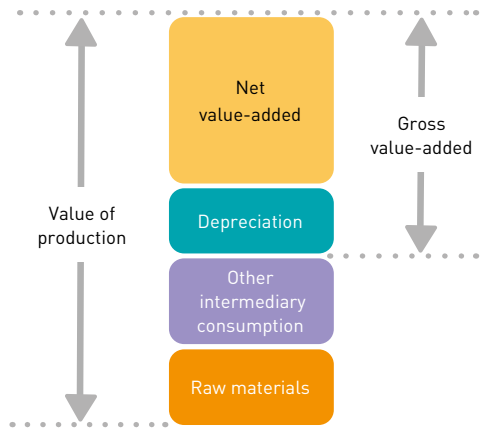
Development and changes within value chains may lead to evolutions in terms of creation of wealth and jobs: overall turnover, overall value-added, employment and distribution of value-added between stakeholders (farmers' income, remuneration of paid workers, other stakeholders' margins).

To calculate the annual overall value-added, it is necessary to calculate the value-added at each level of the value chain (collection, processing, storage, preservation, transport, distribution), and then add up the values obtained. Calculation of value-added at a given level of the value chain is based on the same principles as calculation of value-added at agricultural-production level, taking into account the fact that for the downstream value chain intermediary consumption consist largely of raw materials, i.e. the agricultural product or a product generated by processing an agricultural product (see Figure 5.10).

Reconstitution of a simplified annual operating account for each stakeholder in the value chain is therefore recommended. Value-added may then be adjusted to a product unit (e.g. for a litre of milk). By including the different levels of the value chain, it is then possible to calculate the overall value-added per product unit. In the case of processed products, care will be taken to use conversion coefficients. For example, if 5 litres of milk are needed to produce 1 kg of cheese, one may decide to adjust all of the calculations to the litre of milk. If the precise value-added generated within the value chain is unknown, it is possible to calculate the ratio between the purchase price and the sale price of the product for each level of the value chain

With regard to the distribution of value-added, it is necessary, at each level of the value chain, to determine the portion of value-added used for remuneration of paid labour, the portion paid in levies (rent, interest, VAT, tax on profits, etc.) and the portion making up net income (after payment of the company's taxes) (see Figure 5.11).

Figure 5.10. Value-added at a particular level of the value chain.



When VAT is applied at different levels of the value chain, care should be taken not to record it several times. Therefore, for each level, only VAT paid by the company to the State must be recorded, i.e. the difference between VAT received by the company for the sale of a product and VAT paid by the company (VAT included in the purchase price of the raw material, other intermediary consumption and equipment).

Figure 5.11. Distribution of value-added at a particular level of the value chain.

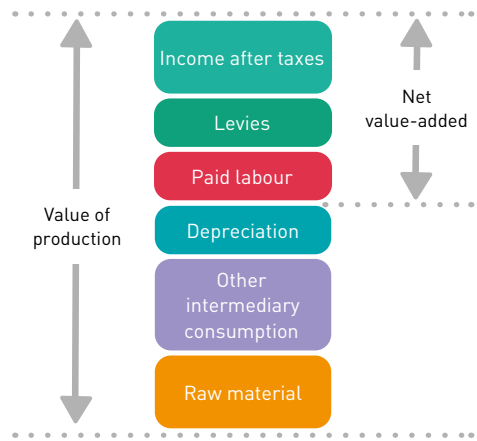


Figure 5.12 gives an example of creation and distribution of value-added throughout a value chain.

To evaluate the effects of the development of agroecological practices and systems on the creation of value-added and jobs, and on the distribution of value-added in value chains, a more in-depth additional study of the value chains in question needs to be conducted, in particular with individual interviews with the main stakeholders

or a sample of different types of stakeholders. The purpose is to identify prices at the different stages of the value chain (purchase price from the farmer to sale price to the consumer) and evaluate the creation and distribution of value-added at each stage by reconstituting the essential components of the operating account for each stakeholder, as illustrated in figures 5.11 and 5.12. Care should be taken to ensure that all of the effects, including those affecting the destruction of value-added, are taken into account. In this way, if the creation of a new value chain leads to a decrease in volume of activity in another value chain (or to its disappearance), the net value-added resulting from the change will be obtained by subtracting the value-added destroyed from the value-added of the new value chain. Moreover, the comprehensive economic evaluation from the community's point of view includes additional stages, particularly an estimate of the creation of value-added in the manufacture of production resources used (equipment, intermediary consumption) and the opportunity costs of the various factors of production (labour, production resources), i.e. loss of value-added related to abandonment of their former use.

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

More in-depth evaluation of value chains is only conducted at the beginning and at the end of an intervention. A lighter evaluation of the changes that occurred may, however, be conducted as part of monitoring (particularly change in the number of market outlets and in the prices paid to farmers).

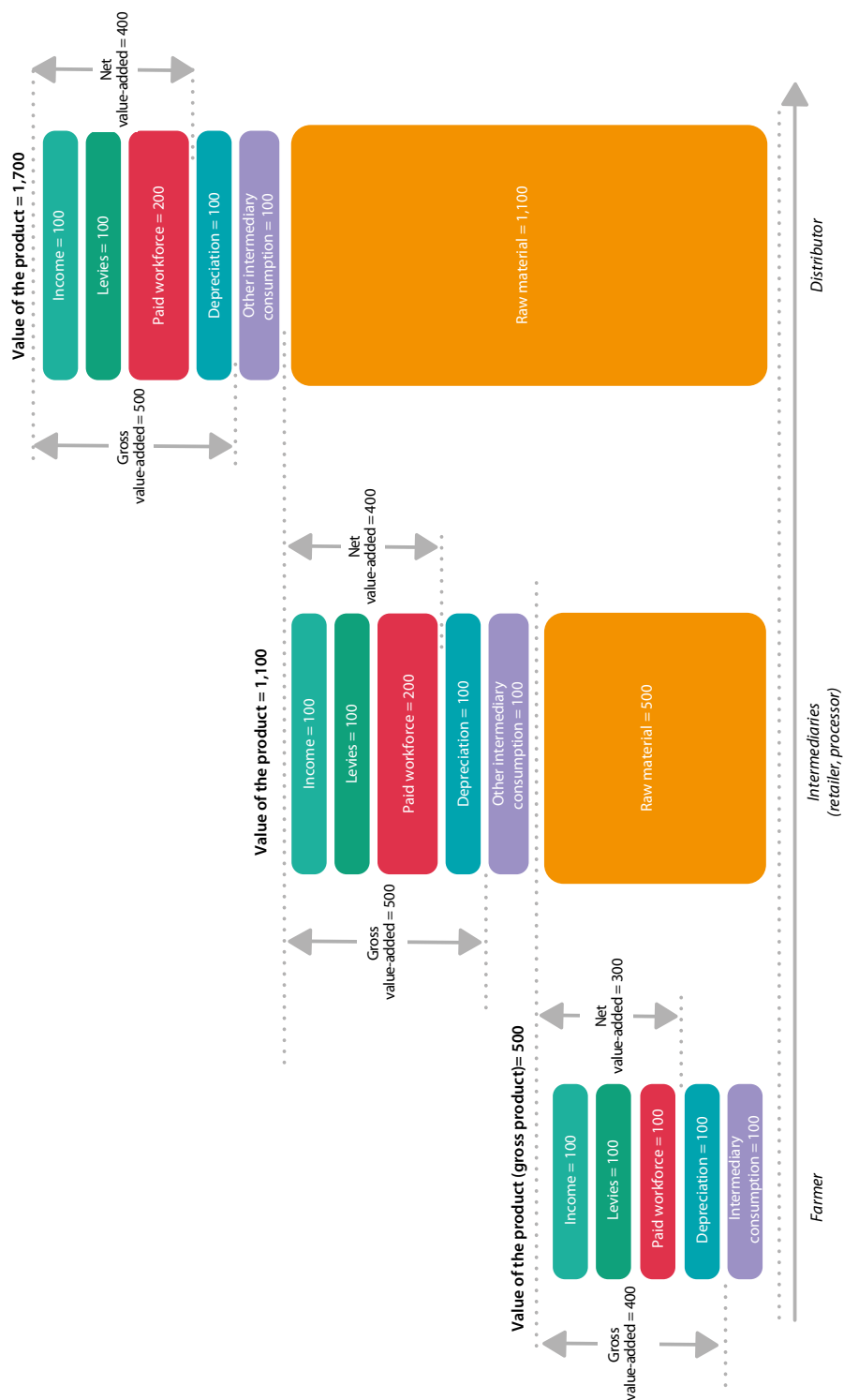
4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

The evaluation of the effects of agroecology on the number of market outlets may be conducted simply during the general interviews and case studies of farms. For the other aspects of the evaluation (development and functioning of value chains, creation of wealth and jobs), a specific study relating to existing value chains (agricultural products and potentially supplies) needs to be conducted. This study requires a certain degree of technicity. Analysis of the creation and distribution of value-added within a value chain is data that is generally complex to obtain. It is easier to simply identify sale and purchase prices at the different stages of the value chain.

Further reading

Springer-Heinze A., 2018. *ValueLinks 2.0, Manual on Sustainable Value Chain Development*, GIZ, 365 p. <https://www.valuelinks.org/material/manual/ValueLinks-Manual-2.0-Vol-1-January-2018.pdf>

Figure 5.12. Creation and distribution of net value-added throughout the value chain.





Attractiveness of agriculture for young people

Definition

The attractiveness of agriculture for young people is linked to all of the economic, social and cultural factors that determine whether or not young people want to continue to live and work on the family farm, and ultimately take over the farm, or set up their own operation. It is particularly linked to prospects for personal development and, ultimately, to young people's feeling of well-being.

Young people may have other opportunities and prospects for jobs and income than those offered by agriculture, and this may mean that some of them do not wish to continue to live and work on the family farm or set up their own operation. The attractiveness of agriculture and the well-being of young people are therefore important. Agroecology may have an influence on the attractiveness of agriculture, depending on the amount of income that can be generated. Agroecology is also likely to make agriculture more attractive if it leads to lower health risks linked to the use of pesticides, and if it helps create social bonds and gives meaning to agricultural work. Agroecology often favours the sustainability of agricultural practices, both environmentally and for the community. By strengthening the economic and social viability of farms, agroecology favours the transferability of farms from one generation to the next. But the effects on the attractiveness of agriculture for young people may, on the contrary, be negative if the implementation of agroecological practices and systems is perceived as entailing more intense or arduous work, excessively high investment, lower income or greater risks.

It is pertinent to evaluate the attractiveness of agriculture for young people from the family's point of view, as well as from the point of view of the community and the overall public interest, in so far as it is a determining factor for the future economic activity and for job retention and creation in rural territories. This evaluation is therefore useful in contexts where young people do not want to take over the family farm and where there is a real risk of declining agricultural activity, social crisis, rising under-employment and unemployment, and rural exodus. This is particularly the case in rural territories that offer few employment opportunities outside the agricultural sector.

The evaluation of the effect of agroecology on the attractiveness of agriculture for young people is useful in a one-off evaluation as part of the in-depth case studies of farms (see [Chapter 2](#), Stage 2b) or in complementary group interviews with young people (see [Chapter 2](#), Stage 2d, Complementary approaches in the territory). Specific interviews may be organised with groups of young women if one wishes to more specifically evaluate the attractiveness of agriculture from their point of view. The evaluation may also be pertinent for the initial evaluation and final evaluation of a monitoring-and-evaluation system (see [Chapter 3](#)).

Important

Possible differences based on gender

The attractiveness of agriculture for young people and their feeling of well-being may vary by gender, revealing the existence of inequalities between men and women. An approach that makes it possible to differentiate the situation by the gender of the people interviewed is therefore often very useful.

The proposed method is largely inspired by the work carried out in France by FADEAR (Associative Federation for the Development of Agricultural and Rural Employment) with groups of farmers.

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria	Indicators	Scale	Technicity
Economic viability	<i>Agricultural income in relation to satisfaction of social needs and other income opportunities – Evaluation Sheet 9</i>	Farm	Average
	Evolution and development prospects, and young people's plans	Farm	Low
Liveability on the farm	Length of work days	Farm	Low
	Number of rest days in the year	Farm	Low
	Feeling of fulfilment or arduousness of work	Farm	Low
	Empowerment of young people vis-à-vis their elders	Farm	Average
	Access to essential services and social life	Farm	Low
Security	Estimate of one's own security vis-à-vis land tenure (and water in the case of an irrigated system)	Farm Territory	Low

The indicator in italics is from a different evaluation sheet.

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

1. Economic viability

The attractiveness of agriculture for young people depends a lot on its economic attractiveness and on the sector's ability to create value-added and decent income for farmers so that they can provide for their own needs and their family's needs.

● Agricultural income in relation to satisfaction of social needs and other income opportunities

The level of agricultural income per family agricultural worker (AI/FALU) and total income per family worker (TI/FLU) in relation to the reproduction threshold makes it possible to assess the extent to which the agricultural activity and all the farm's activities make it possible to provide for basic social needs (see [Tool Sheet 5](#), Developing a typology of farms). Comparison with the country's minimum wage and with other income opportunities also makes it possible to assess the relative economic benefit of the agricultural activity.

● Evolution and growth prospects, and young people's plans

The existence of prospects for evolution and growth of the farm, particularly with a view to boosting income, contributes to its attractiveness and therefore to transferability. These prospects depend on both the farm's resources and its socio-economic environment. It can be assessed qualitatively by questioning farmers, and more specifically young people, on what they think of the prospects for boosting income (no prospects, limited prospects, strong prospects). It is desirable to also address the question of their plans: Do they ultimately plan to remain on the family farm (or their in-laws' farm)? Why? Is this a free choice or a compelled choice (particularly for young women)? If they intend to leave, what are their plans? If the decision has not yet been made, what are the deciding factors that would influence their decision?

2. Liveability on the farm

"Liveability" is a relatively complex concept to evaluate. Income alone does not determine an economic activity's quality or liveability. Liveability is based on both quantitative and qualitative criteria, taking into account the perceptions of stakeholders themselves.

● Length of the work day

Workload is an essential element of the farm's liveability. The length of the work day is an important component of the workload.

This question must be asked differently to the men and women on the farm, who often perform different tasks. It is easy to define a typical day by hour or by period of day with the people interviewed, either individually or in groups. It is useful, moreover, to include social activities and activities linked to domestic tasks (preparing meals, cutting and transporting firewood, caring for children, doing laundry, etc.) in order to understand how the length of the work day affects other tasks, and whether or not it enables people on the farm to have any rest periods during the day. This also helps avoid omissions, as the people interviewed may not mention certain quickly performed tasks that are not considered as work – such as feeding the chickens in the morning and evening – even though these tasks are part of the farm's economic activities.

It is important to ask about the effects of agroecology on the length of the work day, and therefore on how much rest time the farmers have. This information will also be useful for evaluating the conditions necessary for the development of agroecology.

Important

Taking into account several different times of year

It is pertinent to collect information on the length of the work day, and therefore on a typical day at several different times of year. Agricultural work is not constant. There are periods of high activity, and periods of lower activity. A typical day must therefore be evaluated at least twice in the year: a typical day during the period of high workload for agricultural activities (cropping season, birthing season, etc.), and a typical day during periods considered as having a lower level of activity.

Number of rest days in the year

Liveability also depends on the ability to free up time outside of agricultural activities. The number of rest days per week and per year may be estimated.

Feeling of fulfilment or arduousness of work

Arduousness takes into account working hours and the physical difficulty and harshness of the work, as well as the type of work and how it is organised. All of these elements contribute to either greater fulfilment or less fulfilment in the work performed. The members of the farm have their own perception based on their natural and social environment. Arduousness is evaluated based on what the stakeholders themselves say. The following questions may be asked:

- What is the overall level of arduousness of your work?
 - the work is fulfilling,
 - the work is neither arduous nor fulfilling,
 - the work is arduous,
 - the work is very arduous;
- Is the arduousness due to the length of the working hours, the difficulty of the work or the physical harshness of the tasks carried out? If yes, can you name the tasks that are particularly long, difficult or arduous?
- Is the arduousness due to the natural environment in which the work is carried out? What are the aspects of this natural environment that make the tasks arduous?

With regard to the arduousness criteria, the effects of agroecology will depend on how the young people define this term. Perception of arduousness varies greatly from one context to another.

Empowerment of young people vis-à-vis their elders

By creating new modes of social organisation, agroecology may have effects on the empowerment of young people vis-à-vis their elders. Specific interviews (with individuals or groups) with several young people (both men and women) will make

it possible to assess how they perceive their empowerment vis-à-vis their elders. The concept of “elders” varies from one context to another, but it most often designates people who hold authority on the farm or within the community. Empowerment of young people on the farm may include responsibility in managing some of the farm’s activities, direct access to a portion of the farm’s income, and real autonomy in managing that income. Empowerment of young people within the community may include freedom to share their opinions and participation in decision-making within collective organisations, such as farmers’ organisations and collective work groups.

● Access to essential services and social life

Access to essential services (water, energy, health, sanitation, education, etc.) or services that are nowadays considered important (telephone networks, Internet, etc.) is also a factor that has an impact on the attractiveness of farms for young people, and therefore their transferability. The same applies to possibilities for social life (leisure activities, youth associations), which are increasingly important criteria for the attractiveness of agriculture in rural areas for the younger generations. The effects of agroecology on these criteria are indirect: emergence of new forms of social organisation, creation of value-added within the territory, and therefore appearance of new services in the tertiary sector.

3. Security

Security refers in particular to security vis-à-vis land tenure and access to water for irrigated systems. Agroecology does not, a priori, have an impact on security, but it is an important factor to take into account when globally assessing the question of the attractiveness of agriculture for young people. It is possible, for example, that agroecology may improve the attractiveness of agriculture, but still not be enough to offset the lack of attractiveness owing to security problems.

Access to land (and access to water in irrigated systems) has a direct impact on the farm’s viability. The farmer’s capacity to invest and anticipate will depend on this security. The farmer must therefore be asked whether he/she feels a sense of security with respect to these elements. More detail will be sought regarding this question by asking the farmer about the predominant type of occupancy on his/her farm (tenant farmed, private property, collective land, etc.), the level of formalisation (existence of documents, property deeds) and his/her capacity to make decisions about land use.

In irrigated systems, water is a central means of production. The farmer’s sense of security will be estimated in the same way. It will also be necessary to try to characterise how water is accessed (private, collective) and used (existing regulations).

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

The attractiveness of agriculture for young people may be addressed during the initial evaluation and final evaluation. During the analysis of perceptions, particularly

the farmer's fulfilment, particular attention will be given to changes with regard to the baseline situation, and not just his/her immediate perception.

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

Evaluating the effects of agroecology on the attractiveness of agriculture for young people requires low overall technicity. Complementary interviews with young people (especially young women) without parents, elders or other authority figures may, however, be complicated to carry out as part of individual interviews during case studies of farms. That is why complementary group interviews are often recommended.

This evaluation does not require special material resources.

Further reading

Fadear, 2014. *Agriculture paysanne. Le manuel*, 132 p.



Job retention and creation

The agricultural activity may contribute to the retention of jobs for family workers or paid workers, or even to the creation of such jobs. The agricultural models of the Green Revolution often lead to a decrease in jobs in the agricultural sector. Agro-ecological practices and systems, on the other hand, may require more work, and may therefore make it possible to retain jobs in the agricultural sector. It is therefore useful to evaluate the effects of agroecology on the retention and creation of jobs.

Measuring the capacity of the agricultural activity of family farms to provide employment for family members and remunerate family work is pertinent from the farm's point of view. Beyond the family circle, the effects on paid labour (creation of paid jobs, remuneration, arduousness) are pertinent from the point of view of communities and the public interest.

This evaluation is useful in all situations of under-employment where agriculture and other productive activities are not capable of generating enough jobs for the entire population, particularly in rural areas.

Analysis of the farm's work calendar makes it possible to assess the production system's capacity to generate jobs throughout the entire year.

Evaluating the effect of agroecology on job retention and creation may therefore be wise in the case of a one-off evaluation, as part of the in-depth case studies of farms (see [Chapter 2](#), Stage 2b). The evaluation may also be pertinent for the initial evaluation and final evaluation of a monitoring-and-evaluation system (see [Chapter 3](#)).

Important

Possible effects upstream and downstream of production

Jobs may also be created directly or indirectly in value chains upstream and downstream of agricultural production. In the Moroccan commune of Ghassate, for example, the development of agroecological production for a specific market encouraged young people from farms in the area to create their own business collecting and delivering agroecological products to markets and consumers in order to free themselves from collectors and capture some of the value-added created in this new value chain. Creation of these new jobs may vary by gender, so it is useful to differentiate between the situation of men and women when conducting surveys. The creation of jobs upstream and downstream of production is addressed in the evaluation of the effects of agroecology on value chains and the organisation of trade (see [Evaluation Sheet 10](#)).

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria	Indicators	Scale	Technicity
Job retention and creation	<i>Number of working days and total workers per hectare over one year – Evaluation Sheet 9</i>	Farm	Average
	<i>Number of working days and paid workers per hectare over one year – Evaluation Sheet 9</i>	Farm	Average
Use of workforce during the year	Analysis of the annual work calendar	Farm	Average

The indicators in italics are from different evaluation sheets.

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

1. Job retention and creation

It is important to first assess whether agroecology makes it possible to retain or create jobs.

● Number of working days and total workers (family workers and paid workers) per hectare over one year

These indicators make it possible to evaluate the farm's capacity to retain or generate employment. The figures are calculated per unit of land area in order to make it easier to compare situations.

● Number of working days and total paid workers per hectare over one year

These indicators make it possible to evaluate the farm's capacity to create paid employment beyond the family circle. Temporary work is characterised by indicating its periodicity.

2. Use of workforce throughout the year

In addition, reconstitution of the annual work calendar makes it possible to analyse how the workforce is used on the farm and how agroecological practices influence this calendar. The implementation of agroecological practices can have impacts on numerous interventions: decrease of treatments, increase or reduction of weeding time, elimination of ploughing, preparation of fertilisers, type of marketing etc. Do they increase the need of work? Or, on the contrary, do they enable time to be saved or arduousness to be reduced (animal traction, irrigation systems, mechanisation, etc.)? Do they increase the irregularity of the calendar? Or, on the contrary, do they contribute to the creation of jobs during the periods of relative under-employment?

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

The evaluation of the effects of agroecology on job retention and creation may also be incorporated into the initial evaluation and final evaluation of a monitoring-and-evaluation system.

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

The calculation of permanent jobs is relatively simple. The complete reconstitution of the work calendar can, however, be quite laborious in some complex production systems.

Further reading

Devienne S., Garambois N., 2014. La méthode du diagnostic agricole, in Étienne M. (coord.), *Élevages et territoires. Concepts, méthodes, outils*, Inra FormaSciences, 97-108.

Diepart J.-C., Allaverdian C., 2018. *Farming systems analysis. A guidebook for researchers and development practitioners in Myanmar*, Yangon, Gret-Yezin Agricultural University.



Autonomy

This evaluation sheet is largely based on Fadear's family-farming manual (Fadear, *Le manuel d'agriculture paysanne*, 2014).

Definition

The autonomy of a farm represents:

- its ability to have control over its technical, economic and financial decisions, and to not be dependent on external production factors from outside the farm or territory;
- the possibility of exercising this ability.

Autonomy allows the farmer or agriculture to valorise the human, technical and financial resources that are present locally. Autonomy is evaluated at farm level, but may depend heavily on territorial level.

There are three different dimensions in the autonomy of farms:

- decision-making autonomy, i.e. the farmer's capacity to analyse the farm's advantages and its external and internal constraints in order to choose modes of production, trading and funding that will effectively meet his/her objectives;
 - economic and financial autonomy, or the farm's capacity to generate sufficient available income to remunerate work and ensure self-financing;
 - technical autonomy, which measures independence in terms of access to supplies. This dimension provides information on economic vulnerability (dependency in terms of prices) and technical vulnerability (e.g. less control of animal-feed composition).
-

Farm autonomy is important in that it makes farms better able to adapt and makes them more resilient to agro-climatic and economic events. It can enable them to make quick adjustments to technical choices or the farm model in response to new opportunities or constraints. Autonomy may contribute to the attractiveness of a farm, which is a key issue when many young people envisage not taking over their family's farm. While autonomy is an important evaluation criterion from the farm's and the family's point of view, it is also important from the point of view of the public interest. This is particularly true as economic autonomy is often associated with more localised food systems that address the major challenge of combating climate change.

Agroecological practices and systems may have a direct impact on this autonomy. Preferential valorisation of local resources, diversification of activities, coordination between local know-how and scientific and technical innovations, and diversification of modes of trading are all factors that will have an impact on autonomy, particularly with regard to decision-making. Similarly, limiting production costs through valorisation of work invested must have an impact on financial autonomy. Lastly, producing seeds and inputs on the farm contributes to technical autonomy.

Autonomy is therefore one of the principles of agroecology and an effect of agroecology.

Evaluating the effects of agroecology on the autonomy of farms is pertinent in the case of a one-off evaluation, as part of the in-depth case studies of farms (see

Chapter 2, Stage 2b). The evaluation may also be wise in the case of a monitoring-and-evaluation system (see Chapter 3). The comparative analysis, by groups of farmers, of their respective degrees of autonomy is a method that favours exchange between peers on their practices and systems, particularly agroecological practices and systems.

Important

Farm autonomy and individual autonomy

Work and responsibilities on the farm are divided up in such a way that, beyond the overall autonomy of the farm, some individuals may have more autonomy than others. Inequalities may exist between men and women. Moreover, the autonomy of young people vis-à-vis their parents may be, from their point of view, a factor that makes agriculture more attractive (see Evaluation Sheet 11, Attractiveness of agriculture for young people).

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators	Scale	Technicity
Decision-making autonomy	At production level	Estimated degree of autonomy	Farm	Low
		Intergenerational transmission of knowledge	Farm	Low
		Availability of decision-making tools	Farm	Low
	At trade level	Estimated degree of autonomy	Farm	Low
		Availability of decision-making tools	Farm	Low
	At processing level	Estimated degree of autonomy	Farm	Low
	At investment capacity level	Estimated degree of autonomy	Farm	Low
		Availability of decision-making tools	Farm	Low
Economic and financial autonomy		<i>Income per family worker relative to the simple reproduction threshold and minimum wage – Evaluation Sheet 9</i>	Farm	Average
		<i>Portion of net value-added in gross product (NVA/GP) – Evaluation Sheet 9</i>	Farm	Average
		Amount of debts relative to agricultural income	Farm	Average

Criteria and sub-criteria		Indicators	Scale	Technicity
Technical autonomy	Fodder autonomy (in the case of livestock production)	Quantity of fodder produced relative to the quantity of fodder consumed	Farm	Average
	Seed autonomy	Quantity of seeds produced relative to the quantity of seeds consumed	Farm	Average
	Autonomy in use of fertilisers	Quantity of fertilisers produced relative to the quantity of fertilisers consumed	Farm	Average

The indicators in *italics* are from different evaluation sheets.

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

1. Decision-making autonomy

Decision-making autonomy represents the farmer's capacity to analyse the farm's advantages and its external and internal constraints in order to choose modes of production, trading and funding that will effectively meet his/her objectives. More than quantitative criteria, the aim here is to estimate the level of autonomy through the farmer's analysis of his/her own situation. This must make it possible to understand the farmer's motivations and the conditions for accessing information. This means assessing the feeling of autonomy and evaluating the availability of decision-making tools.

● At production level

The farmer evaluates his/her own level of autonomy. Does the farmer feel:

- very autonomous?
- somewhat autonomous?
- not very autonomous?
- not autonomous?

To take things further, we try to identify the reasons behind production choices:

- Are these choices voluntary, or are they more or less imposed?
- Which constraints are echoed in the choices: agro-environmental constraints related to the environment in which the farmer carries out his/her activity; constraints related to conditions of access to land (access conditional on certain practices, access not secured over the long term and therefore limiting the possible choices); socio-economic constraints related to advice, external pressure or trading opportunities; social constraints related to the family's and associates' motivations and capacities, or to the dominant ideologies in the territory regarding the agricultural model?

In this context, we seek to evaluate the degree of intergenerational transmission of knowledge. This transmission makes it possible to safeguard traditional knowledge and strengthen the farmer's capacity for autonomous decision-making when faced with external pressure. We ask the farmer whether he/she was able to benefit from all of his/her parents' know-how, and whether he/she is capable of passing on his/her own know-how to future generations. We also examine whether the farmer is equipped with tools that can contribute to better decision-making autonomy:

- Does the farmer have access to information (e.g. weather forecasts)?
- Does the farmer have tools for technical monitoring, monitoring of expenditure, cropping calendars, etc.?

● At trade level

The farmer evaluates his/her own level of autonomy. Does the farmer feel:

- very autonomous?
- somewhat autonomous?
- not very autonomous?
- not autonomous?

To take things further, we try to identify the reasons behind trading choices: Are these choices voluntary, or are they more or less imposed? Which constraints are echoed in the choices: agro-environmental constraints related to the capacities for access to markets or production capacities; economic constraints related to market outlets, markets and value chains that exist in the territory, and to negotiation capacities; or social constraints related to the history of the farm, family organisation or choice of associates?

We also examine whether the farmer is equipped with tools that can contribute to better decision-making autonomy from a trade point of view:

- Does the farmer have access to information on prices?
- Does the farmer have financial-management tools?

● At processing level

The farmer evaluates his/her own level of autonomy. Does the farmer feel:

- very autonomous?
- somewhat autonomous?
- not very autonomous?
- not autonomous?

To take things further, we try to understand the reasons behind processing choices:

- Are these choices voluntary, or are they more or less imposed? Are they the result of a family heritage?

- Which constraints are echoed in the choices: economic constraints related to investment capacities; technical constraints related to availability of working hours; or social constraints related to the family, choice of associates or external pressure?

● At investment level

The farmer evaluates his/her own level of autonomy. Does the farmer feel:

- very autonomous?

- somewhat autonomous?
- not very autonomous?
- not autonomous?

To take things further, we try to identify the investments made on the farm and understand the reasons behind them:

- Are they voluntary, or are they more or less imposed?
- What were the main difficulties encountered to make the investment?

To specify the constraints influencing these decisions, we try to identify the investments envisaged and the factors that could limit them. We also examine whether the farmer is equipped with tools that can contribute to better decision-making autonomy from the point of view of investments: Does the farmer have financial-management tools?

2. Economic and financial autonomy

Economic autonomy represents the capacity to generate sufficient available income to remunerate work and ensure the farm's self-financing.

● Comparison of income per family worker with the simple reproduction threshold and minimum wage

Calculation of agricultural income per family agricultural worker (AI/FALU) and total income per family worker (TI/FLU) makes it possible to evaluate the farm's capacity to generate income. Comparing income per family worker with the simple reproduction threshold and with the minimum wage makes it possible to assess the farm's capacity to ensure the family's autonomy to satisfy its needs, while repositioning it in the national social reality. For more details, refer to [Tool Sheet 5](#), Developing a typology of farms.

● Portion of net value-added in gross product

This criterion makes it possible to assess the portion of gross product corresponding to the creation of economic wealth and, in negative, the portion of gross product that only compensates for the loss of wealth (consumption of inputs, services and fixed capital). It is therefore an indicator of autonomy relative to the various costs, and an indicator of the production system's pertinence from the farmer's point of view: What (and whom) does the farmer work for primarily? To compensate for the value of the means production consumed, or to generate value? The NVA/GP ratio is based on the calculations of gross product and net value-added (see [Evaluation Sheet 9](#), Economic performance from the farmer's point of view – agricultural production system). The spreadsheet for automated economic calculation includes the calculation of the NVA/GP ratio (see [Tool Sheet 7](#)). This criterion is also used as one of the elements for characterising the degree of agroecologisation of production systems (see [Tool Sheet 8](#)).

● Amount of debts relative to agricultural income

This criterion makes it possible to evaluate the influence of financial commitments on the farm's functioning.

3. Technical autonomy

Technical autonomy measures the farm's dependency in terms of access to supplies. It provides information on economic vulnerability (dependency in terms of prices) and technical vulnerability (e.g. less control of animal-feed composition). Indicators also take into account energy autonomy. Technical autonomy depends more globally on the capacity to close the cycle of elements. It can be evaluated by taking into account in the "production" part (fodder, seeds, fertilisers produced) only what is produced on the farm itself, or by also taking into account production from neighbouring farms. This is therefore more a measurement of the autonomy of the territory than a measurement of the autonomy of farms, strictly speaking.

● Fodder autonomy: quantity of fodder produced relative to the quantity of fodder consumed

This indicator applies only to farms that have a livestock-production activity. Feed is a key item and is often costly. This indicator makes it possible to estimate independence vis-à-vis external suppliers.

In order to better understand the supply logic, it is useful to analyse the form of supply (distance, type of supplier, capacity to negotiate with the supplier) and the percentage of the supply cost relative to the margin generated by the livestock-production activity.

● Seed autonomy: quantity of seeds produced relative to the quantity of seeds consumed

This indicator makes it possible to estimate dependency on external seed suppliers.

In order to better understand the supply logic, it is useful to analyse the form of supply (distance, type of supplier, capacity to negotiate with the supplier) and the percentage of the supply cost relative to the margin generated by the agricultural activity.

● Autonomy in terms of fertiliser use: quantity of fertilisers produced relative to the quantity of fertilisers consumed

This indicator makes it possible to estimate dependency on external suppliers.

In order to better understand the supply logic, it is useful to analyse the form of supply (distance, type of supplier, capacity to negotiate with the supplier) and the percentage of the supply cost relative to the margin generated by the agricultural activity.

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

In the case of a monitoring-and-evaluation system, it is useful to evaluate changes in the farmer's perception of his/her own autonomy between the start and end of the intervention.

When evaluating technical and financial autonomy, attention will be given to one-off events that could have had an impact on the data collected (income, minimum wage, cost of inputs, etc.).

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

Evaluating autonomy is not complex. However, it involves conducting more qualitative interviews on decision-making autonomy, which require a more detailed focus on the farmer's own perceptions regarding his/her own situation. Some indicators, however, require carefully collecting certain information and making calculations (costs, feed value of different fodders, fertilisation value of different fertilising elements).

Further reading

Fadear, 2014. *Agriculture paysanne. Le manuel*, 132 p.



Food security

Definition

Food security exists when all members of the household can at any time consume a sufficient quantity of quality food that is appropriate in terms of variety, diversity, nutrient content and food safety to satisfy their nutritional needs and their food preferences, and thus lead a healthy and active life.

Evaluating the effects of agroecology on food security is justified in contexts where food insecurity problems exist. It is pertinent from the point of view of both the family and the community.

From the household's point of view, food and nutrition security is often a central objective of the agricultural activity. Depending on the context, the farmer gives more or less importance to each aspect: accessibility, availability, quality and regularity.

From the point of view of the general public (community, whole of society), households living directly from agriculture often represent a significant percentage of the population. Many communities and societies face problems in terms of food insecurity. Moreover, the availability and regularity of agricultural production help ensure the food security of the rest of the population, particularly against the risk of soaring prices for food products. The quality of agricultural production, for its part, has an impact on the nutritional status of the entire population.

The evaluation of the effects of agroecology on food security may be conducted in the case of a one-off evaluation in contexts where people are facing food-insecurity problems, as part of each in-depth case study of farms (see [Chapter 2](#), Stage 2b). The evaluation may also be conducted as part of monitoring and evaluation, in cases where food security is one of the objectives of the intervention (see [Chapter 3](#)).

There are many different methods and indicators relating to food security. This guide presents a few of the ones that can be easily incorporated into the general approaches for one-off evaluations and for monitoring and evaluation (see Part 1).

Food and nutrition security (FNS) is a term that incorporates the definition of food security provided in the introduction, but that also takes into account the existence of a health environment, health services and adequate care. These are additional parameters that agroecology is not likely to have an effect on, which is why this guide focuses only on the effects on food security. We propose a few additional questions, however, in cases where the evaluator would like to evaluate the FNS situation more globally.

1. CRITERIA, INDICATORS, SCALE AND TECHNICITY

Criteria and sub-criteria		Indicators, entity in question	Scale	Technicity
Availability of food	Quantity of food produced	<i>Average crop yields (F, C)</i> – Evaluation Sheet 7	Plot Group of plots Farm	Average
	Diversity of food production	Number of foods or types of foods produced (F, C)	Farm	Low
Accessibility	Household income	<i>Agricultural income per family agricultural worker and total income per family worker, position in relation to the threshold for the satisfaction of basic needs (F)</i> – Evaluation Sheet 9	Farm	Average
		<i>Portion of income managed by women (F)</i> – Evaluation Sheet 9	Farm	Average
	Creation of paid jobs	<i>Working days for paid workers and paid jobs per unit of land area (C)</i> – Evaluation Sheet 12	Farm	Average
Quality	Diversity and nutritional quality	Food consumption score (FCS) (F)	Farm	Low
	Diversity of food products sold	Number of products or types of foods sold (C)	Farm	Low
	Sanitary quality of foods	<i>Exposure to pesticides (F, C)</i> – Evaluation Sheet 6	Food product	Average
Regularity	Availability of food	<i>Indicators of crop yield regularity (F, C)</i> – Evaluation Sheet 7	Group of plots	Average
	Accessibility	<i>Agricultural income per family agricultural worker and total income per family worker in a crisis year, level of income in relation to the threshold for the satisfaction of basic needs (F)</i> – Evaluation Sheet 9	Farm	Average
	Quality	Difference in FCS during the harvest period and during the hunger gap (F) FCS in a crisis year (F)	Farm	Low

F: family; C: community. The indicators in italics are from different evaluation sheets.

2. METHODOLOGICAL APPROACH AND TOOLS FOR ONE-OFF EVALUATIONS

It is necessary to focus on each of the different dimensions of food security: availability of food, accessibility, quality and regularity.

1. Availability of food

● Quantity of food produced

The level of crop yields has an impact on the availability of food products for families (in the case of on-farm consumption) and for the general public. Reference will be made to [Evaluation Sheet 7](#), Crop and livestock yields (estimate according to stakeholders), for everything concerning methods for evaluating yields. However, while yield levels do provide an indication of the quantity of food available from family production, they do not alone provide an indication of household food security. They must be cross-referenced with other accessibility and quality criteria.

● Diversity of food production: number of foods or types of foods produced

Diversity of food production is evaluated based on the number of food products (or types of foods) produced on the farm, whether they are intended for family consumption or for sale, or based on the number of food groups, using the food groups from the food consumption score (FCS). The information is gathered as part of the evaluation approach through in-depth case studies of farms (see [Chapter 2](#), General approach for one-off evaluations, Stage 2b).

2. Accessibility

● Household income

Agricultural income per family agricultural worker (AI/FALU) and its level in relation to the threshold for the satisfaction of basic needs are key elements for determining the accessibility of food. They contribute therefore to the assessment of household food security. On farms that generate extra-agricultural income, it is more pertinent to consider total income per family worker (TI/FLU). Reference will be made to [Evaluation Sheet 9](#), Economic performance from the farmer's point of view (agricultural production system), and [Tool Sheet 5](#), Developing a typology of farms.

● Portion of income managed by women

The implementation of agroecological systems sometimes changes the portion of income managed by women.

Women may make different choices than men in terms of how to use income, and these choices may help improve access to good food and healthcare. The portion of income managed by women therefore often has a positive impact on the accessibility

of diversified foods and on healthcare spending, particularly for the members of the household who are most vulnerable to food insecurity and malnutrition (women who are pregnant or nursing, young children).

In the absence of a more in-depth specialised study on the use of household income, the portion of agricultural income managed by women may be taken into consideration in the diagnostic analysis (see [Evaluation Sheet 9](#), Economic performance from the farmer's point of view – agricultural production system).

Each time the existence of agroecological practices and systems has an impact – positive or negative – on the portion of agricultural income managed by women, more qualitative questions may be put to the women in order to identify what effects the change has on the use of income (more or less spending on food, health, education, etc.).

● **Creation of paid agricultural jobs**

When there is under-employment, the capacity of agriculture to offer jobs to people outside the family may also have an impact on food security. The development of paid agricultural jobs leads to a distribution of income to the workers performing those jobs, and is therefore likely to increase the accessibility of food for their families. In order for this to happen, the paid labour must of course be correctly remunerated, which is usually not the case in the agrarian structures dominated by agribusiness. The families of paid agricultural workers are among the most vulnerable in the world.

The number of days worked by paid workers and the number of paid agricultural workers per unit of land area (see [Evaluation Sheet 12](#), Job retention and creation) are used for this evaluation, while also taking into account the level of wages paid.

3. Quality

● **Diversity and nutritional quality**

Measuring the food consumption score (FCS) makes it possible to assess the diversity and nutritional quality of families' nutritional intake. The FCS takes into account how frequently foods are consumed over a seven-day period and their nutritional quality, giving them a weighting coefficient. The weighting coefficient is based on the density of nutrients contained in the foods consumed. Eight food groups are taken into account when calculating the FCS: main staples (cereals and tubers), pulses and oilseeds, vegetables, fruits, animal proteins, sugars, dairy products, oil and fat.

The FCS is therefore a composite score based on the variety of different types of food consumed, how often each food group is consumed and the nutrients provided by each food group. It has both a quantitative component and a qualitative component. However, taking into account the quantitative component is very approximate in so far as the exact quantity consumed of each food is not taken into account (see Table 5.3).

Table 5.3. Food groups and weighting coefficients for calculation of the food consumption score (FCS)
[source: World Food Programme, 2008, p. 8 and 20].

Food groups	Weight	Foods consumed in households	Justification
1. Main staples (cereals, tubers)	2	Millet, sorghum, rice, corn, tubers, wheat, etc.	Energy dense, protein content lower than legumes (lower protein efficiency ratio), micro-nutrients (inhibited by phytates)
2. Pulses and oilseeds	3	Bambara groundnuts, beans, peanuts, sesame, etc.	Energy dense, high amounts of protein but of lower quality than protein of animal origin, micro-nutrients (inhibited by phytates), low in fat
3. Vegetables	1	Leaves and vegetables	Low energy, low protein, no fat, rich in micro-nutrients
4. Fruits	1	Mango, watermelon, avocado, orange, pineapple, etc.	Low energy, low protein, no fat, rich in micro-nutrients
5. Animal proteins	4	Meat, poultry, eggs and fish/shellfish	Rich in high-quality protein, easily absorbable micro-nutrients (no phytates), energy dense, rich in fat Even when consumed in small quantities, improvements to the diet are large
6. Sugars	0.5	Sugar and sweetened products	Rich in empty calories. Usually consumed in small quantities
7. Dairy products	4	Milk, cheese, yoghurt	Rich in high-quality protein, micro-nutrients, vitamin A and energy. However, milk could be consumed only in small amounts and should then be treated as a condiment, which necessitates reclassification in some cases.
8. Oil and fat	0.5	Cooking oil	Energy dense but low in micro-nutrients. Usually consumed in small quantities
9. Condiments*	0	Spices, tea, coffee, salt, fish sauce, small amounts of milk for tea	These foods are by definition eaten in very small quantities and not considered to have an important impact on overall diet

* This ninth category is optional. It is not always included, as it has no impact on the FCS.

This table must be adapted to the context. The composition of each food group depends on the specific diet in the locality that is being studied. The list of foods may be revised based on national food-consumption tables and interviews conducted with local resource persons.

To obtain the food consumption score, the frequency of consumption for each food group (days of consumption over a seven-day period) is multiplied by the group's nutritional value (weighting coefficient). The following formula is used:

$$FCS = \sum(x_i \times a_i)$$

where

x_i = number of days each food group is consumed over a seven-day period;

a_i = coefficient attributed to the food group (see Table 5.5).

All the scores for each food group are then added up. The total score is positioned on a scale whose maximum possible value is 112. A household's consumption profile may be assessed by interpreting the value of the score: poor food consumption corresponding to food insecurity, borderline food consumption corresponding to a borderline situation from a food-security point of view, acceptable food consumption corresponding to a lack of food insecurity (see Table 5.4).

Table 5.4. Scale for evaluating the food consumption score
(source: World Food Programme, 2008, p. 9).

Threshold	Household consumption profile
0-21	Poor food consumption
21-35	Borderline food consumption
> 35	Acceptable food consumption

Important

Adapting the thresholds

These thresholds must be tested and, if necessary, modified depending on the context and food habits of the target population. The World Food Programme therefore proposes, for some countries, methodological kits that are adapted for collection and calculation of the FCS. In the methodological kit for Laos, for example, the thresholds are different: 0-25.5 (poor); 25.5-36.5 (borderline); and > 36.5 (acceptable). At an inter-agency workshop in Rome on 9 and 10 April 2008 that covered ways to measure food consumption and harmonisation of methodologies, it was stated that “typical” thresholds must be increased for societies that consume fats and sugars every day (~ seven days a week). The thresholds are increased to: 0-28 (poor); 28-42 (borderline); and > 42 (acceptable).

The FCS may be calculated for several periods of the year. This is particularly necessary in areas that have problems with regularity in terms of the availability or accessibility of foods, especially during the hunger gap. The focus is then on foods consumed over a seven-day period in a typical week at a time of the year considered to be the most favourable in terms of the availability and accessibility of foods, and over a seven-day period in a typical week at the most difficult time of the year. This

requires having previously identified, during the first phase of the evaluation (see [Chapter 2](#), General approach for one-off evaluations, Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory), the main periods in the annual food calendars of farming families, and in particular the times of the year that are the most favourable and the least favourable in terms of food security.

Example

Calculation of the food consumption score in Burkina Faso

In the Sahel zone of Burkina Faso (commune of Guiè), calculation of the FCS was incorporated into the evaluation of the effects of agroecology. Tables 5.5 and 5.6 show the example of a farm where distinction was made between the most favourable time of the year and the hunger gap.

Table 5.5. Calculation of FCS during favourable period on a farm in the commune of Guiè (Burkina Faso).

Favourable period			
Food group	Weight	Number of days/ week	Score
1. Main staples (cereals, tubers)	2	7	14
2. Pulses and oilseeds	3	3	9
3. Vegetables	1	6	6
4. Fruits	1	3	3
5. Animal proteins	4	2	8
6. Sugars	0.5	2	1
7. Dairy products	4	0	0
8. Oil and fat	0.5	4	2
Total			43
Poor/borderline/acceptable			Acceptable

Table 5.6. Calculation of FCS during hunger gap on a farm in the commune of Guiè (Burkina Faso).

Hunger gap			
Food group	Weight	Number of days/ week	Score
1. Main staples (cereals, tubers)	2	7	14
2. Pules and oilseeds	3	3	9
3. Vegetables	1	5	5
4. Fruits	1	1	1
5. Animal proteins	4	0.5	2
6. Sugars	0.5	2	1
7. Dairy products	4	0	0
8. Oil and fat	0.5	4	2
Total			34
Poor/borderline/acceptable			Borderline

In conclusion, the different stages of the process for calculating the FCS are as follows:

- adapt the list of foods to the context of the study;
- identify periods during the year that are more favourable or less favourable in terms of food security;
- interview a member of the family (preferably someone who is in charge of preparing meals) and ask them how frequently the different food groups are consumed at two extreme periods of the year (more favourable period and less favourable period);
- calculate the food consumption score for the two periods;
- interpret the results in relation to the scale for evaluating scores, adapted to the context and food habits of the population covered by the study.

● Diversity of food products sold

The diversity of agricultural products sold provides information on a farm's contribution to the diversity of foods offered by the market, and therefore to the overall nutritional quality of the population's diet. This is calculated by counting the number of agricultural products sold, or the number of food groups, based on the food groups of the FCS.

However, when assessing the diversity of food products available in the territory covered by the study, it is also important to know the destination of the products that are sold. If they are sold outside the territory, then agricultural production, although it may be diversified, does not contribute to the diversity of food products available in the territory.

● Sanitary quality of foods

The sanitary quality of agricultural products depends on the potential existence of biological pathogens or pesticide residues in foods or on the surface of foods. The sanitary quality of foods is measured through lab analyses, and this measurement is made if there are doubts as to the effect of agroecology on the sanitary quality of agricultural products. We do not go into detail here about the specific methods used. However, the method proposed in [Evaluation Sheet 6](#), Reducing exposure to pesticides, makes it possible to evaluate an essential risk factor of the agricultural activity in terms of the sanitary quality of foods.

4. Regularity

● Regularity of availability

On farms where food production is consumed on the farm, the regularity of crop yields – and particularly the risk of yields being below a certain threshold – has an impact on the regularity of the availability of food, and therefore on household food security (see [Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders).

● Regularity of accessibility

In situations where yields or agricultural prices vary greatly, it may be useful to calculate agricultural income per family agricultural worker (AI/FALU) and its relative level in relation to the threshold for the satisfaction of basic needs for a year of poor yields or low prices (see [Tool Sheet 5](#), Developing a typology of farms). This provides an indicator of the regularity of accessibility to food for the family. On farms that have other sources of income, it is more useful to consider total income per family worker (TI/FLU).

● Regularity of quality

The difference between the food consumption score during the harvest period and during the hunger gap provides information on the regularity of the diversity and quality of the products consumed in a given year. We have mentioned the need for this dual calculation.

Moreover, if yields and income vary greatly from year to year, it may be useful to also calculate a food consumption score for a critical year. A relatively recent year (within the last five years) should be taken as a baseline so that the person interviewed can remember the situation better. Moreover, the hunger-gap period is evaluated for the critical year.

5. Complementary elements influencing food and nutrition security

A qualitative interview may be conducted to assess other elements that may influence food and nutrition security. The following questions may be asked.

- Care provided for vulnerable people in the family: Do children under five years old, women who are pregnant or nursing, and elderly people receive care that is tailored to their age group and their needs in terms of food, hygiene and dietary supplements?
- Families' ability to provide necessary care for vulnerable individuals: Does the division of tasks on the farm between family members make it possible to free up the time needed to care for vulnerable individuals (young children, elderly people) and relieve them from part of their workload (pregnant women, elderly people)?
- Use of healthcare, healthcare systems and expenditure: For which types of medical care does the family make specific expenses? Is healthcare accessible geographically and financially for farming families? Do healthcare expenses take priority in relation to other types of expenses?

3. ADDITIONAL METHODOLOGY FOR MONITORING-AND-EVALUATION SYSTEMS

For a monitoring-and-evaluation system, the choice as to which criteria and indicators to use depends largely on the objectives of the intervention (incorporation or non-incorporation of food security and food and nutrition security).

If the intervention includes food security as an objective, it is possible to perform a more in-depth analysis to characterise the baseline situation and the situation at the end of the intervention, using specific methods not presented in this guide. Moreover, for the final evaluation, it is possible to organise one or more specific meetings to present and discuss the provisional conclusions regarding the effects of agroecological practices and systems on household food security. It is therefore desirable to invite individuals to these meetings who are in charge of their household's food, both from farms that have implemented agroecological practices and from farms that have not implemented such practices.

Over the years of monitoring, the system may be simpler and, with regard to consumption, focused on the situation during the hunger gap(s).

4. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

Aside from certain indicators from other sheets, the evaluation of the effects of agroecology on food security requires rather low technicity, even though it is necessary to conduct the interviews rigorously. Higher technicity would be necessary for more in-depth and more specific evaluations.

This evaluation does not require special material resources.

Further reading

FAO, 2018. *Compendium of indicators for nutrition-sensitive agriculture*, Rome, FAO. <http://www.fao.org/3/i6275en/i6275en.pdf>

WFP VAM, 2008. *Food consumption analysis. Calculation and use of the food consumption score in food security analysis*. https://documents.wfp.org/stellent/groups/public/documents/manual_guide_proced/wfp197216.pdf



Farm resilience and ability to adapt to climate change

Definition

Farms are subjected to various types of changes that may affect their performance. These may be economic, security, health or climate-related changes, and they may be one-off instances (extreme climate events, economic crises) or longer-term trends (global warming, inflation, etc.). Faced with these changes, farm resilience represents:

- the capacity to recover (capacity to absorb);
 - the capacity to learn and adapt (capacity to adapt);
 - the capacity to anticipate and prevent (capacity to transform).
-

Populations around the world are increasingly exposed to natural hazards and health, economic, climate or security crises. These hazards and crises have a particularly severe impact on people who are poor and experiencing food insecurity, most of whom depend on agriculture and natural resources to live. Repercussions on households are often devastating, whether losses are sudden or due to gradual deterioration over time of living conditions and livelihoods, while ecosystems are depleted, degraded or even destroyed.

Thanks to their diversity, agroecological systems may contribute to more resilient agricultural systems at several different levels.

At farm level, diversification and integration of different types of production, and implementation of systems that are less dependent on external inputs, contributes to improving socio-economic resilience and reducing vulnerability to economic risks and food insecurity.

Agroecological systems also make it possible to establish functional biological balances at plot and territorial level, which improve resistance to attacks by bio-aggressors, diseases and climate hazards.

The evaluation of farm resilience and the ability of farms to adapt to climate change is therefore pertinent from the point of view of both farmers and the public interest. It may be used in a one-off evaluation ([Chapter 2](#), particularly Stage 2b, In-depth case studies of farms), and in a monitoring-and-evaluation system ([Chapter 3](#)).

The evaluation of farm resilience consists in assessing the maintenance of farm performance:

- over time, to measure resilience to trends;
- in crisis and post-crisis situations versus a “normal” situation, to measure resilience to a one-off shock.

Farmers are subjected to a variety of changes (climate, other agro-environmental conditions such as soil fertility and biodiversity, socio-economic conditions), and it is not always easy to assess the precise responsibility that each type of change bears

with regard to changes in agricultural income and its regularity, or to changes in terms of food security.

Performing a rigorous evaluation of the effects of agroecology on overall farm resilience is therefore complex.

In the interest of simplification, we therefore propose analysing resilience in relation to a specific type of change (resilience to climate change, resilience to economic change or resilience to health change).

Regardless of the causes of higher or lower regularity in yields, income and food situation, certain indicators, and the analysis of the evolution of the environment (trends and shocks), if it is well contained, make it possible to assess the resilience of farms that implement agroecological practices and systems.

The criteria and performance indicators used for the evaluation are identified depending on the type of change analysed and its impacts on agricultural systems.

1. TYPE OF CHANGE, IMPACTS ON AGRICULTURAL SYSTEMS, CRITERIA, INDICATORS AND TECHNICITY

Types of change	Impacts on agricultural systems	Criteria	Indicators	Scale	Technicity
Climate change	Lower yields Reduction in activity due to lower production capital (reduction in cultivable areas and herd size, degradation of natural resources)	Regularity of yield and income, regularity of food security	<i>Indicators of yield regularity</i> – Evaluation Sheet 7	Farm, group of plots	Average
			<i>Indicators of income regularity</i> – Evaluation Sheet 9	Farm	
			<i>FCS during the hunger gap and in a crisis year</i> – Evaluation Sheet 14	Farm	
Economic change (drop in sale prices, increase in costs)	Lower income	Regularity of income	<i>Indicators of income regularity</i> – Evaluation Sheet 9	Farm	Average
Health change	Lower yields Loss of livestock	Regularity of yields and income	<i>Indicators of yield regularity</i> – Evaluation Sheet 7	Farm, group of plots	Average
			<i>Indicators of income regularity</i> – Evaluation Sheet 9	Farm	

FCS: food consumption score. The indicators in italics are from different evaluation sheets.

2. METHODOLOGICAL APPROACH AND TOOLS

Evaluating resilience makes sense only if there is the possibility of a change (trend or shock) affecting farm performance.

This possibility may be assessed as part of the general evaluation approach (Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory).

Moreover, gradual degradation in the situation of a farm is not necessarily linked to a gradual change in its environment or to external shocks. It may be linked to the fact that its income is too low to enable the farm to grow, or that it leads to a gradual decapitalisation. The situation and dynamic of farms must therefore also be taken into account and analysed before undertaking an evaluation of resilience.

The evaluation of resilience requires first of all characterising the change that is currently underway and its effects on farms (e.g. loss of agricultural land, reduction in cultivated areas, reduction in herd size, degradation of natural resources). This characterisation must distinguish between the changes and effects observed on the one hand, and the farmers' perceptions on the other. This requires having data (climate, economic, etc.) that is contextualised to each region in Phase 1 of the one-off evaluation approach (literature review and Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory) and noting the farmers' assessment of the consequences of the change (Stage 2b, In-depth case studies of farms). For monitoring and evaluation, given the fact that it is a long-term approach, records may be kept and direct measurements may be made.

The evaluation of the effects of agroecology on farm resilience also involves identifying specifically which agroecological practices can allow agriculture to better adapt to the change, and how.

Important

Taking into account the various factors contributing to resilience

Farm resilience is multifactorial, so the analysis of the change in performance needs to take into account all of the factors that contribute to resilience (e.g. savings, alternative income opportunities, which strongly contribute to the capacity to absorb shocks and revive activity).

Example

Application of the approach to the evaluation of resilience to climate change

The following elements need to be studied in order to characterise climate change:

- evolution in average climate parameters (rainfall, temperatures, shifting seasons);
- interannual variability of these parameters;
- amplitude and frequency of extreme climate events and their consequences (flooding, drought, etc.).

This characterisation then makes it possible to identify and characterise:

- the direct consequences of the changes: hydrology, biodiversity, frequency and amplitude of periods of drought or flooding, etc.;
- the effects of these changes on farms: average crop yields, interannual variability, animal health, zootechnical yields, etc.

In Stage 2b, In-depth case studies of farms, of the approach for one-off evaluations (Chapter 2), farmers' perceptions regarding climate changes and the effects of agroecological practices and systems on adapting to climate change may be gathered. First of all, the following questions are asked:

- Have you observed any changes in the climate since you set up the farm? If yes, what changes have you observed?
- What impact do these changes have on your activities?
- How have you tailored your activities to take better account of these changes and adapt to them?
- Lastly, were you able to actually adapt to these changes and compensate for their negative effects?

Then, based on the interviewee's spontaneous answers, we will go into more detail by attempting to identify:

- whether the issues are due more to average evolution of climate parameters (temperature, level of rainfall, calendar of agricultural seasons), the effects of climate change on the production environment (hydrology, biodiversity, etc.), greater irregularity in the climate from one year to the next, or an increase in the frequency and amplitude of extreme events;
- whether the issues are linked more to greater risk of climate events or greater vulnerability of farmers when faced with these risks;
- the type of adaptation strategy implemented by the farmer: protective infrastructures, water management, soil management, crop-management practices, agroforestry and reforestation, livestock-production management practices, grazing lands and fodder, increase in autonomy vis-à-vis the exterior, seed banks, constitution of reserves that can be mobilised, diversification of activities as a complement to or outside of agriculture, collective solidarity mechanisms, concerted development of the territory*.

During this interview, it can be pointed out that some agroecological practices mentioned by the farmer contribute to adaptation to climate change.

In a third stage, if it has not been spontaneously covered by the farmer, it is possible to question him/her about the specific effect of the agroecological practices implemented in terms of adaptation to climate characteristics, climate variability (which is not necessarily the result of climate change) and, where applicable, the effects of climate change previously mentioned by the farmer.

* Levard, 2017.

3. TECHNICITY, HUMAN RESOURCES REQUIRED, COSTS

Performing a rigorous evaluation of the effects of agroecology on farm resilience is relatively complex. It is necessary to cross-reference data from national agencies (weather, trade, economy, health monitoring), studies that may provide information on changes in the environment and the impacts observed or measured on crop- and livestock-production activities on the one hand, and interviews with farmers and agencies providing support and advisory services to farmers in order to gather perceptions and observations on the other.

The more accurate the data on the area covered by the study is, the better the quality of the evaluation will be.

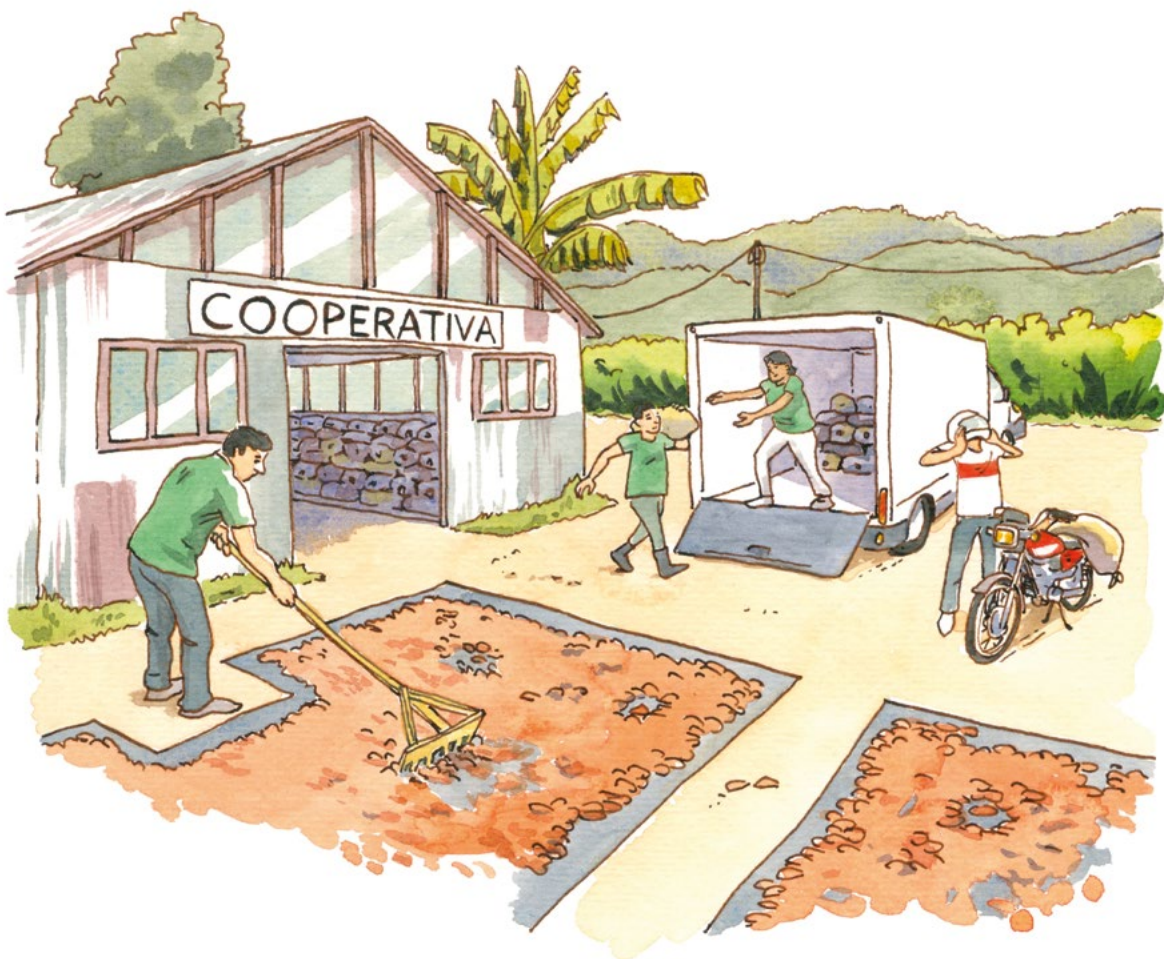
Further reading

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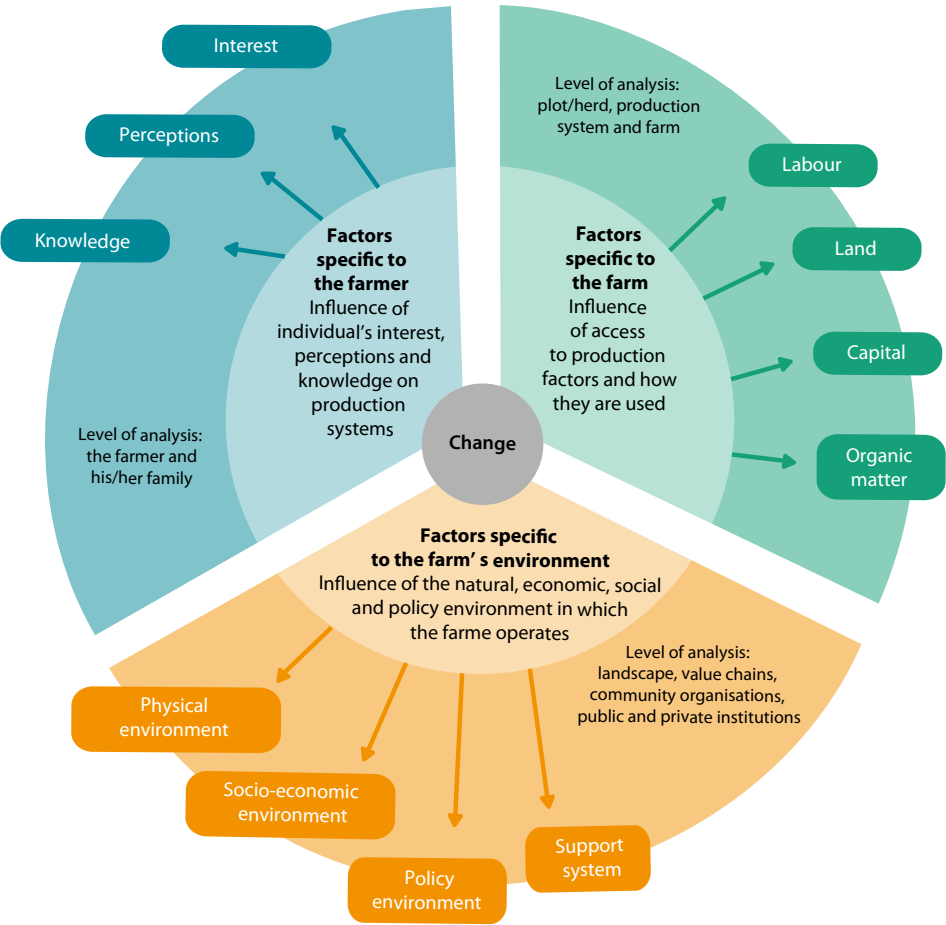
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Evaluation of the conditions necessary for the development of agroecology



The development of agroecology leads to significant changes in agricultural production systems beyond just changes in practices. The evaluation of the conditions necessary for the development of agroecology, i.e. the factors that facilitate or hinder its development, must take into account a whole set of factors specific to the farmer, the farm and the environment in which they operate. The purpose is to assess all of the stakeholders and dynamics that have an impact – positive or negative – on the development of agroecology.

Figure 6.1. Factors for analysing the conditions necessary for the development of agroecology.



As each evaluation of the conditions necessary for the development of agroecology must be contextualised, these factors are not all systematically analysed. They are selected based on their relevance in a given context. The factors that are selected must enable the formulation of hypotheses and questions to be included in the evaluation framework. The answers to these evaluation questions determine whether each of these factors is a facilitating or hindering factor in the given context, and provide elements for analysing the conditions necessary for the development of agroecology.

METHODOLOGY

The evaluation of the conditions necessary for the development of agroecology may be conducted as part of a one-off evaluation at a given time *T*, and as part of monitoring and evaluation of an intervention.

In a **one-off evaluation** (see [Chapter 2](#)), the question of the conditions necessary for the development of agroecology is addressed throughout the evaluation process. If the evaluation is conducted in preparation for an intervention, then the evaluation enables identification of the key elements to act on in order to effectively, efficiently and sustainably support the development of agroecology. If the evaluation is conducted at the end of an intervention that aims to develop agroecology, then the evaluation makes it possible to analyse the factors that facilitated or hindered the attainment of the expected results and draw useful lessons for the development of future actions. Lastly, if the evaluation has an advocacy-related objective, then the evaluation makes it possible to identify which points to raise in position papers and in discussions with stakeholders from the political sphere in order to promote the development of agroecology.

During the initial scoping phase of the evaluation, it is necessary to identify an initial set of evaluation questions, taking into account the context, the specific objectives of the evaluation and the resources available for carrying out the evaluation. These questions may be reviewed and validated at an initial consultation with the evaluation's key stakeholders, and then updated throughout the process depending on the results obtained.

In **monitoring and evaluation** (see [Chapter 3](#)), the question of the conditions necessary for the development of agroecology is addressed mainly through discussions with farmers. This may enable changes to be made to the intervention as it is being carried out, by adapting some of its objectives and how it is implemented in order to take better advantage of the facilitating factors and minimise or circumvent the hindering factors.

EVALUATION QUESTIONS BASED ON THE SELECTED FACTORS

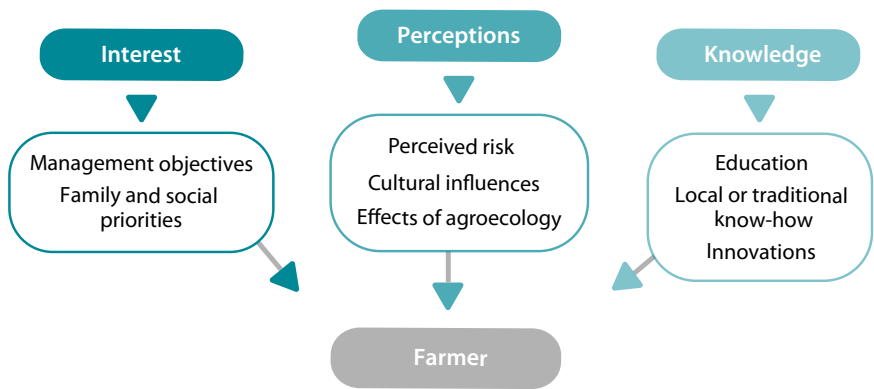
Factors specific to the farmer

Decisions regarding the technical and economic management of farms are made by farmers and their family. These decisions are made first and foremost according to their fundamental interests and objectives. The first question to focus on is therefore the extent to which agroecological practices and systems help them meet their interests and objectives.

An analysis of the conditions necessary for the development of agroecology that takes into account only the accessibility of the resources needed for its implementation without studying these different aspects would run the risk of missing the hindering factors. Contradictions are sometimes observed between the immediate interests and objectives of farmers, their perception of agroecology and their knowledge and know-how on the one hand, and changes that would be desirable for the farm or community over the long term (protection of productive natural resources, combating climate change, etc.) on the other.

The farmer is the human factor at the centre of the farm who decides whether or not to implement agroecological practices and systems. Without the farmer's acceptance, no shift towards an agroecological transition is possible. It is therefore necessary to take into account the factors presented in Figure 6.2, particularly during individual or group interviews conducted with farmers.

Figure 6.2. Factors specific to the farmer.



The interest of implementing agroecological practices and systems

When trying to determine the conditions necessary for the development of agroecology at the level of individual farmers, it is necessary to determine the interest and objectives behind the decisions farmers make on their farm. This makes it possible to understand their interest – or lack of interest – in implementing agroecological practices and systems.

Is the implementation of agroecological practices and systems in line with the farmer's objectives for the management of his/her farm with respect to:

- use of the farm's labour: labour opportunity costs (e.g. for vulnerable households, the sale of their labour to other farms may take priority over the use of their own farming area in order to generate immediate income); periods of competition between agricultural work and collective work; reduction of the arduousness of work (e.g. contour cropping with the creation of anti-erosion belts may be perceived as too arduous and time-consuming to be worth the effort);
- time for return on investment: depending on his/her capacity to invest over the short, medium or long term;
- destination of production: sale, on-farm consumption, intra-unit consumption?

To what extent do maintaining and improving the productive potential of the ecosystem (soil fertility, water resources, plant cover, biodiversity) constitute a management objective for the farmer, given:

- the nature of the farm (family farm or industrial farm);
- the conditions of access to land (security or not over the long term);
- the prospects for the farm (taken over or not by the next generation);
- potentially precarious and vulnerable situations that would lead the farmer to give priority to producing things that will generate income over the short term?

Is the implementation of agroecological practices and systems in line with the farmer's family and social priorities for:

- satisfaction of the household's immediate needs: in terms of income and food (see management priorities above);
- the household's food practices: agroecological production in line with desired consumption (type of product, quality, quantity);
- integration within a group: interest in following the group's rules and orientations in a way that hinders or facilitates the implementation of agroecological practices and systems?

Perceptions on agroecological practices and systems

Farmers' decisions are based on their perception of agroecological practices and systems. These perceptions may be linked to personal experiences, information from peers, societal or cultural influences, etc. It is important to take these perceptions into account, because they can have an impact on the evolution of systems and the content of interventions. These perceptions – positive or negative – can slow the implementation of practices and systems that are adapted to the farm's constraints, facilitate the development of agroecology or give the farmer a false sense of confidence with respect to agroecological practices, potentially leading the farmer to implement solutions that are not suitable for his/her environment.

Taking farmers' perceptions into account may complicate the analysis of the conditions necessary for the development of agroecology, as it generally involves considering qualitative data linked to human factors that are highly variable from one individual to another, even among farmers with the same farm profile. But when considering farms with similar profiles and contexts, it is difficult to assess the reasons why agroecology is developed in some cases but not in others without taking into account the farmers' personal perceptions.

Perceptions

Perceived risk

How does the farmer perceive the potential risks linked to the implementation of agroecological practices and systems with regard to:

- the farmer's production: quantity, yield, quality, margin (e.g. association of pigeon pea in rainfed mountain rice plots may be seen as a risk for production if the farmer thinks the bush will shade the rice and slow its growth);
- the farmer's food: quantity and quality of production for on-farm consumption;
- the farmer's income: sale price of products, securing the market?

Perceptions

Cultural influences

To what extent does the farmer's culture influence his/her perception of agroecological practices and systems:

- taboos linked to production and food: prohibitions imposed by a lineage, social community, religious community, etc. (e.g. in certain communities, faecal matter may not be used to fertilise food crops. Practices for recycling manure or composting with manure are therefore unsuitable);
- social barriers: linked to a person's gender, age or socio-economic category (e.g. certain types of agricultural work are not authorised for women, which may prevent women from implementing certain agroecological practices);
- social recognition: agroecological practices valued or not (e.g. some agroecological practices may be perceived as outdated, old or retrograde compared with the technical "innovations" of conventional farming)?

Perceptions

Effects of agroecology

What is the farmer's perception of the effects of agroecology on:

- profitability: increase (or not) in income for producers thanks to the implementation of agroecological practices and systems;
- employment: improvement (or not) in the attractiveness of the agricultural sector in terms of its ability to provide a stable, income-generating job;
- food security: improvement (or not) in the production system's ability to provide food in sufficient quantity and quality for the household;
- the environment: improvement (or not) in the natural environment and sustainable management of productive natural resources;
- human and animal health: reduction (or not) of the negative factors affecting human and animal health;

- the place of women and young people: greater autonomy (or not), effects on balance of power (access to land, division of tasks on the farm, participation in decision-making, etc.)?

Influence of education and knowledge

A person's level of education is often associated with the ability to accept change and innovate. Individuals who are able to learn on their own will be more capable of evaluating the risks and consequences of a change in practices. Non-academic knowledge, however, which is based on long-held local knowledge and years of practice and experience, must not be ignored. That knowledge is important. It needs to be identified, inventoried and understood, as it may be just as much a tool for the integration of agroecological practices and systems as an obstacle to their acceptance.

Knowledge



Education

For the development of agroecology, does the farmer's level of education influence:

- his/her ability to learn: search for information, participate in technical training, etc.;
- his/her approach to change: ability to modify or change his/her practices and overcome or change his/her perceptions;
- his/her ability to take risks: ability to assess risks analytically and make decisions based on facts and not solely on perceptions?

Knowledge



Know-how

Do agroecological practices and systems make use of traditional knowledge and know-how? How familiar is the farmer with this knowledge and know-how, and what influence do they have on the development of agroecology?

- Negative influence: local practices at variance with agroecological practices, possible break in the transmission of traditional know-how to younger generations (generation that implemented the systems of the Green Revolution, younger generations are less present on farms), etc.
- Positive influence: existing local practices valorised, considered as silent agroecology or closely resembling agroecological practices.

Knowledge



Innovations

Do agroecological practices and systems make use of new knowledge and know-how? To what extent does the farmer have the skills needed to access this knowledge and know-how and put it to use, particularly by conducting experiments?

How willing is the farmer to innovate and seek changes? What are the factors that influence the farmer's ability or desire to innovate?

- Age: different generations of farmers have differing levels of access to information technologies.

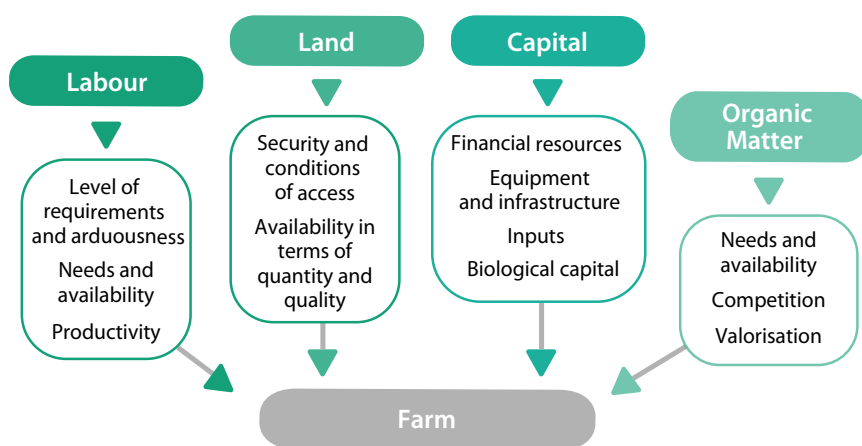
- Gender: each gender has different access to education and training, which may lead to a higher or lower desire to innovate.
- Complexity of the agroecological practices: limited understanding of crop-management sequences or agroecological processes may slow innovation.
- Level of technical change required: adaptive (simple adaptation in the cropping system having no major impact on the other cropping or livestock-production systems), systemic (requires a change in the management of the farm) or transformative (change of values or references)¹.

Factors specific to the farm

The farm is, in a given environment, a production unit within which the farmer mobilises and combines material and immaterial resources to obtain agricultural products. These resources are the production factors, i.e. land, labour and capital (financial resources, equipment and infrastructure, inputs, biological capital).

Access to and use of each of these resources, and the combination of these resources, which makes it possible to characterise different types of farms, may be factors that facilitate or hinder the development of agroecology. They have an impact on the farmer's ability to implement agroecological practices and systems.

Figure 6.3. Factors specific to the farm.



It should be noted that a number of these factors depend on characteristics that are specific to the farm (availability of resources) and characteristics that are specific to the farm's environment (accessibility of resources in the territory). The latter are addressed in sub-section 3 of this chapter.

The typology of farms defined in the approach for one-off evaluations (Chapter 2) may provide additional elements for analysing the conditions necessary for the development of agroecology on farms. Certain types of farms may tend to implement certain practices more or less than others, depending on their own characteristics.

1. See CIRAD's multi-dimensional analysis method in Berton *et al.*, 2018.

Work

Agroecological practices may require more intensive use of labour, particularly during the investment phases. This requirement sometimes hinders the implementation of agroecological practices and systems, especially if the work is considered to be arduous.

Labour



Level of requirements

Does the implementation of agroecological practices and systems lead to differences in terms of how demanding and arduous the work is for the farm's workers with respect to:

- technical aspects: technical change requiring a relatively large mobilisation of labour or the mobilisation of new skills (e.g. replacing application of synthetic chemical inputs with mechanical manual labour for weeding, or the need to learn transplanting for intensive rice-growing systems);
- temporal aspects: change in the duration of work for production systems (e.g. more time monitoring animals and crops to prevent disease and infection, or more time dedicated to planting and maintaining trees);
- quantitative aspects: need to mobilise a large quantity of labour (e.g. for large soil-conservation infrastructure projects requiring collective mobilisation);
- arduousness: relatively large mobilisation of physical strength (e.g. for soil preparation, zai holes or stone barriers)?

Given the level of arduousness and labour requirements, are these changes accessible to any type of farmer, regardless of gender or age?

Labour



Needs and availability

Is the workforce needed to implement the agroecological practices available on the farm? Is it available off the farm?

Does the implementation of agroecological practices require a mobilisation of labour at the same time as other agricultural or non-agricultural works (see question on labour opportunity costs in the paragraph on evaluation questions relating to interests and management objectives at the level of individual farmers)?

If the workforce is from off the farm, does the farm have the means to remunerate a specific paid workforce to carry out the agroecological practices?

Labour



Productivity

Does the investment in labour for the implementation of agroecological practices have an immediate or delayed effect? Is it in line with the farmer's priorities (see section on "Interest" in factors specific to the farmer)?

Land

The availability of agricultural land, in terms of quantity and quality, and the conditions of access to that land have a strong influence on a farmer's ability to implement certain agroecological practices, particularly those requiring a medium- or long-term investment.



Do agroecological practices and systems require sustainable access to land? To what extent is secure access to land a determining factor for the development of agroecological practices (e.g. farmers who own their plots will be more open to making improvements that present a medium- or long-term return on investment)? Is there a social division of land on the farm affecting the conditions of access for certain categories of individuals, and therefore affecting their ability to implement agroecological practices (e.g. access to ownership or to the use of land may be limited for women and young people, making it less possible for them to implement agroecological practices because of their lack of influence in decision-making)?



Is the farm's available land (number of plots and land area) compatible with the land needed to implement agroecological practices and systems (e.g. the integration of crop and livestock production in cattle systems requires the creation of fodder plots, and therefore agricultural land for the production of fodder)?

Is the quality of the available agricultural land (soil quality, slope, access to water, etc.) a factor that facilitates or hinders the implementation of agroecological practices and systems?

Capital

The farm's capital includes financial resources, equipment, infrastructure, inputs and biological capital². The farm's capital, labour and land are the production factors to take into account in the analysis of the conditions necessary for the development of agroecology. Depending on the farm's needs and their availability, they may be facilitating or hindering factors.



Does the implementation of agroecological practices entail specific costs? If so, are these costs:

- one-off investments (e.g. installation of infrastructure) or ongoing investments (e.g. gradual increase in herd size)?
- an increase in annual spending (inputs, paid workforce, etc.)?

2. Biological capital, or "productive capital", is plant or animal material that is used over the medium and long term, i.e. breeding animals, trees, etc.



Does the implementation of agroecological practices require specific equipment or infrastructure? Is the equipment or infrastructure available on the farm? Does the use of this equipment or the installation of this infrastructure require special knowledge or know-how?



Does the implementation of agroecological practices require specific inputs? Are these inputs available on the farm? Does the use of these products require special knowledge or know-how (e.g. production and dosage of biological insecticides)?



Does the implementation of agroecological practices require an investment or use of specific biological capital (e.g. presence of breeding stock of a local breed that is adapted to the locality to increase herd size)?

Organic matter

Organic matter – and therefore its production, collection, transfer, preservation and reuse within the agricultural production system – is often at the heart of the agroecological transition. Its low initial availability, particularly on family farms but also at territorial level, can be an obstacle to the development of agroecology. Even if it is available in sufficient quantity with respect to what is needed, the farmer does not always have the means to valorise or store it, owing to a lack of transport equipment, storage equipment and preservation equipment.



What are the farm's organic-matter needs in connection with the implementation of agroecological practices?

What are the methods and levels of preservation, valorisation and reuse of all organic waste on-site (e.g. valorisation of crop residues, animal housing, installation of husking units in villages)?

How available is this organic waste on farms? How available is it at territorial level? Is its availability a limiting factor for the implementation of agroecological practices, or does it present an opportunity?

Does the use of organic matter need to be prioritised owing to its limited production? If yes, what are the farmers' priorities (e.g. fodder or burial of residues, choice of which plots to fertilise in the case of limited organic manure, sale of residues or manure when money is needed)?



Is production of organic matter in competition with the farmer’s other priorities in terms of mobilising labour or land?

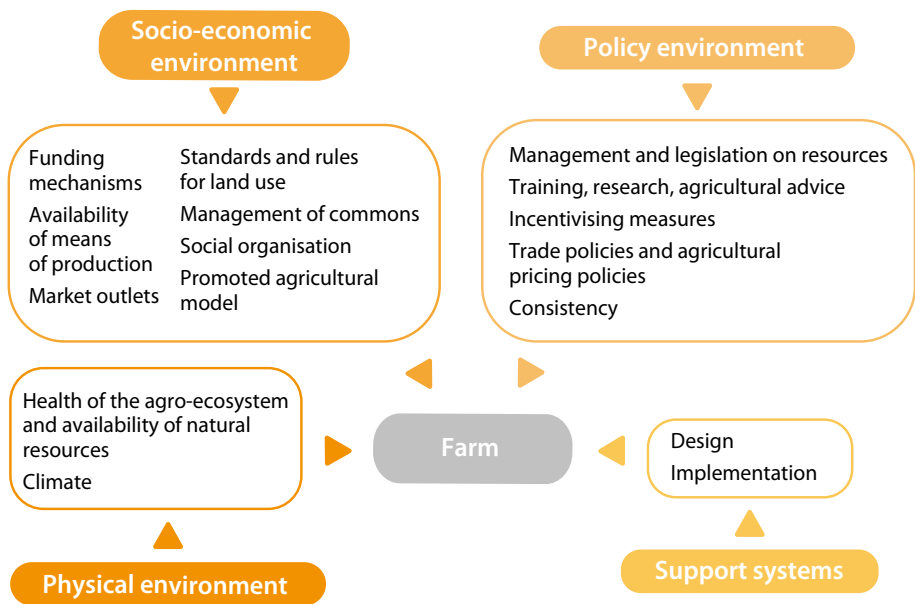


Do the methods for producing, transporting and storing organic matter on site require special equipment or infrastructure? Does the use of this equipment or the installation of this infrastructure require special knowledge or know-how?

Factors specific to the farm’s environment

The different components of the environment in which the farm operates, and their characteristics, also have an impact on the farmer’s interest in and ability to implement agroecological practices and systems. It is therefore necessary to analyse the physical, socio-economic and policy environments in which the farm operates in order to measure their effects on the development of agroecology.

Figure 6.4. Factors specific to the environment.



Physical environment

The state of the physical environment and the conditions of access to productive natural resources may or may not, depending on the context, be favourable for the development of agroecology. For example, an environment where the soils are heavily degraded may be favourable because it increases people's interest in implementing agroecological practices and systems that would help restore them. An environment with low availability of natural biomass, on the other hand, may be a limiting factor for the implementation of certain practices, such as mulching and composting.

Physical environment



Health of the agro-ecosystem

What is the current state of the agro-system³ (see [Chapter 4](#), Agro-environmental evaluation)?

- Water: level of access, availability, quality and quantity.
- Soil: soil type, quality (level of fertility, structure, etc.).
- Biodiversity: type, threats.
- Natural biomass: type, quantity, availability.

How much investment (labour and resources) is needed to restore or preserve this agro-system? Does the required level of investment have an impact on the level of interest among farmers to implement new practices?

Physical environment



Climate

How consistent are rainfall levels and temperatures? What is the level of climate insecurity (intra- and inter-annual variations in rainfall and temperature, prevalence and intensity of extreme climate phenomena)? How do these levels affect:

- the production, quality and availability of the resources needed to implement agroecological practices (water, soil, biodiversity, biomass);
- the implementation of agroecological practices in general?

Socio-economic environment

The socio-economic environment in which farms operate may affect their access to certain production factors and determine the market outlets for agricultural products from those same farms. It therefore has a direct impact on their capacity, interest and possibility of implementing agroecological practices and systems.

Socio-economic environment



Funding mechanisms

What are the funding mechanisms for agriculture (loans, grants, payments for environmental services) that can be mobilised by farms? Are they accessible to all

3. This indicator may be measured based on declarations, or based on elements from the agro-environmental evaluation and on the trend analysis of yields and input use over time.

farms? Do they meet the specific financial needs for the implementation of agroecological practices (see “Financial resources” in the section on capital)?

Are there mechanisms that are specifically targeted at funding the agroecological transition (funding for investments, compensation for lower initial or long-term profitability)?

Socio-economic
environment



Availability of means of production

Are the specific means of production needed for the implementation of agroecological practices (see “Equipment and infrastructure”, “Inputs”, and “Biological capital” in the section on capital) physically available in the territory and financially accessible to farms (e.g. fodder seed may be purchased in the territory at a price that is accessible to farmers, enabling the establishment of fodder systems)?

Are special supply chains required for the marketing of these specific means of production? Is the development of these supply chains hindered by technical, logistical or human limitations?

Socio-economic
environment



Market outlets

Do consumers have a particular interest in agroecological products?

Are there initiatives to inform consumers about agroecological products?

Are there specific market outlets (value chains, markets) for varieties or species produced using agroecological practices, enabling economic recognition (price levels) of agroecological products? Is the development of these specific value chains or market outlets hindered by technical, logistical or human limitations?

Are these market outlets more profitable than outlets for conventional-farming products?

Are there labels or designations for agroecological products that could be used to promote such products among consumers?

Socio-economic
environment



Standards and rules for land use

Are there rules or social standards for land use that could hinder or facilitate the implementation of agroecological practices in terms of:

- compatibility: agroecological practices in line with collectively defined land-use rules (e.g. existence of local agreements for sustainable management of natural resources, such as concerted management of resources or common spaces such as water and pasture);
- divergence: between the common rules and the individual interests of farmers who want to implement agroecological practices and systems (e.g. collective

practices of common grazing where the group's animals consume crop residues in the off-season, limiting the possibility of practising improved-fallow systems with soil cover)?

Do social rules regarding investment in land hinder the implementation of agro-ecological practices (e.g. planting trees may be difficult as it may be seen as a form of land grabbing, or, on the contrary, it may be seen as a positive venture as a way to secure land)?



Which local structures are in charge of managing commons in the farm's environment? To what extent can these organisations contribute to facilitating or hindering the implementation of agroecological practices and systems in terms of:

- compatibility: actions to promote and support the implementation of concerted management of common spaces that is favourable to the implementation of agro-ecological practices, or local initiatives to change local standards for the management of resources in order to make them more favourable to the implementation of agroecological practices;
- divergence: collective actions or initiatives in the management of commons that are unfavourable to the implementation of agroecological practices and systems.



Does the organisation of society generate differences in access to resources based on social group (age, gender, level of education)? Does it generate differences in decision-making power? Does it generate differences in the division of tasks? Does it have an impact on the ability of each of these groups to implement agro-ecological practices?



What is the agricultural model promoted by agricultural and rural training centres and private agricultural advisory bodies (including NGOs, professional farmers' organisations, companies), and by research entities?

What role do companies play upstream and downstream in the promotion and reproduction of this agricultural model (by offering funding, technical advice, advertising, etc.)?

Are there organisations (village groups, civil-society organisations, producers' organisations, cooperatives, etc.) working locally to promote and implement agro-ecological practices and systems? Do they have sufficient human, financial and organisational resources to implement their actions to promote agroecology?

Policy environment

Public policies have an impact on the development of agroecological practices and systems. The content of these policies and the ways they are implemented are all factors that either facilitate or hinder their development. The question then arises as to the nature of public policies and the means allocated for their implementation, as well as policy decision-makers' vision of development and the ability of other stakeholders, particularly those who promote agroecology, to influence them through advocacy initiatives.

Policy environment



Management and legislation on resources

Are sustainable management of natural resources and protection of the environment taken into account in public policies?

What are the laws governing the management of natural resources? Do they hinder or facilitate the development of agroecology? In what way?

Are there laws governing land? If yes, do those laws hinder or facilitate the implementation of agroecological practices and systems?

Policy environment



Training, research, agricultural advice

What is the agricultural model promoted by public training bodies, research entities and agricultural advisory bodies?

Is agroecology included and given priority in their strategic planning or their interventions (research projects, educational content, etc.)?

Policy environment



Incentivising measures

Are there policies to subsidise or to help finance equipment, biological materials or inputs? Do these policies favour the implementation of agriculture based on the Green Revolution (e.g. massive subsidies for synthetic chemical inputs, hybrid seeds) or agroecology?

Are there policies legislating certain types of inputs that facilitate or hinder agroecology (e.g. GMO seeds or farmers' seeds)?

Policy environment



Trade policies and agricultural pricing policies

Are there policies that guarantee or encourage negotiation of remunerative prices? Stable prices? Do they differentiate between agroecological and non-agroecological products?

Are there policies that support production and marketing of agroecology products (e.g. public procurement, creation of markets, promotion among consumers)?

Are there contradictions in the public policies that reduce the effectiveness of public interventions to support agroecology?

Systems supporting the development of agroecology

Support systems that carry out actions to promote and support the implementation of agroecological practices and systems for producers may facilitate or hinder the development of agroecology.

The way in which these stakeholders, both public and private (technical services, civil-society organisations, institutes, experts, producers' organisations, etc.), design, test and implement their interventions has an impact on the dissemination of agroecological practices and systems on farms, and on their potential implementation by farmers.

Is the intervention proposed by the support system consistent with public policies? Does it complement public policies?

Have the factors that facilitate or hinder the development of agroecology been identified? Are they taken into account in the intervention?

Is the identification of which practices to promote based on a sound diagnostic analysis? Does it take into account other experiences? Does it include farmers?

What place was given to farmers' thoughts and opinions in the design phase of the intervention and the support system in general?

Are there already competent support services for the agroecological transition? Are they mobilised by the intervention?

Who are the other key agroecological-transition stakeholders involved in the design?

What is the duration of assistance under the support system? Does the system go beyond initial support (training, advice, provision of equipment and inputs)?

Does the support system enable upscaling, from a few farms to the agrarian system as a whole? Will it be sustained over the long term?

What place is given in the system to discussions between farmers to valorise their knowledge and know-how (an effective way to improve farmers' skills and increase their interest in agroecological practices)?

What place is given to testing by farmers (e.g. through field-school projects) and to farmers' adaptation possibilities?

Do the chosen learning processes facilitate or hinder innovation?

What is the role and positioning of technicians (provision of knowledge, facilitation of testing systems and discussions between farmers)? Have they established a relationship of trust with farmers?

Who are the key agroecological-transition stakeholders (farmers, livestock breeders, retailers, intermediaries, consumers, technical services, etc.) identified and involved in the intervention? Which stakeholders were not taken into account and set aside? For what reasons? And what is the impact on the development of agroecology?

Important

Selection of interviewees

Special attention needs to be given to the profile of the farmer who is interviewed. A person's experiences, perceptions and interests differ and change depending on his/her age and gender.

Interviews conducted only with the head of the farm run the risk of ultimately having a sample comprising mostly men. Sample selection bias will have an impact on the conclusions of the evaluation.

This leads to the risk that certain key factors of the conditions necessary for the development of agroecology relating to other stakeholders, such as women and young people (e.g. arduousness of work, division of workload, decision-making process on the farm, attractiveness of working in the agricultural sector), may not be taken into account.

Likewise, interviews with women should not be limited to women who are the head of a farm, because they do not represent all the different profiles of female farmers. To avoid having too many interviewees for individual interviews at farm level, *focus-group* interview methods may be used to gather additional information from other groups that are under-represented in the sample (women, young people, etc.)

Further reading

Levard L., 2024. *Économie de l'exploitation agricole. Concepts et méthodes pour l'appui au développement agricole dans les pays du Sud*, Éditions du Gret/Éditions Quæ, 264 p.

PART 3

Tool sheets



This part consists of eight tool sheets providing methodological supplements needed at certain stages of the one-off-evaluation approach or the monitoring-and-evaluation approach:

- Tool Sheet 1. Guide for interpreting the agrarian landscape
and establishing zoning 228
- Tool Sheet 2. Guide for interviews on the past and current situation
of the territory 238
- Tool Sheet 3. Inventory and description of agroecological practices 240
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of the territory 250
- Tool Sheet 5. Developing a typology of farms 256
- Tool Sheet 6. Information to gather during case studies and tools
for formatting that information..... 268
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economic calculation and its user manual..... 277
- Tool Sheet 8. Characterisation of the degree of agroecologisation
of farms..... 281

Tool sheets 4, 7 and 8 also refer to documents available on the websites of Éditions du Gret and Éditions Quæ.

Guide for interpreting the agrarian landscape and establishing zoning

The interpretation of the agrarian landscape and the establishment of agro-socio-economic zoning are conducted in Stage 1c of the first phase of the one-off-evaluation approach (Chapter 2). This tool sheet defines the methodological approach.

1. PURPOSE OF INTERPRETING THE LANDSCAPE AND THINKING IN TERMS OF ZONING

Once the initial scoping for the evaluation has been conducted (Stage 1a) and consultation with stakeholders in the territory has been completed (Stage 1b), the evaluator must characterise the agrarian landscape and carry out an initial survey to identify the various agricultural practices.

Given the objectives of the evaluation, this landscape-based approach presents at least three advantages. First, it makes it possible to understand **how agricultural practices are linked to space**, i.e. to know the conditions necessary for their implementation – in other words, the opportunities or constraints presented by the environment regarding what is done or what is possible to do in terms of using the land for agricultural purposes.

Second, understanding and characterising the agrarian landscape makes it possible to have an initial approximation – based on observations and hypotheses – of **the spatial organisation of farms**, i.e. the different terroirs to which farmers have access, their various uses, and the relationships and flows that may exist between them and externally. The purpose is to understand not only which practices are or may be implemented in the different zones or terroirs in question, but also to understand the interactions that may exist between them (e.g. in terms of fertility transfers). In this initial approach concerning agricultural practices, the evaluator must develop an initial understanding of the main ways in which the land is used, while paying particular attention to those that could fall within the scope of the principles of agroecology.

Lastly, from this detailed and methodical observation of the landscape, a number of partial hypotheses may be formulated concerning the **past processes** which have given rise to it and, in particular, the **differentiating factors** behind the different practices and different types of farms existing today. In this sense, the observation work prepares the way for the subsequent stages, particularly the analysis of the historical dynamics and dynamics for technical and socio-economic differentiation of farms (see Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory).

In summary, the interpretation of the landscape and the establishment of zoning at the level of the region covered by the evaluation make it possible to identify **homogeneous landscape units** (which may be terroirs, agroecological zones or parts of the cultivated ecosystem) and formulate **hypotheses** on the connections between

these different units and their past and current agricultural uses. This approach is therefore essential in terms of thinking about the conditions necessary for the development of agroecology.

This tool sheet proposes methodological tools to take into account in this landscape-based approach. It is based on the work carried out in the middle valley of the Senegal River as part of the GTAE's activities¹.

2. IDENTIFYING THE DIFFERENT COMPONENTS OF THE AGRARIAN LANDSCAPE AND HOW THEY ARE CONNECTED

At a given scale – whether cultivated plot, village farming area or territory – the agrarian landscape is a visual expression of the different ways land is used for agriculture. More specifically, it is a complex combination of ecological, technical and socio-economic factors². Understanding the landscape therefore first requires methodically identifying its various components and establishing the relationships between them, their overall consistency and how they are organised. “Starting from what is visible, we decipher the systems that are contained in the space and that have an impact on the space.”³

The landscape has many overlapping components, but they may be observed by focusing on various large units⁴ (see Table 1). As the physical medium for all agricultural land uses, **reliefs** as well as the **geologic substrates** underlying reliefs, the soils covering reliefs and the water channels cutting through, traversing and watering reliefs are all elements whose observation may be prioritised initially, as we will see in the example of the Senegal River valley.

It is on this physical medium that the **different types of vegetation** then grow. These types of vegetation are mostly determined by topography, the nature of the soil or the availability of water. Wild vegetation and cultivated vegetation – whether herbaceous, shrubby or woody – must be included here, as the boundary between the two is often permeable, which can be seen clearly in rangelands and temporary fallow land. Because of the seasonal development of the vegetation, observations should be made at different times of the year, where possible. In many contexts, the types of fodder vegetation present in the different terroirs and their seasonality will be decisive for determining the place occupied in the landscape by **domestic animals** – particularly large and small ruminants – throughout the year.

Lastly, another essential unit of components of the agrarian landscape comprises **improvements** in the biophysical environment and human **constructions**, particularly those that are directly or indirectly linked to crop- or livestock-production activities. These include elements that determine specific uses of certain terroirs that would not be conceivable without them. This is the case with the terracing of slopes in order to favour cultivation with animal traction or mechanised equipment in places where the slopes are particularly steep, or with irrigation at different scales using different methods, enabling farmers to no longer be constrained by rainfall.

1. Jestin, 2021.

2. Cochet *et al.*, 2007.

3. Deffontaines, 1973, p. 6.

4. Cochet *et al.*, 2002.

Table 1. Major units of the landscape's various components.

Units	Components	What is observed? How? What skills are needed?
Physical environment	Types of relief	Units of relief (valley floors, interfluvies, slopes, summit benches, etc.) and their shape (e.g. straight slopes? Convex slopes? Convexo-concave slopes?) Direct observation, use of a topographic map, drawing of sketches and transects Know how to read a topographic map, have a basic understanding of geomorphology
	Rocks that influence relief and surface formations	Substrate outcrops, surface formations, links between substrate and relief Direct observation, use of a geologic map, collection of samples Know how to read a geological map, have a basic understanding of geology
	Soils	Soil types, elements for pedological assessment (texture, colour, depth, thickness of humus layer, useful reserve, etc.) Direct observation, use of an auger, sausage test (texture), samples for physical-chemical analyses (cation exchange capacity, salinity, C/N ratio, etc.) Have a basic understanding of pedology
	Water resources and circulation	In connection with relief units, substrates and soils: hydrographic network (and hydraulic network in certain contexts: irrigation, developed lowlands, etc.), location of sources and aquifers, degree of waterlogging in soils Direct observation, use of topographic and geologic maps Have a basic understanding of hydrology and hydrogeology
Types of vegetation	Wild vegetation	Species, types of formations (forest, woody or shrubby reverted land, savannah, permanent grasslands), location, resources and uses of these spaces. Participative direct observation, works on local flora. Have a basic understanding of ecology and botany.
	Cultivated vegetation	Cultivated species, perennial crops (location and distribution: orchards? Wooded parks? Hedges along plot border? etc.), annual crops (location, tillage, cropping practices observed, etc.), crop associations, etc. Participative direct observation Have a basic understanding of agronomy
Improvements	Buildings, enclosures, paths and roads, hydro-agricultural developments, earthworks, markets	Buildings: location, function, connection with cultivated spaces Paths and roads: location, spaces they connect Irrigation: organisation of the network, works, irrigation systems Participative direct observation Have basic technical familiarity in order to understand the function of the improvements or how they work

This unit also includes improvements and constructions that provide information on the spatial organisation of farms and on the existing relationships between the different terroirs to which the farmers have access. These include, among others, human dwellings (concentrated or dispersed), plots (fragmented, surrounding the dwelling, etc.) and physical barriers along their boundaries (e.g. fences, hedgerows to keep animals out of cultivated areas), agricultural buildings, equipment kept in those buildings, animal pens, paths for rangelands used by transhumant herds, watering points, etc. Lastly, the above list should also include communication channels (paths, roads) linking the different terroirs and constructions, which enable the movement of people and the transport of agricultural products and means of production passing through local markets.

It should be noted that observing all these elements may give an idea of the nature of the **social relationships** determining access to resources (fenced plots suggesting a land-tenure system based on individual access rights, and undivided rangelands suggesting the existence of commons) or **differences between peasant farmers** (differences in plot size, different levels of equipment, unequal access to irrigation, nearness to or remoteness from communication channels and markets, etc.).

3. MAKING THE LANDSCAPE INTELLIGIBLE AND ESTABLISHING ZONING

Interpreting the landscape consists in making a detailed and methodical observation of the various components presented above. This interpretation must make it possible to establish zoning, i.e.:

- delimit the different sections of the landscape in order to be able to better observe and describe each of them;
- formulate hypotheses, based on the observations, on how to use the land within these different sections or zones;
- formulate hypotheses, based on the observations, on the relationships between these different sections.

The rest of this tool sheet focuses on an example of land zoning in the middle valley of the Senegal River⁵.

1. Identify the major landscape units based on the main key features of the landscape

A landscape's relief and the watercourses shaping its relief are very often the main key features of the landscape, enabling an initial attempt at zoning. Initially, zoning may be based on the identification of geomorphologic units, i.e. characteristic, localised and recurring forms of relief often associated with specific soil series. The structuring nature of the relief is evident in particularly mountainous landscapes where major units – valley floors, continuous or irregular slopes, intermediary benches, summits, etc. – may be marked by large differences in slope and separated

5. Jestin, 2021.

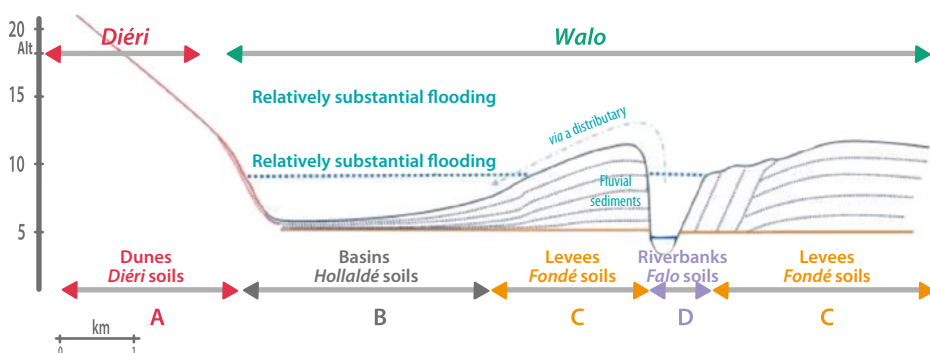
by significant differences in altitude, determining a characteristic terracing – altitudinal zoning – of the different land uses. Andean valleys are a particularly good example of this. However, this terracing may also exist in landscapes that are clearly flatter and more uniform, where very small changes in elevation can lead to significantly different land uses. This is the case in the middle valley of the Senegal River, where clear differences in land use are seen over very slight changes in altitude (10 to 15 metres).

In Guédé, on both sides of the minor bed of the Senegal River and its branches (Gayo and Doué), there are four major land types. The first three are located within the major bed of the river – 20 to 25 km wide – and are caused by erosion and the seasonal deposit of alluvium during the high-water period. Just after the start of the rainy season, the rising water floods all of the major bed from mid-July to early October, and then gradually recedes until mid-December. The area covered by the rising water is known locally by the Pulaar word *walo*. This area contains slightly sloping land along the banks of the Senegal River, where every year flooding is followed by the deposition of fine alluvium (clay). The soils – called *falo* – which form on the riverbanks are therefore compact and clayey (swelling clay), and retain moisture for a long time. Clay deposits on riverbanks also occur in vast basins fed during the high-water period by a network of tributaries and distributaries of the Senegal River. On these relatively flat basins, soils are formed which are also very clayey and which the farmers refer to as *hollaldé*. Lastly, these decantation areas are separated from one another by scroll bars, or levees, which are generally drained during the high-water period and where alluvium is deposited that is older and often more coarse. Sandy-clay-loam soils – called *fondé* – are formed there.

Finally, on both sides of the major bed, from 5 to 6 metres above the minor bed, there is a dune landscape through which the Senegal River has carved out a passage: the *diéri*. Composed of aeolian sand several metres thick, it gives rise to sandy soils that are slightly oxidised. This area marks the transition with the cuirasse plateaus, which are located between 5 and 10 km from the edge of the major bed.

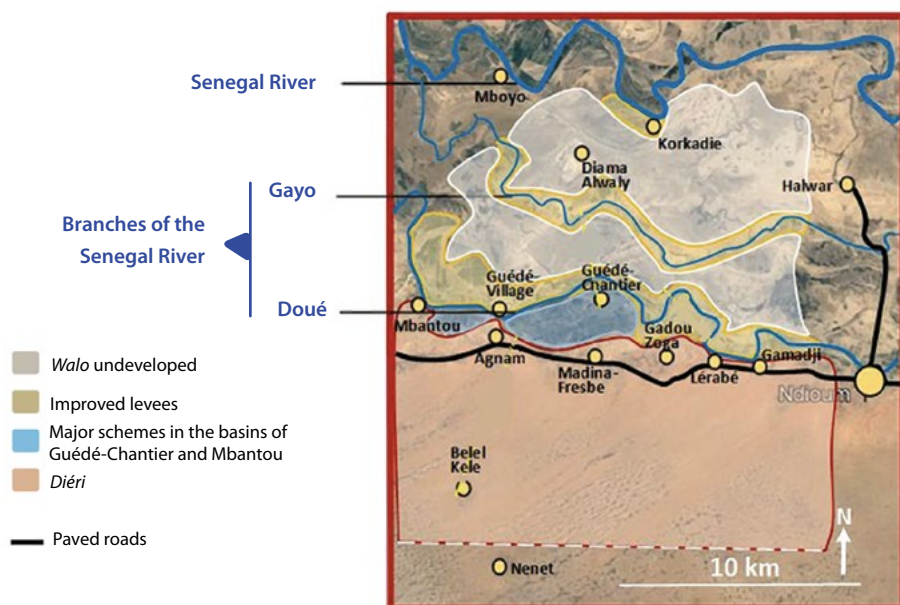
While the different land types described above are the result of a long process involving the erosion and deposition of various materials in accordance with the rhythms of the annual flood/recession cycles, their possible uses should be seen in the context of the advanced irrigation improvements they were subject to.

Figure 1. Cross-section of the valley of the Senegal River.
Relief units and land types.



The hydraulic network also structures the landscape, and the possibility of irrigating or not must be taken into account during zoning (Figure 2). Certain basins were protected by levees enabling control over the entry of water through various works (valves, pump stations or motor-pump units), and were then developed into irrigated segments (levelling, delimiting plots with small levees). These improvements also concerned scroll bars, deeply transforming the possibilities for land use. It should also be noted that the quality of the improvements – i.e. their capacity to enable good control over irrigation and drainage – is very unequal.

Figure 2. Zoning: land types and location of major schemes, villages and roads.



2. Establishing hypotheses on the different forms of land use for agriculture in the different zones

The major key features of the landscape enable the evaluator to define a certain number of land types, from which it is then possible to characterise the **specific forms of land use for agriculture** (Figure 2). Among these forms, the evaluator may start to identify those which could fall within the scope of **practices that are agroecological to a greater or lesser degree**.

In the region around Guédé, the key features are the relief and the soils shaped by flood/recession cycles on the one hand, and the hydro-agricultural developments that enable irrigation of some of the basins and levees on the other hand. Based on this, it is possible to establish an initial zoning and make multiple observations at each of the different scales to describe how each of the identified zones is used throughout the year. At this stage, the observation may be “participative”, based on explanations provided by the farmers who shape the landscape on a day-to-day

basis. The synthesis of this work must make it possible to establish the connection between the different components of the landscape in each zone and may be strengthened using different forms of complementary representations: cross-section (Figure 1), map (Figure 2), summary table (Figure 3). In summary:

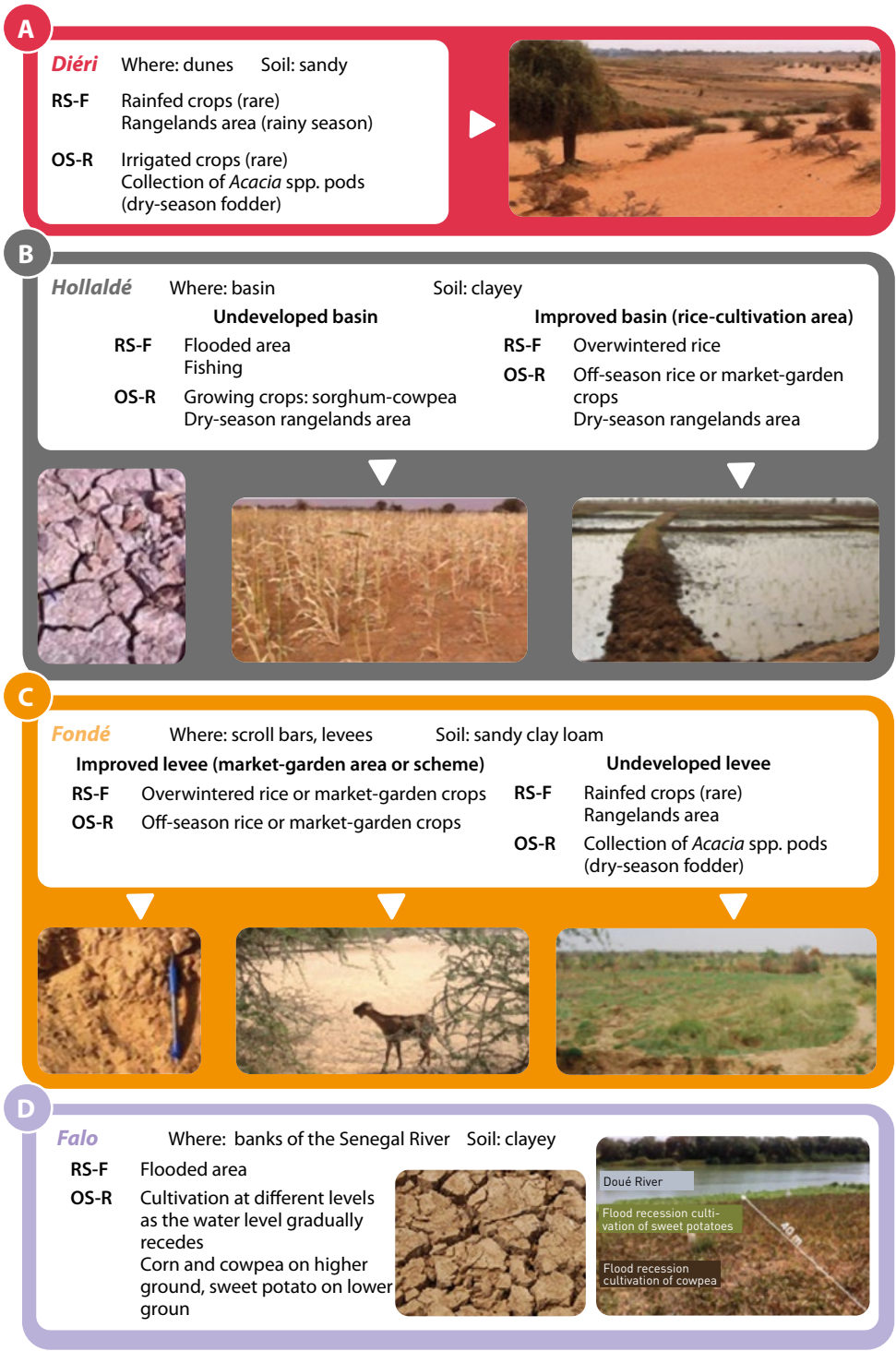
- on the *diéri* dunes, land use is largely determined by rainfall patterns. During the brief rainy season (June to September), cattle and goats graze the fast-growing grass. They are confined at night in pens whose location may change from year to year. Small plots where old pens used to be located – and which benefit from the organic matter deposited there by the animals – may be cultivated under rain-fed conditions using manual tools (millet associated with cowpea and watermelon), with results limited by the low useful reserve of the sandy soils. During the dry season, the pods of *Acacia* spp. are one of the rare fodder resources available with rice straw from improved basins and levees (see below);
- on the *hollaldé* soils of undeveloped basins, farmers grow flood-recession crops using manual techniques (sorghum associated with cowpea) when the water level of the river starts to drop. Some of these basins may also be used as rangelands, but the absence of fences around the cultivated plots limits this use. During the high-water season, the basins are flooded and used for fishing;
- improved basins are large irrigated areas that are particularly conducive to growing rice because of their clayey soils. Dyking them makes it possible to control the entry of water by gravity during the rainy season and to grow rice there over the winter using partially mechanised techniques. The installation of a means of pumping water also makes it possible to grow crops (rice or market-garden crops) during the off-season. On the *fondé* soils of the levees, double cropping (overwintering and off-season) is also possible so long as the abovementioned means of pumping water is available year-round. Without a means of pumping water, the forms of land use are more like those observed for the *diéri*;
- on *falo* land, female farmers grow crops along the riverbank during the off-season, planting them little by little as the water level recedes (corn associated with cowpea and sweet potato at ground level).

3. Initial thinking on the spatial organisation of farms and on their diversity

In addition to making a detailed observation of the different forms of land use for agriculture within each identified zone, the evaluator must also seek to understand the **relationships between them** and discern the different **levels of organisation of the landscape**, which are not always visible at first glance. The purpose, for example, is to better understand the composition and structure of village farming areas and the spatial organisation of farms. Observations must here give greater importance to interviews with farmers, which are particularly effective as they are based on past experience.

If we return to our example of Guédé, the type and location of dwellings may be a good place to start in terms of rendering these levels of organisation in an intelligible way. Dwellings are always grouped together in villages located along the Senegal River or along its branches. We will distinguish between three different situations

Figure 3. Summary of the different forms of land use for agriculture in each identified zone.



RS-F: Rainy season or flood period; **OS-R:** Off-season or recession period

depending on their location (Figure 2), and therefore on their inhabitants' specific access to each of the identified zones or terroirs:

- villages (50-100 households) situated on the *diéri* dunes bordering the major bed. Their inhabitants have access to rangelands on the *diéri* dunes and to improved and undeveloped basins. The farms combine cattle and goat farming on *diéri* rangelands (during the rainy season) with flood-recession crops and irrigated crops on the *hollaldé* soils of the basins. The fodder deficit in the dry season is made up for with stocks (rice straw) or long-distance transhumance;
- villages (50-100 households) located on levee land within the major bed. The inhabitants of these villages live farther away from the *diéri* and have smaller livestock-production operations. During the high-water period, farmers combine growing overwintered rice on the improved basins or levees with fishing on the flooded undeveloped basins. During the off-season, flood-recession crops are grown on the undeveloped basins, and rice or market-garden crops may be grown on the improved basins and levees. Some of these villages, however, are located far from the improved basins and levees – which tend to be concentrated near the main road through the valley on its left bank – which makes it harder for inhabitants to be able to grow irrigated crops;
- a large village, Guédé-Chantier (6,000 inhabitants), next to a large improved basin. Guédé-Chantier is a village that was built at the time the large basin bearing the same name was developed. It comprises households from villages all along the valley that have a plot within the improved area. These households may, however, have access to other areas in the different terroirs considered here, both improved and undeveloped, thus giving rise to a variety of situations.

4. Linking with the rest of the evaluation approach

This initial overview of the different parts of the landscape, their forms of land use for agriculture and the possibility of combining them on farms at different locations in the region covered by the study may give rise to a certain number **of hypotheses and questions** that the evaluator must work on in the subsequent stages of the evaluation. The next step is to better characterise the diversity of farms and the role that agroecological practices play on farms based on the historical dynamics that gave rise to these farms (Stage 1d of the general approach for evaluations), and on a thorough analysis of their technical functioning and their economic and environmental performance (stages 2b and 2c of the general approach).

If we return to the example of the Guédé region, the landscape approach and the resulting zoning are an invitation, for example, to focus on the historical dynamics that are specific to the different types of villages identified. The differences in access to the various improved and undeveloped terroirs implies distinct local evolutions of agriculture and farms from very specific trajectories. Also, the spatial concentration and differences in the quality of hydro-agricultural developments are an invitation to focus on the role of irrigation as a differentiating factor for farms throughout the region. The bigger schemes and the type of agriculture practised there (rice growing and market gardening with intensive use of inputs) suggest exogenous intervention methods and other agricultural policy measures (subsidies for inputs, marketing

support), modulating these same differentiation processes and limiting in this case the emergence of practices that are more agroecological.

Lastly, the landscape approach and zoning (and their consolidation when working on the historical dynamics) are an invaluable help when conducting the detailed farm surveys on which the description of the cropping systems, livestock systems and production systems will be based. In the example used in this tool sheet, for instance, they make it possible to establish an initial classification of cropping systems based on the terroir (*diéri*, *hollaldé*, *fondé*, *falo*) and on access to irrigation, as the quality of access to irrigation can increase the number of possible systems or sub-systems. By establishing an **initial deciphering** of the spatial organisation of farms and the possible uses of the different terroirs throughout the year, they help subsequently facilitate a better understanding of how the farms operate and the conditions necessary for the development of agroecological practices and systems on those farms.

Further reading

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Cochet H., Brochet M., Ouattara Z., Boussou V., 2002. *Démarche d'étude des systèmes de production de la région de Korhogo-Kouloukakaha-Gbonzoro en Côte d'Ivoire*, Éditions du Gret.

Deffontaines J.-P., 1973. Analyse du paysage et étude régionale des systèmes de production agricole. *Économie rurale*, 98 (1), 3-13.

Guide for interviews on the past and current situation of the territory

This tool sheet is a guide for conducting interviews on the past and current situation of the territory, which are carried out in Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory, of the general approach for one-off evaluations ([Chapter 2](#)). The objective is to summarise the **essential themes** that should be covered in the interviews.

Although some interviews focus more on the territory's agrarian history and others on its current situation, there is a complementarity between the two approaches and therefore between the two types of interviews. It is largely the historical approach that makes it possible to interpret the current characteristics of the territory and its agriculture. The themes are therefore common to both types of interviews, but those focusing more on the "current situation" make it possible to delve deeper into certain questions. Depending on the interviewee, each theme may be explored to a greater or lesser degree. Some interviews on the current situation may also focus on specific questions (loans, marketing of products, agricultural advisory services, intervention of stakeholders promoting the development of agroecology, etc.).

The themes presented in this tool sheet must not be addressed independently of each other. A key objective of this stage is to consider changes in the socio-economic environment in relation to changes in the agrarian structure and land-use pattern (differentiation of farms). This will make it possible to highlight changes that are more or less agroecological in land-use patterns (particularly dynamics of innovation, development, regression and disappearance of agroecological practices and systems) and the factors behind these changes. Likewise, this stage aims to formulate hypotheses on the current links between the socio-economic environment, land-use pattern and main problems of various types of farms (see [Tool Sheet 5](#), Developing a typology of farms), and in particular hypotheses on the conditions necessary for the development of agroecology.

Interviews focusing on the past begin by exploring a situation from the past (period that the interviewee can remember or knows about): occupants, activities, landscape, land, land-use pattern, social relations, etc. This is followed by a discussion of the changes that have occurred over time, ending with a characterisation of the current situation.

If there is a key feature in the territory, a complementary approach may be implemented to characterise the issues relating to this element (see [Tool Sheet 4](#), Grid for analysing issues linked to a key feature of the territory).

1. SOCIO-ECONOMIC AND INSTITUTIONAL ENVIRONMENT

For each characteristic of the socio-economic environment, it is important to consider its potential impact on farmers' production choices, particularly regarding the development (or non-development) of agroecology. Any significant differences between the territory's different zones should be identified:

- economic stakeholders linked with agriculture (traders, stakeholders in the processing of agricultural products, provision of inputs and equipment, etc.), activities;
- organisations and institutions: agricultural organisations, interprofessional organisations, public and private research institutions, training institutions, agricultural advisory institutions, lending institutions, NGOs;
- legal and regulatory framework;
- dominant production and trade relationships: conditions of access to land, labour, loans, markets (methods for setting prices, markets with varying degrees of competition, etc.);
- markets and conditions of access to markets for the different types of products and means of production, particularly transport and logistics conditions for marketing, average level of agricultural prices, seasonality and interannual volatility of prices, price trends, negotiation conditions;
- conditions of access to information (agricultural techniques, markets and prices, etc.);
- security situation;
- public policies in terms of infrastructure, intervention on markets, access to land and natural resources, direct provision of goods and services (agricultural loans, technical advisory services, etc.), income transfers (taxation and subsidies) and regulation (on products, production methods and social relationships).

2. AGRARIAN STRUCTURE, LAND-USE PATTERN, DYNAMICS, MAIN PROBLEMS

These themes make it possible to formulate hypotheses for the development of a pre-typology of farms, as well as hypotheses on the historical trajectories of the various types, on changes in and the current situation of agroecology, and on the conditions necessary for its development:

- farm size;
- quantitative scale;
- connection with agro-socio-economic zoning;
- existence of extra-agricultural jobs and income;
- fundamental objectives;
- specific production and trade relationships for access to productive resources (land, labour, means of production, services, money) and for the marketing of agricultural products, differentiating between relationships involving a transfer of value and relationships of cooperation;
- land-use patterns: crop- and livestock-production activities, types of equipment, use of inputs, method of reproducing fertility, existence of practices and systems in line with the principles of agroecology;
- economic, social and ecological dynamics, and main problems (constraints) affecting farmers and territories.

Further reading

Cochet H., 2015. Making History in Comparative Agriculture, Chapter 8, in Cochet H. *Comparative Agriculture*, Éditions Quæ/Springer, 101-108.

Inventory and description of agroecological practices

This tool sheet aims to present the method for inventorying and characterising practices that are presumed to be agroecological. The method may be integrated in stages 1c (Characterisation of the landscape, and identification of agroecological practices and systems) and 1d (Reconstitution of the agrarian history and assessment of the current situation in the territory) of the general approach for one-off evaluations ([Chapter 2](#)).

1. OBJECTIVES

The aim of inventorying and characterising agroecological practices is to:

- identify practices that are presumed to be agroecological and how they can be combined (or not) in production systems that are more or less agroecological;
- incorporate, based on this identification, the diversity of these practices in the purposive sampling established in the second phase of the general approach for one-off evaluations (Stage 2b, In-depth case studies of farms).

An initial inventory and an initial characterisation of practices presumed to be agroecological may be produced rather early in the study, in particular through a specific and complementary approach during the initial stages of the diagnostic analysis of the agrarian system (stages 1c, Characterisation of the landscape and identification of agroecological practices and systems, and 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory). This approach is presented in this tool sheet.

Certain practices are easy to identify if they have been implemented as part of projects supporting the agroecological transition, through which a number of farms received assistance. There is a risk, however, of focusing only on promoted practices and forgetting the other agroecological practices that exist in the agrarian system, including practices that have been implemented for a long time and that may go unnoticed without a specific method in place to help identify them.

2. METHODOLOGY

1. Helping identify practices

It is important to detect agroecological practices at different levels:

- on all types of farms;
- in all agricultural activities: crop production (soils, plants), livestock production, management of productive natural resources (irrigation), etc.;
- at all scales: plot, farm, irrigated scheme, territory.

It is important to make sure you have the means necessary for identifying specific, isolated agroecological practices so that they are taken into account in the sampling of farms. This is particularly the case if the agrarian diagnostic analysis

does not enable clear identification of production systems that are more or less agroecological, as is the case in certain irrigated systems.

It may be useful here to define:

- practices implemented by a large number of farms (popularity);
- how innovative the practices are (even if not widely practised in the area in question);
- practices that, even if isolated or not widely practised, would be very useful to replicate in the territory and, in the case of irrigated systems, in individual or collective irrigated schemes.

The **classification** presented in Table 1 may be used to help identify the practices (some practices may belong to more than one group). For each group, the type of objectives these practices may decisively contribute to was identified: production, autonomy, improving soil fertility and water availability, other positive effects on the environment (biodiversity, no contamination), mitigating and adapting to climate change.

2. Creating a grid for characterising and analysing agroecological practices

To create an inventory of agroecological practices, it is necessary to study each practice individually in relation to the context in which it is used, its nature and its particularities (e.g. an irrigated scheme), and then evaluate its results. The scope will be limited to field-level practices which have a direct impact on soils, water and crops, and which are implemented on a relatively small scale (mainly plot and farm). It is entirely possible, however, to also document practices implemented at territorial level, provided they are correctly identified.

For each agroecological practice, the inventory can be broken down into two stages.

- The first stage is **descriptive**. It describes the practice at the level where it is implemented (plot, farm, hydraulic unit, etc.), relating it to the system it is part of and therefore to its socio-economic and environmental context, as well as to the stakeholders involved. Later in this tool sheet, we present a series of questions to help describe each practice, retrace its history, identify the problem it addresses and characterise the drivers of and obstacles to its development.
- The second part is **analytical**. It provides an analysis of the practice in relation to the principles of agroecology. Later in this tool sheet, we present a series of questions to help analyse each practice.

The results are summarised in a table which presents all the agroecological practices identified in the zone covered by the study in relation to the principles they reflect.

A second table may be produced based on the initial observations, in order to summarise certain combinations of practices in the zones covered by the study. These summary tables provide a quick indication of the diversity of agroecological practices in the zone covered by the study.

● Description of the agroecological practices

The questions presented below enable the person in charge of the study to describe each practice, retrace its history, identify the problem it addresses and characterise the drivers of and obstacles to its development.

Name and classification of the practice

What is the name of the agroecological practice?

Which class(es) of agroecological practices does it belong to (crop diversification and rotation, agroforestry, integration of agriculture and livestock production, management and conservation of soil and water, biological and mechanical control, other alternative solutions to pesticides, farmers' seeds, improvement of irrigation practices, etc.)?

Context of the practice and territorial roots

On what scale(s) is this practice used (plot, farm, hydraulic unit, irrigated scheme, territory, watershed, landscape)?

In the case of an irrigated system:

- Who are the stakeholders and actors in the irrigated system, or outside the irrigated system, involved in this practice? What are their roles?
- Is this practice internal or external to the irrigated system? Does it have an impact on the irrigated system? If it is internal to the system, what effects does it have on the irrigated system?

Description of the practice

How does this practice work, and what are its main characteristics (what does the implemented technique involve, what tools and material resources are used, at what time of the year or growing season is it implemented, etc.)?

What financial resources are needed to implement this practice (for the investment and for maintenance)?

What raw materials are needed to implement this practice? Where do they come from and in what quantities?

How many people (labour) are needed to implement this practice and make it last: one person/two or three people/several people/a very large number of people (to be specified for each scale at which the practice is implemented)?

Who are the people involved (women, men, young people, elderly people, etc.)?

What knowledge is needed to implement this practice?

Does this practice require access to particular land or water resources?

Is this practice influenced by specific social or cultural norms in connection with beliefs, ancestral practices, customary law?

Does this practice mainly affect women or men, young people or elderly people? Why and how?

Table 1. Classification of agroecological practices for each main objective.

Practices considered		Objectives					
		Climate change					
		Availability of water					
		Biodiversity					
		Soil fertility					
		Autonomy					
		Production					
Diversification and crop rotation	Diversification as such Crop associations Crop rotations (particularly rotations that include legumes)						
Agroforestry	Planting, maintaining and using trees in fields Planting, maintaining and using hedgerows Assisted natural regeneration (ANRI), whether in cultivated fields or pastoral spaces Reforestation						
Integration of crop and livestock production	Fodder crops and valorisation of agricultural and forest production for fodder Valorisation of animal waste to fertilise fields (paddock, paddock manure, manure, compost) Possibility of also valorising household waste Use of animal energy (tillage, transport, drawing water, processing agricultural products)						
Management and conservation of soil and water	Covering and protecting the soil (keeping crop residues on the surface, catch cropping, mulching) Burying organic matter (manure, crop residues) Cropping in basins, zai and half-moon trenches Sowing on contours Stone barriers and grass strips						

Biological control and use of alternatives to pesticides	Biological control through the conservation and management of habitats Use of natural pesticides Mechanical weed control					
	Farmers' seeds	Massal selection of seeds Cropping and seed-saving Farmer-to-farmer exchanges Testing of new species and varieties				
Collective practices		Collective actions and creation of producer groups to procure agroecological inputs and equipment, valorise their production through processing or new markets, and have greater influence and negotiating power with other stakeholders in value chains Collective practices specific to irrigated systems: - weeding along the edges of canals - raising fish in canals, ponds, flooded plots and drainage areas Planting and maintaining trees to limit evaporation, and potentially to reuse the biomass Cleaning of canals and use of sediment as an amendment Valorisation of invasive plants for composting or mulching Grazing along canals				

History and trajectory of the practice

How did this practice come to be, and how was it introduced (origin)?

Since when has this practice existed?

Why was this practice introduced, and what are its advantages in relation to existing practices?

How has this practice changed technically and spatially (limited within the territory, widespread, etc.)?

What were the main stages in the development of this practice?

What difficulties and obstacles were encountered, and how were they overcome?

If this practice has been disseminated, how did it happen?

Main problems this practice is seeking to solve

What issues can this practice address?

Which ones can it solve? For example, in the case of an irrigated system, are these issues linked to the irrigated scheme as a hydro-agricultural development, or are they linked to irrigated production?

Drivers and obstacles for the implementation and development of the practice

Have elements or conditions that facilitate or hinder the implementation of this practice been identified? For example, in the case of an irrigated system, are there potential constraints linked to irrigation vis-à-vis this practice (e.g. water tower and flow of canals, persistence of a layer of flood water in rice-growing systems, homogeneity of landscapes preventing diversification, potential water pollution, density of rodents)?

Does this practice require modifying how water is managed?

Are there other elements or conditions that could make it possible to develop this practice on a larger scale?

Did the development of this practice require support from a group of farmers or specific policies?

Is there policy support facilitating the implementation or development of this practice? If yes, in what form (subsidies, investments, awareness-raising, etc.)?

● Analysis of agroecological practices

This sub-section analyses the practice with regard to the principles of agroecology presented in [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms⁶. For each principle, the purpose is to provide detailed information on how the practice in question reflects the principle, by giving precise answers to

6. With regard to the FAO's elements of agroecology (FAO, 2018), we have used (and adapted) only those that concern practices implemented at production-system and farm level, even though some of them also have indirect effects on the agroecological nature of the entire agrifood system. We have not used certain elements that seem to us to be more effects or conditions necessary for the development of agroecological practices and systems, i.e. that do not characterise the practices themselves.

the questions listed. Please note: since an individual practice does not necessarily reflect all of the proposed principles, answers should be provided only for the relevant principles.

Cultivated biodiversity and livestock biodiversity

Does the practice valorise animal biodiversity (wild and domesticated) and plant biodiversity (wild and cultivated): diversity of crops, diversity of animals? If yes, how? If no, why?

Synergies

Does the practice generate synergies such as:

- integration of crop and livestock production: if yes, how? If no, why?
- crop rotations and crop associations: if yes, how? If no, why?
- integration of trees and hedges in the agricultural production system: if yes, how? If no, why?
- contribution to connectivity between the different elements of the agro-ecosystem and the landscape: does the agro-ecosystem present a mosaic of diversified landscapes or many elements such as trees, bushes, hedges or ponds that are integrated or adjacent to crops and grasslands? Does it include many semi-natural areas or ecological compensation areas: if yes, how? If no, why?

Does the practice generate other synergies that strengthen food systems, improve production and support ecosystem services? If yes, which ones and how? If no, why?

Saving and recycling of elements

Does the practice make it possible to save or recycle water? If yes, in what proportions and how? If no, why?

Does the practice make it possible to save or recycle energy: does the energy used come from renewable sources on the farm (animal traction, wind, water, wood, biogas, solar)? If yes, in what proportions and how? If no, why?

Does the practice make it possible to recycle organic matter and nutrients? For example, are non-exported products and joint products of the production system recycled on site (decomposition, burning, consumption by animals, transfers to other crops)? If yes, in what proportions and how? If no, why?

Are specific practices implemented to limit carbon and nitrogen losses over the course of the cycles (composting of manure, nitrate-fixing intermediate crops, collection of runoff from manure, etc.)? If yes, which ones and how? If no, why?

Autonomy of the system

Does the practice make the system more autonomous in terms of inputs: are inputs produced on the farm or acquired from neighbouring farms? If yes, in what proportions and how? If no, why?

Does the practice enable the development of fertilisation practices that make the system autonomous in terms of fertilising elements? Are organic fertilisers used for fertilisation (manure, slurry, compost, green manures, plant residues)? If yes, in what proportions and how? If no, why?

Does the practice improve sanitary and phytosanitary protection? Are biological products used for the phytosanitary protection of crops and the sanitary protection of livestock? If yes, in what proportions and how? If no, why?

Does the practice have an impact on the autonomy of genetic resources? Do plant genetic resources (seeds, seedlings) and animal genetic resources (animals, animal semen) come from the farm, or are they acquired through exchanges with other peasant farmers? If yes, in what proportions and how? If no, why?

Does the practice have an impact on strategies for managing irrigation water? If yes, on what scale (plot, scheme, watershed, etc.) and how?

What impact does irrigation have on the practice?

Protection of soil

Does the practice help improve the prevention of erosion and protection of the soil?

In areas at risk of erosion, is there an integrated system for preventing erosion and protecting soil that potentially includes a combination of different practices? If yes, how? If no, why?

Does the practice have effects on soil cover? Is the cultivated area protected by residues or cover crops in the months following harvests? If yes, how? If no, why?

Does the practice help improve soil fertility? If yes, how? If no, why?

Does the practice help improve the soil's ability to retain water? If yes, how? If no, why?

Does the practice help reduce the potential negative effects of irrigation (soil salinity, groundwater pollution, waterlogging, etc.)? If yes, how? If no, why?

Contribution to territorialisation and to the ecological viability of the food system

Does the practice favour healthy, diversified and culturally appropriate diets that utilise local varieties and species, and local know-how for food preparation? If yes, to what extent? If no, why?

Are the products produced by the practice sold through a local market or at territorial level? If yes, in what proportions and how? If no, why?

What are the relations with consumers? Are there direct links with consumers?

Does the practice reduce agricultural losses (in the field or after harvest) and food waste?

Does the practice have an impact on the value chain?

Contribution to mitigating or adapting to climate change

Does the practice contribute to mitigating greenhouse-gas emissions through carbon storage in the soil or in biomass, or to reducing emissions linked to productive activities (fuel, fertiliser, etc.)? If yes, how? If no, why?

Does the practice contribute to helping the farm or crop adapt to climate change, and in particular to extreme events (e.g. by improving the efficiency of irrigation-water use, reducing the incidence of climate-related diseases and livestock

mortality, reducing the impact on the farm's yields, improving recovery time after a catastrophe, etc.)?

Once all the practices have been identified, the next step is to:

- create a grid summarising the diversity of practices existing in each zone covered by the study in relation to the principles of agroecology. When filling in this grid, indicate the name of each practice with the same wording that was used for its identification, and then put a checkmark under each of the principles embodied in the practice (Table 2);
- highlight the scale of implementation for each practice: plot (P), farm (F), irrigated scheme (IS), territory (T);
- estimate the frequency of each practice or its popularity in the zone covered by the study: – one-off practice; + infrequent practice; ++ somewhat frequent practice; +++ very frequent practice;
- identify a few combinations of practices encountered several times during the surveys (Table 3).

3. Identifying combinations of practices

Many production systems combine different agroecological practices. Agroecological practices may also be combined with other types of non-agroecological practices. This is the case, for example, with systems that use synthetic fertilisers in combination with organic manure, either to restore fertility to depleted soils or in moderation as part of an agroecological transition within the system. The use of synthetic fertilisers therefore does not call into question the agroecological nature of the production system, even if the system is not “fully agroecological”.

Table 3 enables identification of combinations of practices, including combinations of agroecological practices with non-agroecological practices. The purpose is to better understand the choices made by producers who tend towards agroecological systems and potential similarities with respect to combinations that could be observed at the scale of the zone covered by the study.

Table 2. Summary of existing practices in the zone.

Name of the practice	Scale of implementation	Frequency of the practice in the zone	Principles reflected in the practice					Territorialisation/ ecological viability of the food system
			Cultivated biodiversity and livestock biodiversity	Synergies	Saving and recycling of elements	Autonomy of the system	Protection of soil	

Table 3. Combinations of practices observed in the zone.

Name of the practice	Associated practice	Associated practice	Comments

Grid for analysing issues linked to a key feature of the territory

If there is a key feature in the territory (irrigation system, agrifood value chain, etc.), it may be necessary to include in the general approach for one-off evaluations a specific activity for characterising that feature.

1. OBJECTIVES

The objectives of using a grid for analysing issues linked to a key feature of the territory are:

- to identify the main issues affecting the feature (which contributes to the initial diagnostic assessment of the zone covered by the study);
- to better understand how agroecology can help address these issues;
- to better understand how the key feature influences farmers' decisions, particularly with respect to agroecology.

For this, it is possible to use a **Nexus grid**, which makes it possible to study the relationship between agroecology and the key feature (the term *nexus*, meaning "connect", emphasises the interactions between one or more elements, whether they are relationships of dependence or interdependence).

This tool may be used in the first phase of the approach for one-off evaluations, and more specifically in Stage 1c, Characterisation of the landscape, and identification of agroecological practices and systems, and Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory.

In the case of an irrigated system, for example, the Nexus grid makes it possible to systematically analyse interactions between water, food, ecosystems, energy and livelihoods, as well as their variations at different scales. In this tool sheet, we present the Nexus grid that was created for irrigated systems. If the key feature of the territory is different, an ad hoc grid may be created.

2. METHOD (CASE OF AN IRRIGATED SYSTEM)

1. Create the Nexus grid

The first step is to fill in the Nexus grid. The grid is filled in by local partners before fieldwork is carried out, based on their preliminary knowledge of the sites covered by the study⁷.

Creation of the Nexus grid makes it possible to:

- have a **holistic view** of the irrigated system covered by the study;
- visually summarise existing knowledge according to a **dimension-scale structure**.

⁷ An Excel spreadsheet (© Ducrot R.) that presents the grid in detail and proposes suggested questions is available for download on the websites of Éditions du Gret and Éditions Quæ.

By doing so, the grid also highlights unavailable information where effort must therefore be concentrated during the different stages of the evaluation.

Each **dimension** is therefore adapted, in this example, to the specific case of irrigated systems and may be characterised according to the particularities of the system covered by the study.

- The **agrifood system** refers to food production permitted on or taken from irrigated zones (IZ) and natural zones under direct influence of irrigated zones (or "ZDII", which include adjacent wet zones, wet depressions, etc.): irrigated crops, livestock-production systems benefiting from irrigated production or vegetation and the ecosystem of IZs and ZDIIs, including fish-production systems and fruit production with the use of irrigation.
- The **hydraulic system** refers to improvements that make it possible to collect, store, transport, distribute, drain and potentially treat irrigation water, and to the quantity and quality of the water that is made available.
- The **ecosystem** dimension refers to the functioning of ecosystems under the influence of the irrigated system and to its consequences in terms of plant and animal biodiversity, and in terms of the health of the ecosystem. This dimension refers in particular to the "soil" ecosystem (plot level), the aquatic or wet environments that form the irrigation and drainage canals, and the storage reservoirs. The ecosystem dimension also refers to the specific ecosystems of ZDIIs (landscape level and farm level). At larger scales, it refers to questions regarding the quality of water resources (watershed) and to pollution processes.
- The **energy** dimension refers to the types, delivery methods and network of energy mobilised in the irrigated system, whether directly for production and agrifood processing or for the operation of the hydraulic system. It therefore includes animal traction. At a larger scale, it refers to CO₂ emissions and environmental impacts, among other things.
- **Lifestyles and livelihoods** refers to the lifestyles of families and people who have a direct relationship with the irrigated system, either because it is a source of income for them, or because they live in a zone that is under the influence of the irrigated scheme. They are therefore affected by the risks involved (floods, lack of water). This dimension concerns in particular the way in which households finance their activities. It also includes the method for integrating livestock-production systems into the activities of households, and in particular their importance for savings or prestige.

A complex-systems approach requires simultaneously addressing the **different scales** by distinguishing the various processes and phenomena that emerge depending on the scale. We propose distinguishing five more-specific levels of analysis.

- **Agricultural plot:** this is micro-local level. The plot is focused on as a place where soil, water and biological processes interact.
- **Family and farm:** these are focused on as a socio-economic unit and decision-making unit, particularly in terms of priorities for irrigation and cropping practices. Families are put into different sociopolitical networks, some of which are directly linked to the irrigated system, but they have attachments or relationships to the irrigated system that go beyond the productive framework.

Table 1. Points covered in the Nexus grid, at each scale.

Dimensions	Scales	Plot	Family	Hydraulic module/unit	Landscape/ watershed	Local organisation	State/value chain
Agrifood system		CS*, soil-water-plant, water demand	Food security Vulnerability	Land and land-use dynamic Water demand	Place of the irrigated system in the landscape/agrarian system	Organisation for provision of inputs, marketing, equip- ment, processing	Structuring and organisation of value chains Regulation of value chains
	Hydraulic system	Water man- agement at plot level Vulnerability of the plot to water risks	Vulnerability of households to hydro-agricul- tural risks	Management of infra- structure (operation/ maintenance) Evolution of hydraulic systems (development/ restoration)	Hydraulic interaction (water flow) between the watershed and the irrigated system	Local organisation for the management of water and infrastructure	Regulation and responsibility (state investment) in the irrigated system
Ecosystem		Soil ecosys- tem/hedges along plot border	Vulnerability of households to natural risks	Canal ecosystems, reservoirs	Adjacent flood-prone areas, adjacent dry areas, etc.	Local organisation for the use (or pres- ervation) of natural zones under the influence of irrigated zones	Regulation and responsibility of the state in ecosystems Regulation of value chains linked to specific ecosystems
	Energy	Energy for CS (including animal traction)	Energy vulnerability of households	Spatial organisation of energy depending on the structuring of the irrigated system	Spatial organisation of energy depending on the landscape/ agrarian system/ other energy uses	Local organisation for the management of energy (e.g. use of animal traction)	Regulation and responsibility vis-à- vis energy Energy value chain
Lifestyles and livelihoods		Gender equality and CS Labour demand for CS Economic calculation of CS	Income from activities of the irrigated system/diversity of income	Non-agricultural uses of infrastructure	Diversification of activities	Gender equality/ local organisation Labour resource/ local organisation	Migration

* CS: cropping system.

- **Hydraulic module or unit:** this is a combination of a set of plots and specific hydraulic infrastructure in which water-transfer processes are observed. In irrigated systems, the irrigated scheme is a hydraulic unit covering several sub-units. It is at this level that decisions are made regarding the management of water and infrastructure that are likely to affect several plots. It is therefore at this level that access to water must be coordinated.
- **Territory or watershed:** it is connected to the previous scales by direct flows of water and soil. The different components of the irrigated system are integrated into this territory or watershed.
- **Local organisation:** local coordination mechanisms for the uses of the irrigated system (IZ and ZDII). This includes all forms of coordination, whether they are structured (associations or cooperatives) or not (networks), and more or less formalised and institutionalised (e.g. form of contractual association between a commercial enterprise and producers). These mechanisms may concern provision of inputs, management of land, management of labour or equipment, marketing or processing of products, management of irrigation (infrastructure or water) and management of the energy needed for the different uses of the irrigated system (infrastructure or energy flows). The focus here is local level (irrigated scheme and sub-module).
- **State or value chain:** this is the overarching sociopolitical level. It may be either state-run or a type of network (agrifood value chains). The focus is on the functions of interaction with the families, organisation and regulation of the uses of the irrigated system.

2. Participative selection of interactions to prioritise according to the irrigated system

It is possible to conduct, with the stakeholders involved in the irrigated system and in the evaluation, a collective analysis of the Nexus grid in order to come up with a participative selection of the priority issues for the system covered by the study. This collective analysis may be conducted at the consultation meeting with local stakeholders proposed during Stage 1b of the general approach for one-off evaluations.

The purpose is to distinguish socio-economic issues (which have to do with economic results) from sociopolitical issues (which have to do with power relations between stakeholders) and environmental issues, even though in reality these issues are intimately connected. In this sense, with a view to transitioning to agroecology, some objectives are not compatible and require decisions to be made.

At economic level

Economic valorisation of resources and profitability of investments (at local, regional, global level).

At social and socio-economic level

- Health and food security (local or national).
- Economic development (local or national) and income.
- Control of migratory flows (local, urban/rural, global).

At environmental level

- Health of ecosystems (local, regional, or even global level for greenhouse-gas emissions).
- Sustainability of natural resources, including non-renewable resources (local – underground reservoirs –, regional or global).

At sociopolitical level

- Strengthening of the place and role of certain social groups (including women and young people).
- Support for certain stakeholders, actors or socio-economic groups.
- Compensation or management of conflicts between social groups.
- Management of disparities and social cohesion.

It is possible, for each scale, to summarise this information in a table of this type:

Main issues identified	Information that remains to be clarified
– – –	– – –
Elements to take into account for the evaluation of agro-environmental performance	Elements to take into account for the evaluation of socio-economic performance
– – –	– – –

This initial analysis of the irrigated system is also an opportunity to highlight preliminary information on the conditions necessary for the development of agroecology.

Favourable and limiting factors	Stakeholders

3. Adjusting the indicators to suit the priorities of the irrigated system

Prioritising the issues of the irrigated system covered by the study makes it possible to more precisely orient the choice of criteria and indicators that will be used in the evaluation. A cross-analysis of the envisaged indicators and the Nexus grid highlights the scales and dimensions that are not taken into account or insufficiently taken into account at the level of the hypotheses and indicators of the evaluation. A deeper understanding of the systems covered by the study is therefore helpful in

terms of adapting the hypotheses and indicators to their particularities, taking into account the priority interactions, as well as the drivers of and obstacles to change.

The choice of hypotheses and indicators must also be adjusted with the local stakeholders to integrate their visions, needs and constraints.

A table such as the one presented below may help organise the information needed to specify the priority indicators:

Main issues identified	Hypotheses	Practices identified as potential responses to the identified issues	Indicators for the analysis of agro-environmental performance (and numbers of the practices in question) making it possible to respond to the hypotheses	Indicators for the analysis of socio-economic performance (and numbers of the practices in question) making it possible to respond to the hypotheses
What are the issues concerning the irrigated system at this scale?	For which link(s) between practices and issues will verification be sought?	Which practices may respond to the identified issues?	What must be studied in order to know whether the practices respond to the identified issues?	

3. SKILLS, HUMAN RESOURCES AND EQUIPMENT

It is necessary to work very closely with the local partners in order to benefit from their knowledge on the key feature in question. The interviews conducted in Stage 1d of the evaluation approach, and the literature review, will then make it possible to obtain the remaining information needed to fill in the grid.

The analysis of the grid for the selection, adaptation or construction of relevant indicators must also be conducted with the partners involved in the evaluation.

Developing a typology of farms

In addition to presenting the general approach for one-off evaluations (see Chapter 2), the purpose of this tool sheet is to present the more specific aspects relating to the development of the typology of farms.

1. WHAT IS A TYPOLOGY OF FARMS?

Developing a typology involves identifying, in a given territory, different types of farms beyond the particularities of each farm. The typology must make it possible to characterise the diversity of agriculture in the territory, given the varied conditions of the environment (see Tool Sheet 1, Guide for interpreting the agrarian landscape and establishing zoning) and the historical processes for technical and socio-economic differentiation of farms.

Each type comprises farms that, placed in similar conditions of access to the different spaces within the territory, availability of resources (labour, equipment, cash) and market outlets, practise a specific combination of plant or animal production in order to achieve their objectives.

Each type is therefore characterised by a certain homogeneity between the following characteristics:

- **agroecological conditions**, and in particular how the different agroecological units within the territory are accessed and how the resources they contain (land, water, biodiversity, etc.) are accessed;
- **socio-economic conditions** of production, i.e.:
 - the socio-economic and institutional environment,
 - the components of the farm: family composition, own productive resources (land and means of production),
 - social relationships determining access to resources, public services and support where available, markets, alternative employment and income opportunities;
- **fundamental objectives or interests** of the farmer, or in other words **economic rationality**: priority given to an increase in income per hectare, to work productivity or to profitability of capital advanced, whether or not food self-sufficiency is sought, greater or lesser importance given to risk limitation, whether or not the objective of maintaining and improving the cultivated ecosystem is taken into account, whether or not the objective of reducing the arduousness of work is integrated, potential attempt to space out production intra-annually;
- **practices** that the farmer implements to achieve these objectives;
- agro-environmental and socio-economic **performance** resulting from these practices, and in particular the level of income. Among these performances, the **income** determines the capacity to improve the family's standard of living and to invest in the agro-ecosystem and operating capital. It therefore ultimately defines **the economic, social and ecological dynamic** of the farm (development, stagnation or crisis);
- the farmer's level of satisfaction with respect to his/her objectives, as well as all the factors limiting his/her satisfaction and the development of the farm, i.e. the **main problems** faced by the farm in terms of development.

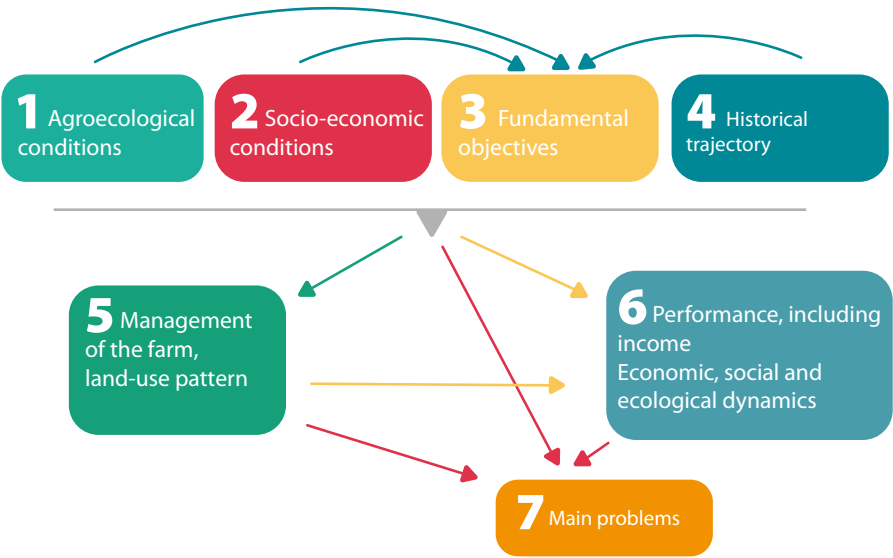
Each type of farm is also characterised by a particular **historical trajectory**. As we will see, reconstruction of the historical trajectories of farms is an essential tool for developing a typology.

The hypothesis underlying the fact that different types of farms can be identified, defined simultaneously by these different characteristics, is that these characteristics are not independent of each other. There are three hypotheses:

- the fundamental objectives of the farmer are largely conditioned by the farm's historical trajectory and by the agro-environmental and socio-economic conditions of production (blue arrows in Figure 1);
- the management choices and land-use pattern are themselves largely conditioned by all of these characteristics (green arrow);
- all of the previous characteristics condition the level of performance – and in particular the level of income – as well as the economic, social and ecological dynamics of the farm (yellow arrows);
- the main problems faced by the farm in terms of development depend on performance levels with respect to the farmer's objectives, as well as constraints limiting this performance (red arrows in Figure 1).

It should be noted that the comparative approach underlies the development of the typology: attention is systematically focused on **differences** between farms and on seeking **the explanation** of these differences.

Figure 1. Characteristics of the different types of farm.

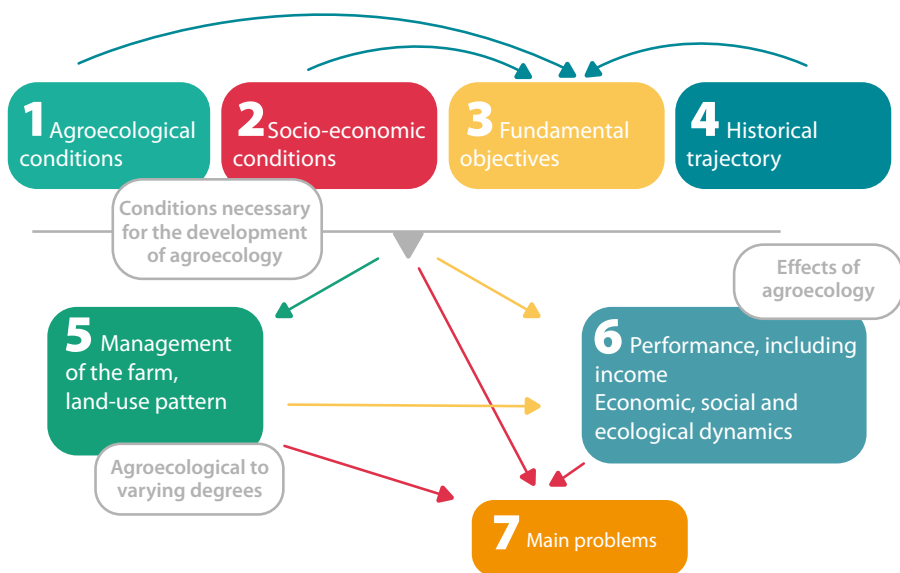


Within this context (Figure 2):

- attention is focused particularly on differences between management choices and land-use patterns **that are agroecological to varying degrees**. To evaluate how agroecological they are, an additional tool, the “agroecolo-score”, is used (see [Tool Sheet 8](#), Characterisation of the degree of agroecologisation of farms);
- an effort is made to try to explain these different choices. Why do some farmers implement land-use patterns that are more agroecological while others do not? This comparative approach makes it possible to identify the **conditions necessary for the development** of agroecology (facilitating or limiting factors);
- the performance of these land-use patterns is evaluated and compared, and the **effects of agroecology** on this performance is deduced.

It should also be noted that the development of the typology is not sufficient for making comparisons between all the different land-use patterns with varying degrees of agroecologisation. Agroecological systems or practices may be specific to certain farms that are more or less isolated and transversal in relation to the different types. The analysis of these specific cases is conducted in parallel with the analysis of the typology.

Figure 2. Integration of questions relating to agroecology in the process for developing the typology.



2. PRE-TYOLOGY OF FARMS

As part of the evaluation approach, Stage 1b, Consultation with stakeholders in the territory, makes it possible to put forth initial hypotheses regarding land-use patterns and types of farms present in the territories.

Stage 1c, Characterisation of the landscape, and identification of agroecological practices and systems, makes it possible to highlight in a rather general way the

different land-use patterns and formulate hypotheses on the factors behind these differences.

But it is above all Stage 1d, Reconstitution of the agrarian history and assessment of the current situation in the territory, that makes it possible to reconstitute farm trajectories over time. For certain key stages of the history, different types of farms, and their land-use patterns, are identified and briefly characterised (essential components of each type, general characteristics of the land-use pattern). During this stage, the differentiation processes and underlying factors are analysed.

Crossing this information with information from previous stages, and with surveys that focus more on characterising the current situation, leads to a **still relatively brief characterisation of the current types of farms** in Stage 1e, Summary and discussion of results. This characterisation focuses on the agroecological environment (what types of spaces, terroirs, ecosystems do farmers have access to?), on certain defining features of the socio-economic environment (social relationships, access to markets), on the essential components of each type (particularly area and type of equipment), on the general characteristics of the management of the farm and land-use pattern (main activities, degree of mechanisation or motorisation, type of management for fertility, weeds and parasites, marketing method), and on the general dynamic of the farm and on its specific constraints (main problems). This brief characterisation makes it possible to develop a pre-typology of farms. By comparing the practices and land-use patterns of the different types of farmers with the general principles of agroecology, an overall assessment may be made as to how agroecological each type is, without applying at this stage the method for calculating an agroecology-score. These results are submitted to the stakeholders in the territory for their opinion.

3. IN-DEPTH CASE STUDIES OF FARMS

Conducting in-depth case studies of farms based on a purposive sample (Stage 2b) is an essential stage for the finalisation of the typology. This stage is presented in the section on the overall evaluation approach ([Chapter 2](#)).

1. Processing and comparative analysis of the results of the case studies

The summary of the case studies in Stage 2b of the general approach for one-off evaluations is presented in a table comparing key data and through a graphic representation of the results. This summary makes it possible to:

- verify the **relevance** and **coherence** of the typology. Farms belonging to the same type are supposed to have similar characteristics and technical and economic results. If excessively large differences appear within a particular type, and if the differences within a particular type are as large as the differences between types, it may be justified to create sub-types, or even split the type into two sub-groups based on the identification of data explaining the differences. Some farms may also be transferred from one type to another;
- analyse the **factors behind** differences in performance. The differences in performance observed between different types make it possible to formulate explanatory

hypotheses that are then verified using additional graphical representations (see example below). When certain types appear to be more agroecological than others, the comparative analysis makes it possible to highlight certain effects of agroecology, and to verify and refine the hypotheses on the conditions necessary for the development of agroecology;

- characterise and analyse **particular cases**. These may result from conscious choices made at the time of sampling, particularly in terms of specific agroecological practices and systems. They may, however, not have been anticipated, in which case the information and calculations should be verified, as atypical results are sometimes caused by errors. In any case, it is necessary to analyse the factors behind the existence of particular cases and their performance. Here too, comparison with other farms makes it possible to highlight certain effects of agroecology, and to verify and refine the hypotheses on the conditions necessary for the development of agroecology.

A model of a typical table is presented below. It may be adapted to each context.

The **graphic representation** of the results makes it possible to combine two variables (vertical axis and horizontal axis). The farms are represented by a different colour depending on the type or sub-type they belong to. The use of different symbols (circles, squares, crosses, etc.) makes it possible to better differentiate farms based on additional factors (location, implementation or not of certain agroecological practices, etc.). Below are the charts that are typically used.

Agricultural income per family agricultural worker (AI/FALU, vertical axis) in relation to farming area per family worker (UFA/FALU, horizontal axis) is the standard chart. There is generally a positive correlation between the two variables, but the situation is often more complex (small farms with relatively large income, large decapitalised farms with low income. etc. – see Figure 3).

Figure 3. Hypothetical example of a graphic representation: agricultural income per family agricultural worker [AI/FALU] in relation to farming area per family worker (UFA/FALU).

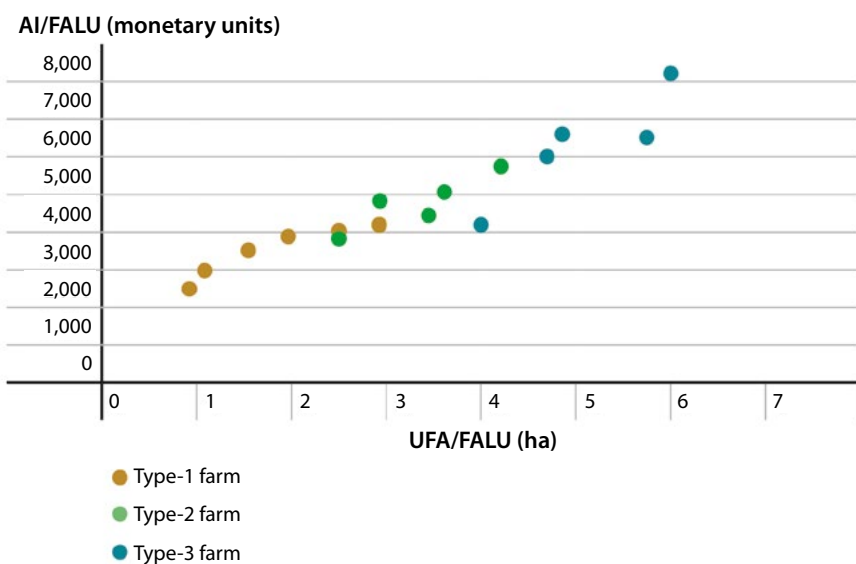


Table 1. Model of a table comparing case studies of farms.

Country: Region: Date:
Study: Person in charge of the study:

Number	Name of producer	Locality	Type	Sub-type	Land				Capital
					UFA/FALU	Status	Particularities	Additional use of land	
1									
2									
3									
...									

Number	Productive orientation of the agricultural production system (five main activities)										Extra-agricultural income				Technical characteristics of the production system			
	Activity 1		Activity 2		Activity 3		Activity 4		Activity 5		EAI/ TI (%)		Activities		Type of tillage	Soil fertility management	UFA irrigated/ UFA [%]	Other notable technical characteristics
	Name	GVA/ ΣGVA [%]	Name	GVA/ ΣGVA [%]	Name	GVA/ ΣGVA [%]	Name	GVA/ ΣGVA [%]	Name	GVA/ ΣGVA [%]								
1																		
2																		
3																		
...																		

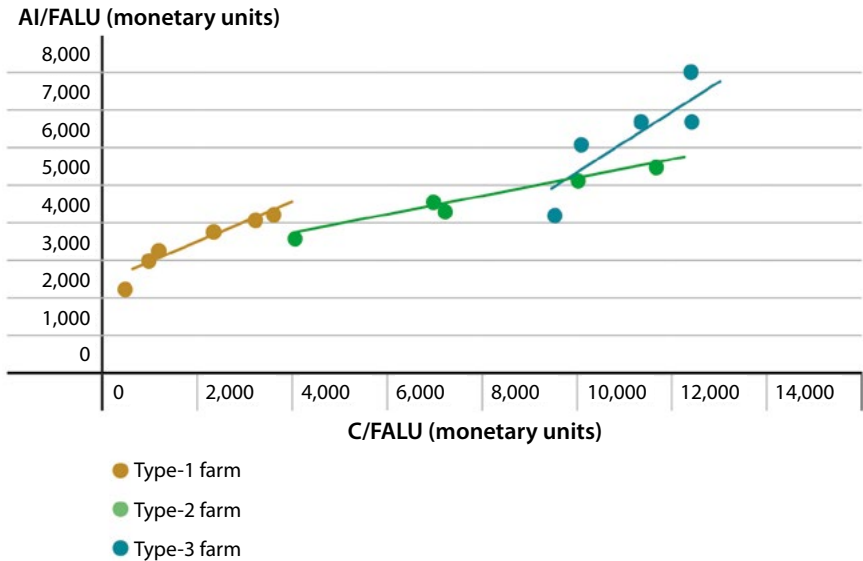
Number	WD paid/WD total (%)	Agroecology		Yields for main crop/crop association			Economic results and efficiency of the production system				TI/FLU
		Degree of agro-ecologisation	Main elements	Unit:		Average	AI/ FALU	AI/ NVA (%)	NVA/ FALU	NVA/ UFA	UFA/ FALU
				Low	High						
1											
2											
3											
...											

Number	Income in relation to consumption units		Change in yield	Attractiveness for young people	Autonomy	Employment and well-being	Food security		Main constraints	Comments
	CU/FLU	TI/ CU	(=, +, -)	(grid to be defined)	(grid to be defined)	(grid to be defined)	FCS* during favourable period	FCS during the hunger gap		
1										
2										
3										
...										

* FCS: food consumption score.

If the weight of extra-agricultural income is a key component of total income (TI), additional charts may be used to represent total income per family worker (TI/FLU) in relation to farming area per family worker (UFA/FALU), or the share of extra-agricultural income in total income (EAI/TI) in relation to farming area per family worker. If availability of capital seems to be a decisive factor for explaining the level of income, additional charts may be used to verify this hypothesis: agricultural income (AI/FALU) in relation to available capital (C/FALU) (Figure 4) and available capital (C/FALU) in relation to available land area (UFA/FALU).

Figure 4. Hypothetical example of a graphic representation: agricultural income per family agricultural worker (AI/FALU) in relation to the level of capital per family agricultural worker (C/FALU).



Net value-added per family agricultural worker (annual productivity of family work, NVA/FALU) in relation to farming area per family agricultural worker makes it possible to assess the extent to which the correlation between these two variables is similar to the correlation between agricultural income per family agricultural worker and farming area per family agricultural worker. Higher agricultural income may be linked to higher value-added or other factors (proportion of value-added remaining for the family after paying paid workers and various levies, proportion of subsidies in family income). Additional charts may be used (always with UFA/FALU on the horizontal axis) (Figure 5).

Net value-added per unit of area (NVA/UFA) in relation to farming area per family agricultural worker (UFA/FALU) concerns the two components of the annual productivity of family work ($NVA/FALU = NVA/UFA \times UFA/FALU$). Figure 6 makes it possible to assess how the different combinations of these two components influence annual productivity.

Depending on the hypotheses relating to the determinants of the level of value-added per unit of area, additional charts may be used (e.g. work intensity or operating-

capital intensity, yield for the main crop, relative weight of certain crops in the crop rotation, weight of livestock production in total value-added, or degree of agroecologisation, with NVA/UFA always on the horizontal axis).

Figure 5. Hypothetical example of a graphic representation: ratio of agricultural income to net value-added (AI/NVA) in relation to area per family worker (UFA/FALU).

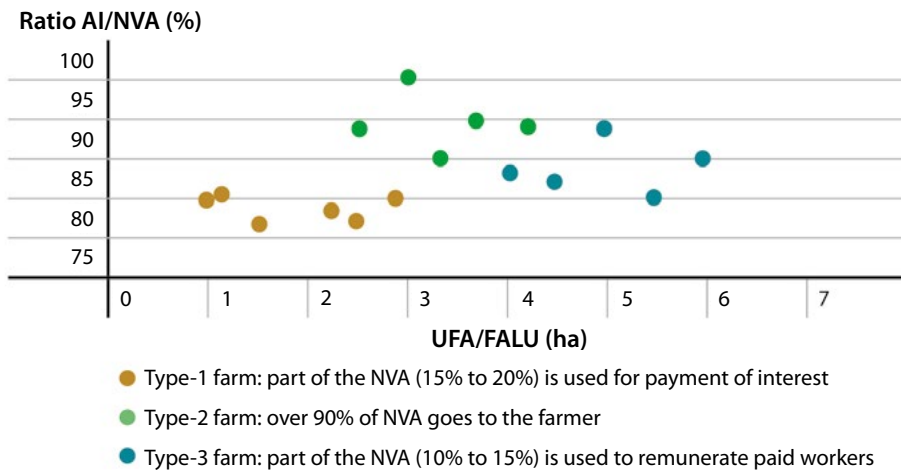
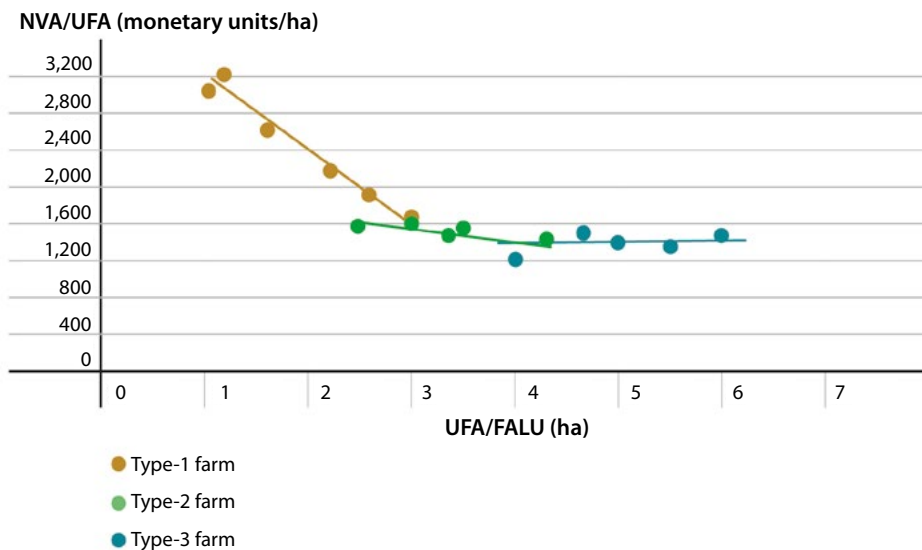
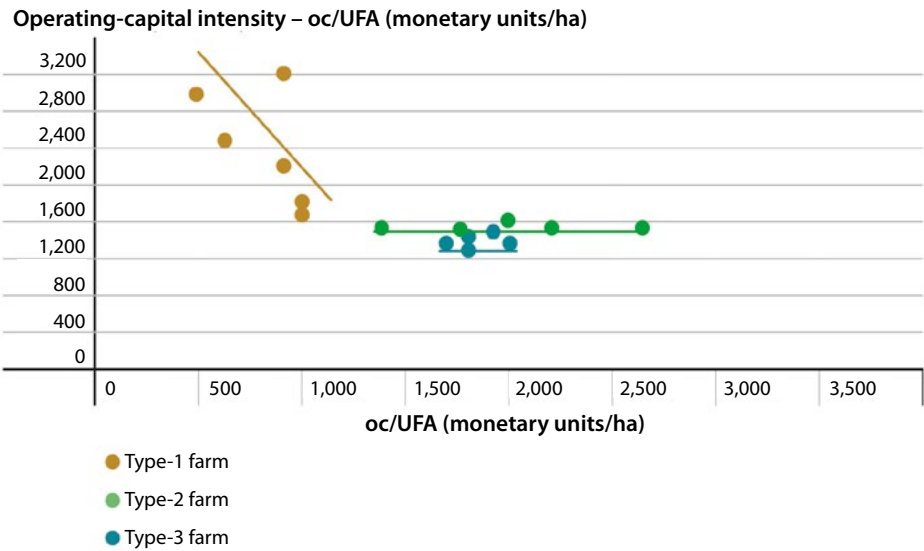


Figure 6. Hypothetical example of a graphic representation: net value-added per unit of area (NVA/UFA) in relation to area per family worker (UFA/FALU).



Other additional charts may enable verification of new hypotheses. For example, if a hypothesis is formulated stating that the quantity of manure applied is decisive in terms of explaining differences in yield, a chart may make it possible to express average yield in relation to the quantity of manure applied. Figure 7 focuses on the link between net value-added per unit of area (NVA/UFA) and operating-capital intensity (oc/UFA).

Figure 7. Hypothetical example of a graphic representation: net value-added per unit of area (NVA/UFA) in relation to operating-capital intensity (oc/UFA).



Moreover, additional charts focusing on data specific to a given crop-production activity may also be used (e.g. average corn yield in relation to quantity of manure). Comparison of types and sub-types with varying degrees of agroecologisation, and their comparison with particular agroecological cases, contributes to the specific analysis of the effects of agroecology in economic terms.

2. Economic modelling of the different farm types

The **economic modelling** of each type of farm provides a better overview of the average income levels for the farms belonging to each type (vertical axis) in relation to the area per family agricultural worker (horizontal axis).

This modelling involves creating a **farm archetype** for each type. This archetype is created based on case studies and corresponds to a model farm with a technical operation and specific agro-environmental and socio-economic performance. For each type, the lower and upper boundaries of area per family agricultural worker (UFA/FALU) must be identified, and the agricultural income for each of these two boundaries must be calculated.

Two points are plotted corresponding to these extreme situations, and a line is drawn between them. Although this stage is useful to assess the economic situation

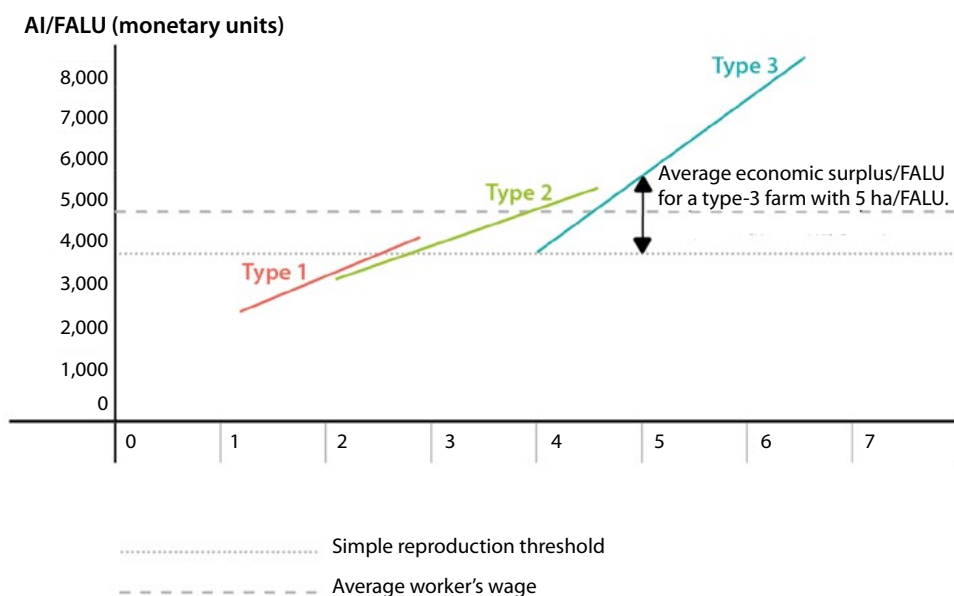
of a type of farm and its economic dynamic over the medium term, it requires specific proficiency in modelling tools for the characterisation of the upper and lower boundaries. Poor proficiency can easily lead to erroneous results.

Horizontal lines are also drawn corresponding to different levels of income for comparison with agricultural income or total income: minimum wage, income per capita corresponding to the poverty line or extreme poverty line (the ratio of family members to workers must be taken into account in this case), income enabling longer-term development of the farm. By comparing the income levels of each type, it is possible to assess the economic and social situation of the farms belonging to the type in question. Comparison with the extreme poverty line (level of income enabling satisfaction of only basic needs) makes it possible to distinguish between the different types of farm and farm surface areas depending on whether the farm is:

- at breakeven but not able to increase its productive capital (investment) or improve its standard of living (income level equivalent to the extreme poverty line);
- in crisis: level of income below the extreme poverty line, indicating failure to satisfy basic needs and gradual decapitalisation;
- capable of generating an economic surplus that can be used to increase its productive potential (investments) and improve the family's living conditions (level of income above the extreme poverty line) (see Figure 8).

Comparison of types and sub-types that are agroecological to varying degrees, and comparison with farms that implement particular agroecological practices or systems (which may be added to the chart), is useful for assessing the overall effects of agroecology on the situation and socio-economic dynamic of farms.

Figure 8. Hypothetical example of modelling for different types of farms.



3. Evaluating the relative weight of the different types

The relative weight of the different farm types is estimated by taking into account the number of farms belonging to each type and the total farming area for each type. It is possible to deduce one from the other based on an estimate of the average area for each type.

In an evaluation of agroecology, only a rough estimate can be made. That estimate is based on the **combination of data** generated using several complementary methods:

- agricultural statistics or other databanks, if they exist. They provide a breakdown of farms by surface area. There is no necessary correspondence between the different surface-area brackets of an agricultural statistic and typology:
 - area is not a defining factor for farm types, even if the farms belonging to a particular type are actually located within a given range in terms of area. Farms that have the same amount of area may belong to different types,
 - for the typology, the criterion of area per family worker is preferred over area per farm,
 - even deducing area per farm from area per family worker, the levels of area used by the agricultural statistics do not necessarily correspond to the ranges of area for the different types.

Agricultural statistics, however, provide a certain amount of useful information that should be cross-checked with other sources of information:

- analysis, based on prior zoning of the territory, of map data or aerial photos, or even direct visualisation of plots in the territory from a high point. Very large farms may sometimes appear clearly and be counted;
- the opinions of key informers who have extensive knowledge of the territory or specific zones. The evaluator has his/her own knowledge for this. The evaluator may, for example, identify zones where a given type clearly dominates, or another zone where two types contain roughly half of the farms each;
- other secondary sources, such as the number of milk deliverers at a dairy company and their distribution.

Further reading

Cochet H., Devienne S., 2006. Fonctionnement et performances économiques des systèmes de production agricole : une démarche à l'échelle régionale. *Cahiers Agricultures*, 15 (6), 578-583. <https://doi.org/10.1684/agr.2006.0028>

Levard L., 2024. *Économie de l'exploitation agricole. Concepts et méthodes pour l'appui au développement agricole dans les pays du Sud*, Éditions du Gret/Éditions Quæ, 264 p.

Information to gather during case studies and tools for formatting that information

This tool sheet provides **an overview of the information** that should be gathered during interviews conducted in case studies ([Chapter 2](#), Stage 2b, Case studies of farms) as part of the general approach for one-off evaluations. It is not, however, intended to be followed to the letter. Even if the order in which the information is proposed has a certain logic and should be used as a guide, it must be adapted to the dynamic of the interview. Moreover, the list of information to gather must take into account the evaluation criteria and indicators used, the specific situation of the territory and the specific evaluation questions. It is therefore up to the evaluator to specify which questions he/she wants to ask, taking into account this list of information as well as the context and course of the interview.

The proposed plan may also be useful for **transcribing the information gathered**. This tool sheet proposes tables that can be used to **organise some of this information**. It is up to the evaluator, however, to decide whether it is necessary to transcribe all the information, or whether his/her handwritten notes are sufficient. With regard to the data needed for the economic calculation, it is faster to transcribe it directly in the spreadsheet proposed in [Tool Sheet 7](#), Presentation of the spreadsheet for automated economic calculation and its user manual.

1. GENERAL INFORMATION ABOUT THE FARM

Farmer's name, village, phone number.

1. Family and paid workers

Objective: to have the information needed to calculate family labour units (agricultural and non-agricultural), paid labour units and consumption units (including for people who do not carry out a productive activity).

- Family members, age, main occupation, participation in agricultural activities.
- Division of responsibilities within the family, particularly for agricultural activities.
- Other people potentially living on the farm.
- Use of paid permanent and temporary workers. Quantification (permanent workers), tasks (permanent and temporary workers).

2. Land

Objectives: to calculate the farm's useful farming area and ensure the overall consistency of the information (effectively taking into account all plots at the time the activities are described).

It is important to proceed by type of crop first, and then count the fallow areas.

- Plots and groups of plots used, location, surface area, type of use, specific use in most recent growing season, land tenure. After having identified the areas where

crops are currently being grown, it must be verified whether there are also areas of permanent pasture, fallow land or forest. It may be useful to create a small map, particularly if the group of plots appears to be complex. When visiting the plots, additional questions may be asked, and direct observations made (topography, soil, vegetation, infrastructure, ecological infrastructure such as hedges, ponds and non-cultivated spaces).

- Use of commons.
- Land belonging to the farmer but not used in the production system.

3. Infrastructure and equipment

Objectives: to calculate the cost of depreciation for means of production, better understand certain production-related choices and ensure the overall consistency of information.

- Main infrastructure and equipment, age, purchase price, lifespan (establish an average for each type of equipment in the territory, which may be used for each case study without needing to ask the same question again during each interview). A visit to the farm makes it possible to formulate additional questions and make observations.
- Existence of shared infrastructure or equipment.

4. Animals

Objectives: to estimate the value of the farm's animals and ensure overall consistency of information when calculating the gross product of livestock-production activities.

- Current number of animals per species and type of animal (age or physiological stage, price).
- Caring for animals belonging to others.
- Existence of animals entrusted to others.

2. HISTORY OF THE FARM

Objective: to better understand the farm's current situation and the farmer's choices.

- The key stages of the farm's history from when the farmer started the farm (or from when the farmer's parents started the farm).
- Identification of significant changes concerning the evolution of the land, operating capital, land-use pattern (activities, equipment and techniques used), family events, extra-agricultural activities and emigration.

How does the farmer explain the changes (particularly regarding land-use pattern)?

Important

Significant changes from an agroecological point of view

Special attention is given to significant changes from an agroecological point of view: experimentation, implementation, adaptation of new agroecological practices and systems, decline in or abandonment of agroecological practices and systems.

3. AGRO-ENVIRONMENTAL AND SOCIO-ECONOMIC ENVIRONMENT OF THE FARM

Objectives: to understand how the characteristics of the agro-environmental and socio-economic environment influence the farmer's choices, and how they might constitute constraints.

- Climate, soil, access to water, specific advantages and constraints. Evolution over the course of the farm's history. Consequences for the farmer (management choices, or technical and economic results).
- Access to markets for agricultural products, funding, equipment, inputs, land: specific advantages and constraints. Evolution over the course of the farm's history. Consequences for the farmer (management choices, or technical and economic results).
- Relations with development stakeholders (technical advisory services, NGOs, etc.). Changes since the farmer began farming. Consequences for the farmer (management choices, or technical and economic results).
- Specific social and production-based relationships (access to land, right to common grazing lands, exchanges of labour, purchases/sales with other crop or livestock farmers, etc.). Changes since the farmer began farming. Consequences for the farmer (management choices, or technical and economic results).
- Membership in an association, cooperative, etc.

Important

Farm environment and agroecology

Special attention is given to the characteristics of the agro-environmental and socio-economic environment that are advantages or constraints for agroecological practices, and to changes that have had an impact on how agroecological the land-use pattern is.

4. AGRICULTURAL PRODUCTION SYSTEM

Objectives: to describe the agricultural production system, understand the farmer's choices and gather information needed for the evaluation of the farm's economic results.

1. Crop rotations, typical rotation for a given year, livestock-production activities

- Description.
- Physical flows between activities.
- Elements to help explain these choices (choice of activities, limits to their scale of implementation): response to an essential objective of the farm, physical flows between activities of the production system (straw, manure, as well as monetary flows, etc.), limitation of resources (land, equipment, labour).

2. Crop-management sequences for each type of activity or system (per plot, group of plots, herd)

Reconstitution of crop-management sequences is done based on the most recent growing year. If the cycle is nearly over, however, it is based on the current year, and for the end of the cycle it is based on the previous year or on what the farmer plans to do to finalise the cycle. In the case of perennial crops and livestock production, it is simpler to base it on the previous twelve months. Beforehand, it is important to be absolutely certain which plots we are talking about.

- Use of soil (crop production, crop association, several cycles in the same year).
- Tasks (agricultural work). Dates.
- Work days, number of people, family or paid labour.
- Intermediary consumption used (inputs and services), origin (purchase or intra-unit consumption) and quantity.
- Equipment used and its origin (owned or rented).
- Explanation of certain production-based choices, different crop-management sequences between plots and groups of plots, or with other farmers.
- For livestock production: annual feeding calendar, per livestock-production activity if necessary (animals in question, pasture, additional fodder and quantity).
- Products obtained on the plot.
- Clarification on the destination of the products and sub-products obtained (intra-unit consumption, on-farm consumption, sale: to whom, where, when? Conditions).
- Sale price. Who sets the price? Variations over the course of the year, inter-annual variations (in this case, an estimate for an average year is required).
- In the case of production for intra-unit consumption and production for on-farm consumption: the cost of purchasing equivalent goods or substitutes if these goods were not produced.
- For livestock production, inventory variations, purchases and sales of animals.

This information may be complemented by:

- a discussion of the variability in yields (see [Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders);
- a discussion of the historical trends for yields (see [Evaluation Sheet 7](#), Crop and livestock yields – estimate according to stakeholders);
- an overall assessment of the farmer on this activity, if he/she is satisfied with it, on the main difficulties encountered, how he/she resolves these difficulties and on the consequences of these difficulties if he/she is not able to resolve them;
- questions specific to the agroecological practices identified: why this choice? Is the farmer satisfied? What are the constraints and negative consequences? Is it possible to quantify these implications and effects? Will the farmer continue (if it is a recent practice)? What would be needed for the farmer to continue/for the farmer to apply it on a larger scale on his/her farm? Why don't some of the farmer's neighbours do the same thing? What conditions would be necessary for them to do the same thing?
- specific questions if the evaluator identifies non-agroecological practices for which there are alternative agroecological solutions in the territory (comparison with the other farms): why does the farmer make this choice instead of choosing more agro-ecological practices (irrelevance, constraints or negative consequences)? Why do

some neighbours have agroecological practices but not the farmer? What would be needed for it to be in the farmer's interests to develop such practices, or for the farmer to be able to implement such practices?

5. THE FARM'S OTHER ECONOMIC ACTIVITIES (OR REMITTANCES FROM FAMILY MEMBERS)

Objectives: to identify the farm's other economic activities in order to calculate the farm's overall economic performance, understand their potential role in the performance of agricultural activities (provision of monetary resources) and better identify the opportunity costs of family labour.

- Description, persons involved, motives.
- Links with the farm's agricultural activity. The purpose is to know whether these activities are funded using agricultural income, or whether the income generated by these activities is used to fund agricultural activities.

6. CROP AND ZOOTECHNICAL YIELDS

Objectives: to evaluate average yields, their variability and their trends. This evaluation is the basis of the economic evaluation. The recording of yields is also an opportunity to become more aware of certain risks and to better understand certain choices made by the farmer.

1. Crop production

The evaluation is conducted by plot or by group of plots. It should be specified whether it is production (in volume, clarification on the unit, area in question) or yield (unit). [Evaluation Sheet 7](#), Crop and livestock yields (estimate according to stakeholders), is used for this. The information to be gathered is specified in Table 1.

Table 1. Table for recording crop yields by plot or group of plots.

Plot or group of plots	Crop*	Yield from last year and qualification	Yield from two years ago and qualification	Yields from earlier years	Assessment of the overall evolution	First year of operation and yield	Worst and best yields over the past 10 years, and years

* For each cycle, every crop in the crop association and every by-product should have its own line.

2. Animal production

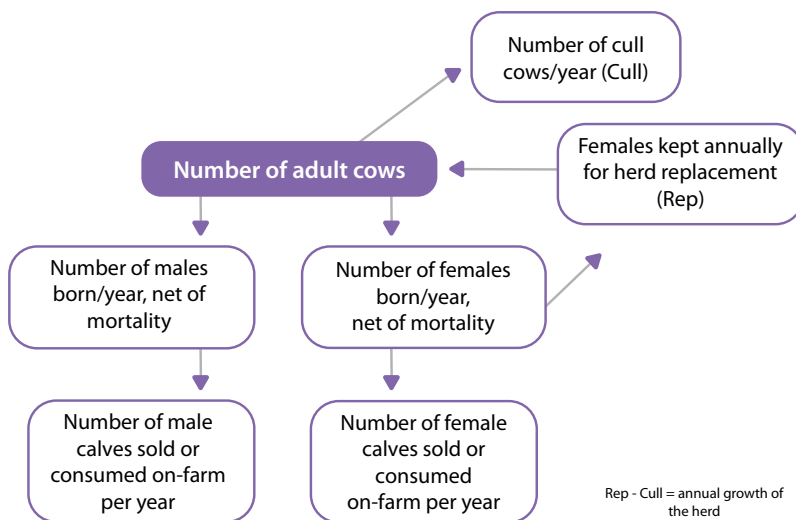
The estimate is made for each herd. [Evaluation Sheet 7](#), Crop and livestock yields (estimate according to stakeholders), is also used. For ruminants, structure of the herd: cows, calves, heifers, young males, adult males, steers.

- Meat production or herd expansion:
 - frequency of birth (and average number of offspring per litter for small ruminants and pigs);
 - use (herd expansion, on-farm consumption, sale);
 - estimated number of animal deaths per year.
 - estimated annual production (whether in the form of variations in inventory, on-farm consumption or sale). The estimate is made after the interview.

Figure 1 shows the type of graphic representation for the dynamic of a herd of cows that the information gathered must make it possible to create.

- For dairy production:
 - number of dairy cows;
 - dairy cows: number of months of lactation. Average daily production per cow;
 - number of cows milked on the day of the interview and total production;
 - month of the year when production is best: number of cows in production and daily production;
 - month of the year when production is worst: number of cows in production and daily production;
 - use (on-farm consumption, sale);
 - estimated annual milk production (the estimate is made after the interview).
- Other production (eggs, manure, etc.): estimates, uses.

Figure 1. Model for a graphic representation showing the dynamic of a herd of cows from one year to another.



7. ECONOMIC PERFORMANCE FROM THE FARMER'S POINT OF VIEW

Objective: to estimate the economic performance of crop- and livestock-production activities, the agricultural production system and the farm in order to evaluate the effects of agroecology. The data needed to do so is obtained during the interview with the farmer (see above), and from additional interviews with stakeholders in the territory in order to identify certain market prices (prices for agricultural products, inputs, services, etc.). The calculation can be made using the spreadsheet for automated economic calculation (see [Tool Sheet 7](#)).

8. FREE DISCUSSION

Objective: to further discuss certain key questions by noting the farmer's direct point of view.

If, after the first visit and after formatting and analysing the data, one wishes to verify the hypotheses that were formulated, then it is essential, during a second visit (in addition to expanding on and verifying particular points), to initiate a free discussion on a certain number of elements using these hypotheses as a starting point. In particular, the following questions should be discussed:

- the farmer's fundamental objectives (economic rationality): various information gathered throughout the interview making it possible to provide answers to the following questions, and thus to better interpret the farmer's choices: which economic criterion is sought? Is self-sufficiency an objective? How important is the risk-minimisation criterion? Is the reduction of arduousness and working hours an objective? What is the farmer's attitude vis-à-vis reproduction of the ecosystem?
- technical and economic management choices linked to fundamental objectives of rationality, to particular characteristics of the agro-environmental and socio-economic environment (including production relationships and opportunity costs external to the farm), and to particular constraints in terms of management of work calendars, use of equipment, draft animals or cash. Particular attention is given to agroecological practices;
- change in the fertility of the environment and yields;
- economic dynamic of the farm, ability to generate income and ways to use that income (investments, improvement of living conditions, education of children);
- risk-management strategies;
- main constraints;
- conditions necessary for the development of agroecology. Questions are asked, and a discussion is initiated on the hypotheses relating to the factors that facilitate or hinder the development of agroecology (see [Chapter 6](#), Evaluation of the conditions necessary for the development of agroecology).

9. ATTRACTIVENESS OF AGRICULTURE FOR YOUNG PEOPLE

Objective: to collect various information for evaluating the attractiveness of agriculture for young people. Refer to the questions presented in [Evaluation Sheet 11](#), Attractiveness of agriculture for young people.

10. AUTONOMY

Objective: to collect various information for evaluating the farm's degree of autonomy. Refer to the questions presented in [Evaluation Sheet 13](#), Autonomy.

11. ENDER EQUALITY

Objective: to assess the division of responsibilities between men and women, and how much equality there is between genders on the farm. This contributes to assessing how much autonomy women have (see [Evaluation Sheet 13](#)).

Division of responsibilities between men and women on the farm, particularly in terms of:

- management of productive activities;
- management of products and monetary income from productive activities. It is important to clearly identify productions where women decide how income is to be used.

12. JOB RETENTION AND CREATION

Objective: to collect various information for evaluating how agroecology contributes to the retention and creation of jobs (see [Evaluation Sheet 12](#), Job retention and creation).

General information on the farm and information on crop-management sequences make it possible to evaluate the number of workers and work days, and to reconstitute the agricultural work calendar for the entire year.

13. FOOD SECURITY

Objective: to collect various information for assessing food security at farm level and evaluating the effects of agroecology on food security (see [Evaluation Sheet 14](#), Food security).

Based on the evaluation criteria and indicators presented in [Evaluation Sheet 14](#):

- information on food supplies is collected in the parts of the interview covering the agricultural production system (evaluation of the diversity of food supplies) and crop yields (quantities of food produced);
- information on accessibility is obtained through economic calculation (income in relation to the threshold for the satisfaction of basic needs) or deducted from the data gathered on the general characteristics of the farm (creation of salaried jobs). It is important, however, to follow up with specific questions in order to enable assessment of how much income is managed directly by women;
- information on diversity and nutritional quality must be collected by creating a general food-consumption calendar, and then calculating the food consumption score (FCS) for each period (the two tables presented below may be used to collect the information). Information on the diversity of food products sold is obtained in the part of the interview covering the agricultural production system;
- information on regularity is obtained from the part of the interview covering crop yields (evaluation of yield regularity), the economic calculation (income in crisis year in relation to the threshold for the satisfaction of basic needs) and the calculation of the FCS for the critical year.

Table 2. General food-consumption calendar.

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
	→										
				→							
							etc.				

Table 3. Food consumption score (FCS).

Food groups	Weighting coefficient	Period 1: ...		Period 2: ...		Critical year: ...	
		Number of days/ week	Score	Number of days/ week	Score	Number of days/ week	Score
1. Main staples (cereals, tubers)	2						
2. Pules and oilseeds	3						
3. Vegetables	1						
4. Fruits	1						
5. Animal proteins	4						
6. Sugars	0.5						
7. Dairy products	4						
8. Oil and fats	0.5						
Total							
Poor/ borderline/ acceptable							

14. ADAPTATION TO CLIMATE CHANGE AND RESILIENCE

Objective: to collect various information for assessing the potential effects of agroecology on the farm's resilience and adapting to climate change.

Reference will be made to the questions presented in [Evaluation Sheet 15](#), Farm resilience and ability to adapt to climate change.

Presentation of the spreadsheet for automated economic calculation and its user manual

The farm's economic results may be calculated automatically from data gathered through surveys, using a specially designed Excel spreadsheet. The spreadsheet and its user manual are available online⁸⁸. These two tools (spreadsheet and user manual) complement [evaluation sheets 8](#) and [9](#), Economic performance from the farmer's point of view (crop- and livestock-production activities, and agricultural production system) as well as a few other sheets utilising the results of the economic calculation.

The Excel spreadsheet for calculating the farm's economic results comprises **fifteen sheets** grouped together into **ten worksheets**. The table below presents all the worksheets, sheets and tables included in each sheet.

88. Available for download on the websites of Éditions du Gret and Éditions Quæ.

Worksheet		Name of the sheet	Tables
1	1	General information and prices for intermediary consumption and paid workforce	- General information - Input prices - Service prices - Paid workforce prices
2	2	Depreciation and value of equipment, infrastructure and plantations	- Calculation for each type of equipment, infrastructure and plantation - Unallocated annual depreciation for all equipment (equal), infrastructure (infual), plantations (plua) and all means of production (dua) - Annual depreciation for all equipment (eq), infrastructure (inf), plantations (pl) and all means of production (d) - Value of all equipment (EQ), infrastructure (INF) and plantations (PL)
3	3	Value of animals (AN), change in inventory value (Δ INV) and number of animal units (AU)	Value of animals (AN), change in inventory value (ΔINV) and number of animal units (AU)
	4	Area of owned land used in the agricultural production system (UFAown), value of owned land used in the production system (L), area of unowned land used in the production system, rent of the land (ren), useful farming area (UFA), use of commons, area of owned land not used in the production system and income from renting it out	- Area of owned land used in the agricultural production system (UFAown) and value of owned land used in the production system (L) - Area of unowned land used in the production system, rent of the land (ren) and useful farming area (UFA) - Use of commons - Area of owned land not used in the production system and income from renting it out
	5	Agricultural capital advanced for production in the year (K)	Agricultural capital advanced for production in the year (K)

Worksheet	Sheet	Name of the sheet	Tables
4	6	Gross product for each crop- or livestock-production activity (GP)	Individual tables for up to 10 activities: 1 to 10. Gross product for each crop- or livestock-production activity
5	7	Labour (WD), monetary costs (MC), intra-unit consumption used (IUC) and allocated depreciation (daI) for the different crop- and livestock-production activities; labour (WD), MC and IUC for unallocated tasks and investments involving work on the farm; value of those investments	1 to 10. Crop-management sequences for crop- and livestock-production activities: individual tables (1 to 10) for up to 10 activities 11. Tasks not allocated to an activity: 1 table 12 to 15. Investments not specific to an activity: 4 tables 16 to 20. Investments specific to an activity: 5 tables
6	8	Gross value-added (GVA), net value-added (NVA), gross margin (GM) and net margin (NM) for the different crop- and livestock-production activities	1. Gross value-added (GVA), net value-added (NVA), gross margin (GM) and net margin (NM) for the different crop- and livestock-production activities 2. Verification that intra-unit consumption produced equals intra-unit consumption used
7	9	Gross value-added for the agricultural production system (GVA _{PS})	1. Sum of gross value-added for the different activities ($\sum$ GVA) 2. Unallocated intermediary consumption (ICua) 3. Gross value-added for the production system (GVA _{PS})
	10	Net value-added for the agricultural production system (NVA _{PS})	1. Net value-added for the agricultural production system (NVA _{PS})
8	11	Distribution of net value-added, agricultural income (AI) and components of agricultural income	1. Remuneration of paid workforce (WFpaid) 2. Distribution of net value-added 3. Agricultural income (AI) and its components

9	12	Additional data for the evaluation of the production system from the farmer's point of view	1. Composition of the family, family labour units (FLU), family agricultural labour units (FALU) and consumption units (CU) 2. Agricultural labour units (ALU) 3. Consumption units (CU) 4. Work days for family agricultural workers (WDfam) 5. Work days for paid agricultural workers (WDpaid) 6. Work days for external work received through cooperation-based relations (WDcoop) 7. Total agricultural work days (WD) 8. Monetary costs of the agricultural production system (MC_{ps})
	13	Characterisation and evaluation of economic performance from the farmer's point of view for the different crop- and livestock-production activities, and for the agricultural production system	1. Availability of productive resources used in the production system per family agricultural worker and per paid agricultural worker 2. Type of workforce used in the agricultural production system 3. Productive orientation of the agricultural production system 4. Labour and capital intensity of the agricultural production system 5. Characterisation and evaluation of economic performance for the different crop- and livestock-production activities 6. Characterisation and annual evaluation of all crop-production activities carried out on a given piece of land 7. Evaluation of the economic performance of the agricultural production system
10	14	Total income for the farm (TI) and TI/FLU	1. Extra-agricultural income (EAI) 2. Total income for the farm (TI) and breakdown of that income 3. Total income per family labour unit (TI/FLU)
	15	Economic surplus (S)	1. Economic surplus from agriculture per family agricultural labour unit (Sagr/FALU) 2. Economic surplus per family labour unit (S/FLU)

Characterisation of the degree of agroecologisation of farms

Evaluating the degree of agroecologisation of a farm involves estimating how well the farm complies with the principles of agroecology. The proposed method for conducting this evaluation involves calculating an agroecolo-score based on these principles.

1. OBJECTIVES OF THE CHARACTERISATION OF THE DEGREE OF AGROECOLOGISATION

Agricultural production systems comply with the principles of agroecology to varying degrees. Between a production system that fully complies with all of these principles and one that complies with none of them, there is a whole range of different situations. This is why we use the expression “production systems that are agroecological to varying degrees”. Outside the agricultural production system, the farm's choices in terms of consumption contribute to making the food system itself either more or less agroecological. This is why it is proposed to calculate the agroecolo-score for the farm as a whole, even though it is mainly the characteristics of the agricultural production system that are taken into account. The characterisation of the degree of agroecologisation of farms in a given territory has two main objectives:

- in **one-off evaluations**, it is necessary for **the evaluation of the effects of agroecology** (see [Chapter 2](#), Stage 2b, In-depth case studies of farms). If one wishes to compare the performance of systems that are “agroecological to varying degrees” and draw conclusions regarding the effects of agroecology, one must be able to determine the precise meaning of “agroecological to varying degrees”, and therefore have objective elements for assessing this characteristic. For this we primarily use the **agroecolo-score**, which takes into account all the principles of agroecology and all the criteria corresponding to those principles. Also, for each farm or type of farm, one may focus on the score obtained for each criterion or sub-criterion of the agroecolo-score, as each criterion corresponds to a principle of agroecology. This enables two types of comparisons: On the one hand, it is possible to assess, for a particular farm (or type of farm), the principle(s) of agroecology that the farm complies with most and those that it complies with least; on the other hand, it is possible to compare farms with other farms (and types of farms) based on each criterion or sub-criterion of the agroecolo-score;
- in **monitoring and evaluation** (see [Chapter 3](#)), it is useful for **monitoring the evolutions** of production systems over time and for evaluating the extent to which those systems gradually become more agroecological (or not). It is possible to monitor the evolution of the entire agroecolo-score over time. It is particularly useful, however, to monitor the evolutions of the scores for each criterion or sub-criterion. This enables a more in-depth comparison of farms with other farms and of evolutions over time. This information may also be useful for exchanges between farmers.

2. METHOD

1. General principles for calculating scores

Assessing the degree of agroecologisation of a farm involves assigning a score to each of the nineteen sub-criteria, which are grouped together into six criteria corresponding to essential principles of agroecology, namely:

- cultivated biodiversity and livestock biodiversity;
- existence of synergies between the different components of the cultivated ecosystem;
- saving and recycling of elements (organic matter and nutrients, water, energy);
- autonomy of the system resulting from valorisation of the ecosystem's resources, synergies, and saving and recycling of elements;
- soil protection;
- the farm's contribution to territorialisation and to the ecological viability of the food system⁹.

Criteria 1 to 5 focus on the agroecological character of the agricultural production process itself (the production system), while Criterion 6 concerns other farm decisions, which also have an impact on how agroecological the entire food system is.

Table 1 summarises the six criteria and 19 sub-criteria.

For each sub-criterion, a score between 0 and 3 is assigned depending on certain variables. The full grid is presented at the end of this tool sheet, including all criteria and sub-criteria, as well as the scores and variables corresponding to each score. The grid also includes a column (on the right-hand side) where the evaluator may record the score assigned to each sub-criterion. A grid may be used for each farm, and is available online in Excel format¹⁰.

For **one-off evaluations** (see [Chapter 2](#)), application of the grid to each farm and calculation of the agroecolo-score are done in Stage 2b, In-depth case studies of farms, after having conducted the interviews with the farmer. All the information needed to fill in the grid is usually already gathered in the case study. It is therefore not necessary to ask the farmer additional questions.

For **monitoring and evaluation** (see [Chapter 3](#)), application of the grid and calculation of the agroecolo-score are done when establishing the baseline situation and during the final evaluation. Monitoring of each criterion or sub-criterion may be conducted throughout the intervention.

⁹. With regard to the FAO's elements of agroecology (FAO, 2018), we have used (and adapted) only the principles that concern practices implemented at production-system and farm level. This includes practices that have indirect effects on the agroecological character of the entire food system. We have not used certain elements that do not appear to characterise the practices themselves, but rather effects or conditions necessary for the development of agroecological practices and systems.

¹⁰. The Excel file is available for download on the websites of Éditions du Gret and Éditions Quæ.

Table 1. Summary of the 6 criteria and 19 sub-criteria used to characterise the degree of agroecologisation.

Criteria	Sub-criteria
1. Cultivated biodiversity and livestock biodiversity	1.1. Crop diversity
	1.2. Livestock
2. Synergies	2.1. Integration of crop and livestock production
	2.2. Crop rotations and associations
	2.3. Integration of trees in the agricultural production system
	2.4. Contribution of the agricultural production system to connectivity between the different components of the agro-ecosystem and landscape
3. Saving and recycling of elements	3.1. Recycling of organic matter and nutrients
	3.2. Water management
	3.3. Energy
4. Autonomy of the system resulting from valorisation of the ecosystem's resources, synergies, and saving and recycling of elements	4.1. Overall autonomy with respect to inputs and other means of production
	4.2. Fertilisation practices
	4.3. Sanitary and phytosanitary protection
	4.4. Genetic resources
5. Soil protection	5.1. Practices to prevent erosion and protect soil
	5.2. Soil cover
6. Contribution to territorialisation and to the ecological viability of the food system	6.1. Valorisation of local varieties and species, and of local know-how for food preparation
	6.2. Products marketed in the territory
	6.3. Relationships with consumers
	6.4. Contribution to limiting agricultural losses and food waste

By adding up the scores, it is possible to characterise the farm's degree of agro-ecologisation (scores of A, B, C, D or E depending on the total sum of all the scores, see Table 2).

Table 2. Characterisation of the farm's degree of agroecologisation.

Agroecolo-score	Number of points	Characterisation
A	47 to 57	Very substantially agroecological farm
B	35 to 46	Substantially agroecological farm
C	23 to 34	Moderately agroecological farm
D	11 to 22	Slightly agroecological farm
E	0 to 10	Non-agroecological farm

2. Adapting the tool to the context

The grid presented at the end of this tool sheet is a generic grid. It needs to be **adapted to each context**. Depending on the context, the relevant variables for characterising the degree of agroecologisation may vary, as well as the weight given to each criterion and sub-criterion. Adapting the grid to each context may involve:

- modifying or clarifying the variables corresponding to certain sub-criteria;
- modifying the weighting of each sub-criterion. The weighting is uniform in the generic grid (with a maximum score of 3 for each criterion), but the weight of certain sub-criteria may be increased if they are considered to be fundamental elements for characterising the degree of agroecologisation. Conversely, it is possible, for example, to eliminate criterion 3.2 (Water management) in the case of territories where there is no risk of a water deficit, or criterion 5.1 (Practices to prevent erosion and protect soil) in the case of territories where there is no risk of soil erosion.

After adapting the grid, the maximum score may not be the same as the maximum score of the generic grid (57). The generic grid for characterising the degree of agroecologisation should then be restructured (Table 2).

It is also possible to reorganise the different criteria according to the element primarily affected by the agricultural practices and systems (soil, water, plant, animal, socio-economic sphere) (see Haiti example opposite).

Two examples of adapting the generic grid

In **Burkina Faso**, in the commune of Guiè, located in the Sahel zone, the score for the sub-criterion Integration of crop and livestock production was doubled (6 instead of 3) to take into account its centrality in agroecology. Conversely, the scores of sub-criteria relating to effects on the food system were reduced because they are of little importance in this context, where most of the production is for family consumption. It was also taken into account that a farm may have strong integration between crop and livestock production, but with a very weak livestock-production activity. To avoid overestimating the degree of agroecologisation of farms in this situation, the score was reduced in situations where the number of animal units per hectare of cultivated area is less than 1. Likewise, for the sub-criterion Fertilisation, situations where organic manure is applied, but in a way that is clearly insufficient in relation to what is needed, were taken into account. A median level of fertiliser applications/ha for all farms was calculated, and the score was reduced for farms whose applications are below the median. The score for the sub-criterion Crop rotations and associations was also reduced in cases where rotations include only a very few legumes in order to take into account their essential role in the agroecological transition. Lastly, to take into account the fact that agricultural practices may be very different for each part of the crop rotation (plots included or not in an agroecological bocage scheme), the scoring of certain criteria was applied separately for each type of situation, and the average of the two scores was used. Other minor adaptations were also made.

In **Ecuador**, in an irrigated zone in the Andes, a component relating to crop-water-requirement irrigation (*irrigation raisonnée*) to reduce water losses was incorporated into the sub-criterion Water management. Phytosanitary protection was distinguished from sanitary protection for animals (the score for both of them combined was doubled) to take into account rather distinct issues between the two types of protection, the scale of external purchases of synthetic protection products and the fact that it is a particularly important dimension of the agroecological transition. The sub-criterion Soil cover was eliminated and integrated into the sub-criterion Soil protection, with an overall reduction of the score linked to this issue, which is less essential than others in the context of this particular zone.

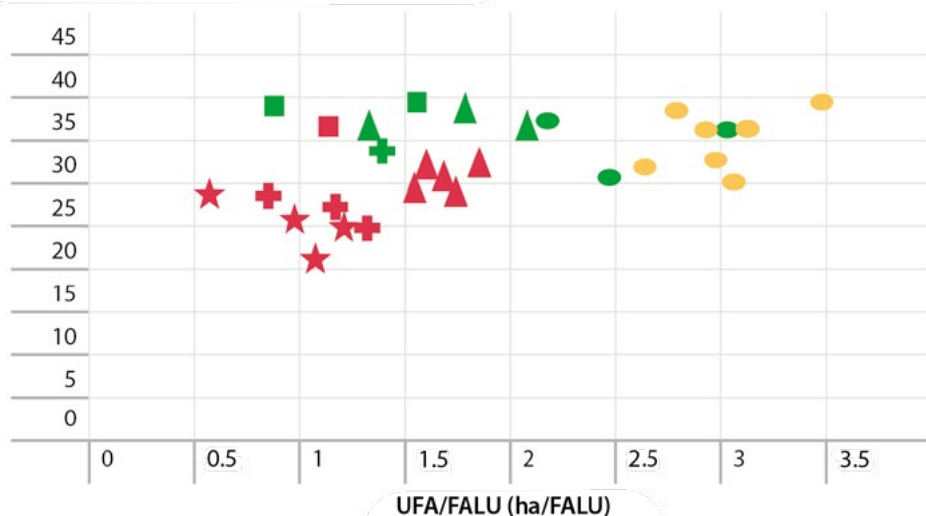
3. Graphic representations of the results

The results of the evaluation of the degree of agroecologisation of farms may be presented in the form of a chart where the horizontal axis represents the farming area per family worker and the vertical axis represents the agroecolo-score.

The example in Figure 1 is from a study conducted in Burkina Faso in the commune of Guiè. The different symbols and colours correspond to various types and sub-types of farms.

Figure 1. Example of graphic representation of farms based on their degree of agroecologisation (commune of Guiè, Burkina Faso)
[source: Ouedraogo and Levard, 2022].

Degree of agroecologisation based on UFA/FALU



Each farm is represented by a different symbol or colour (square, cross, star, triangle, green oval, yellow oval) depending on the type of farm it is. Moreover, for farms belonging to the types represented by a square, cross, star or triangle, the colour makes it possible to distinguish farms that have some of their plots in a bocage scheme (green) from those that have all of their plots outside of bocage schemes (red).

The degree of agroecologisation may also be represented using a spider chart. Each axis represents a criterion or sub-criterion. The scores obtained for each of them may be compared. It also makes it possible to compare several farms at once. Lastly, in a monitoring-and-evaluation system, changes in the scores for each criterion or sub-criterion may be represented.

The example below of a farm in the commune of Saint-Raphaël, in Haiti, illustrates this type of graphic representation for a farm. The criteria and sub-criteria were first adapted to the context, and were then reorganised based on the main element in question, namely soil, water, plant or animal. A chart was created for each main element. In each chart, the axes extending from the centre each correspond to a sub-criterion. One final chart shows the overall level of agroecologisation where an average score was calculated for each element (soil, water, plant, animal). It should be noted that a "Technical and economic performance" axis was added to this final chart, focusing not on the degree of agroecologisation but on the levels and regularity of yields and productivity.

Figure 2. Representation of the scores for each criterion and sub-criterion, and of the overall degree of agroecologisation using spider charts (farm in the commune of Saint-Raphaël, in Haiti) (source: Agrisud international, UEH-CHCL, Gradimirh, IRD, 2020).

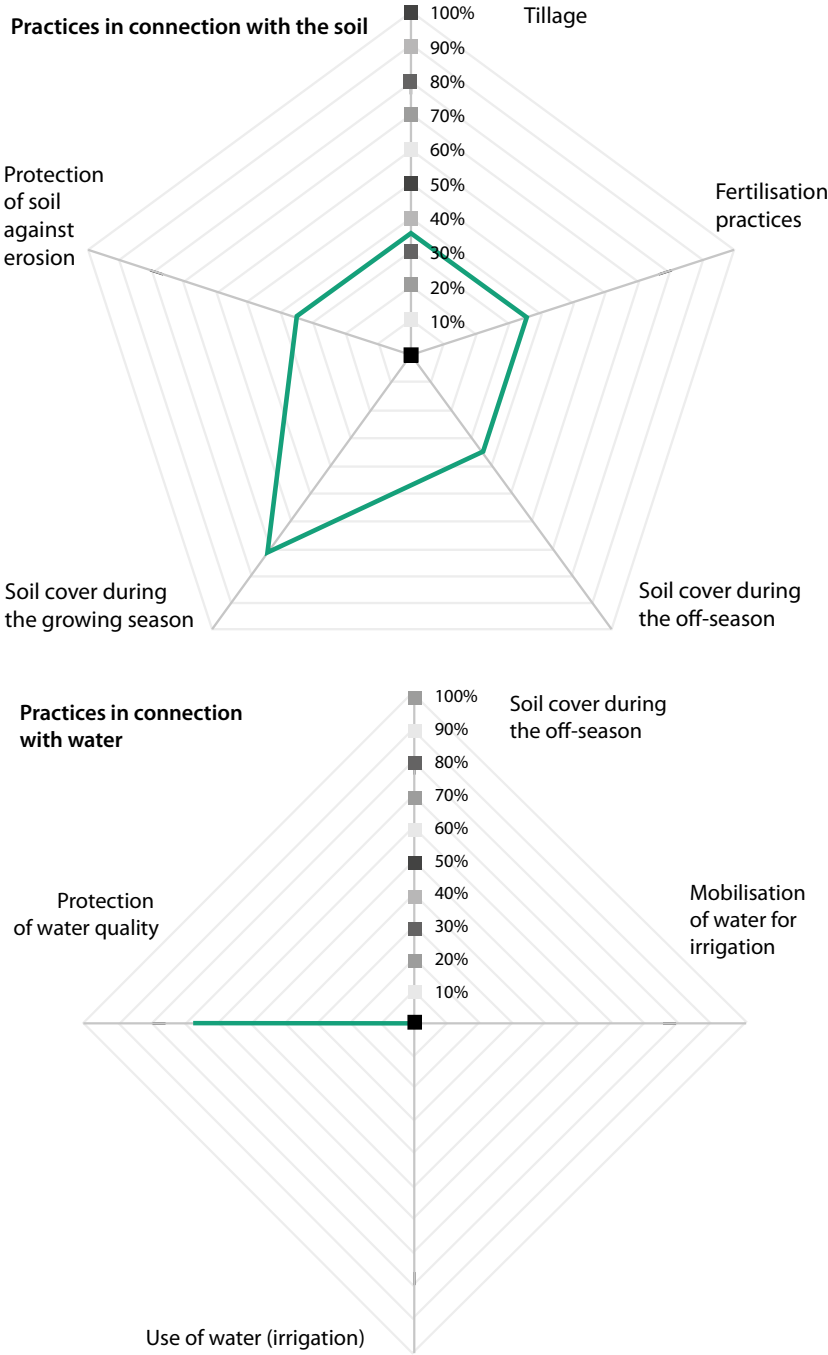
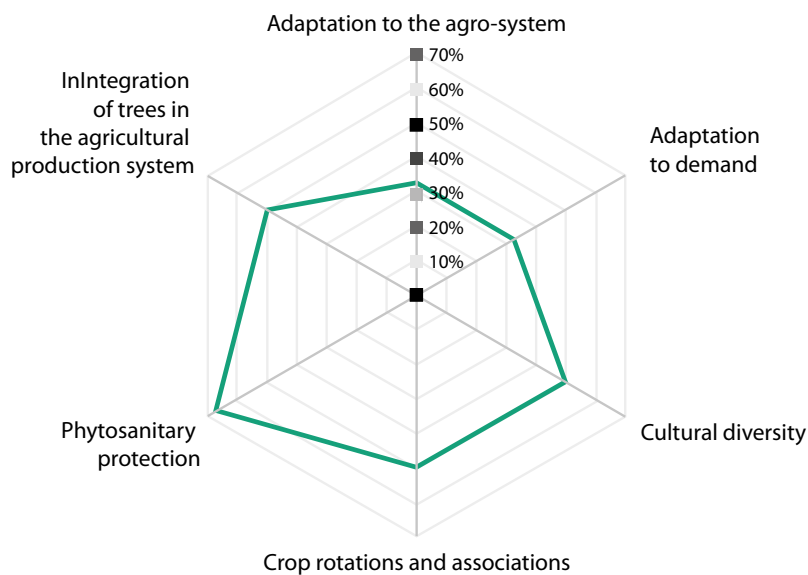
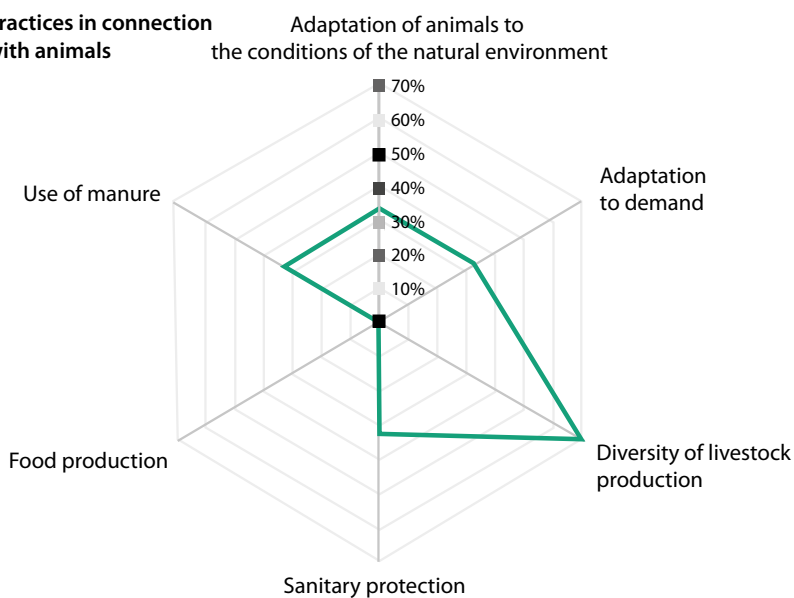
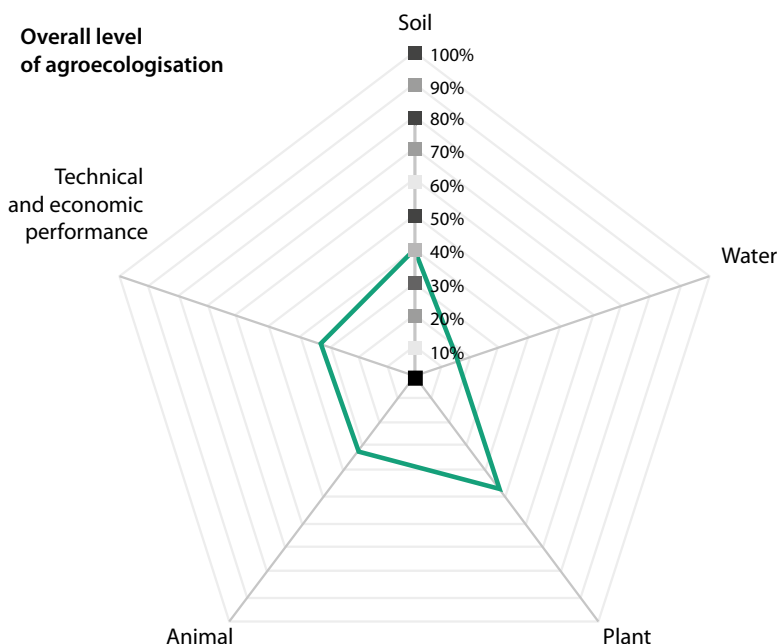


Figure 2. (following)

Practices in connection with plants**Practices in connection with animals**



3. SCALES OF THE CHARACTERISATION OF THE DEGREE OF AGROECOLOGISATION

The preferred scale for the characterisation of the degree of agroecologisation is that of **the farm**, and particularly its agricultural production system given that most of the criteria focuses on the agricultural production system. The degree of agroecologisation of farms may be integrated into the comparative analysis of the economic and social performance of the different farms and farm types. An example of the one-off-evaluation approach is given in the presentation of Stage 2b, In-depth case studies of farms ([Chapter 2](#)).

A characterisation at a lower level (plot or group of plots) would not make sense, as agroecology is based mainly on the diversity of crop- and livestock-production activities, their integration (synergies, recycling of elements) and the effects of that integration on autonomy. The criteria must therefore be evaluated at the level of the entire farm.

The internationally recognised definitions of agroecology, and in particular the FAO's definition¹¹, establish that agroecology concerns not only the practices implemented at the level of agricultural production, but also those implemented at the level of the food system as a whole. The methodological choice of this Guide is to focus on the level of agricultural production. This includes decisions made at farm level that have a more global effect on the degree of agroecologisation of the food system. This is taken into account in Criterion 6 (Contribution of the farm to territorialisation and to the ecological viability of the food system).

11. FAO, 2018.

In addition, the characterisation of the degree of agroecologisation must take into account the fact that many synergies and processes for the recycling of elements occur not only at farm level, but at the level of a zone combining several neighbouring farms. This has two consequences.

The first consequence is that certain criteria (integration of crop and livestock production, recycling of organic elements and nutrients, recycling of energy, seed autonomy) must be considered while taking into account interactions with nearby farms. The grid for characterising the degree of agroecologisation takes into account this type of interaction.

The second consequence is that particular attention should be given to practices that may appear to be agroecological at farm level but would not be agroecological at territorial level. This is particularly the case when there are large transfers of organic matter to the farm from outside the farm (e.g. for making compost or feeding animals). If such transfers degrade the ecosystem outside the farm, it would be difficult to describe these practices as agroecological. This is one limit of the agroecolo-score which needs to be taken into account for a more global assessment of the territory.

It is possible to globally characterise the degree of agroecologisation of a given **territory** based on the average agroecolo-score for each type of farm on the one hand, and the adjusted weight of the different types of farms with respect to use of farming area on the other. Table 3 presents a hypothetical example showing the calculation of a territorial agroecolo-score.

Table 3. Example of the calculation of a territorial agroecolo-score.

Type of production system (PS)	Useful farming area (ha) per type of PS	Number of farms in question (statistics or estimate according to experts)	Surface-area weight (ha) and %	Agroecolo-score per PS	Agroecolo-score weighted by surface-area representativity
Type-1 PS	1	5,000	5,000 [71.5%]	44	31.4
Type-2 PS	1	1,000	1,000 [14.5%]	46	6.6
Type-3 PS	5	100	500 [7%]	38	2.7
Type-4 PS	100	5	500 [7%]	32	2.3
Territory		6,105	7,000 [100%]		43

4. PRESENTATION OF THE COMPLETE GENERIC GRID

Below is the full generic grid used to calculate the agroecolo-score.

Table 4. Generic grid for calculating the agroecolo-score.

Scale of characterisation			Additional notes	Max. score
Score	Description of the situation			
	Main variable	Secondary variable (if applicable)		
CRITERION 1. CULTIVATED BIODIVERSITY AND LIVESTOCK BIODIVERSITY				
Sub-criterion 1.1. Crop diversity				
0	One crop or crop association occupies over 50% of the cultivated area		– Permanent grasslands not included – The "crop associations" dimension of agrobiodiversity is covered in Criterion 2. Synergies (2.2. Crop rotations and associations) – The presence of trees and perennial crops is covered in Criterion 2. Synergies (2.3 Integration of trees in the agricultural production system)	3
1	The main crop or crop association occupies between 33% and 50% of the cultivated area			
2	No crop or crop association covers more than 33% of the cultivated area	In total, between 3 and 4 crops or crop associations		
3		In total, at least 5 crops or crop associations		
Sub-criterion 1.2. Livestock				
0	No livestock production			3
1	Just one animal species			
2	Two or three animal species			
3	At least four animal species			

CRITERION 2. SYNERGIES			
Sub-criterion 2.1. Integration of crop and livestock production			
0	No livestock production, or no integration of crop and livestock production. None of the animal feed is produced on the farm or on a neighbouring farm. Animal manure is not used to fertilise crops (farm in question or neighbouring farm)	- Variants are possible: e.g. a score of 1 may also mean "most of the animal feed is produced on the farm or on a neighbouring farm, but animal manure is not used for fertilisation (farm in question and neighbouring farm)". - Aquaculture included	3
1	Little integration of crop and livestock production. A small portion of animal feed is produced on the farm or on a neighbouring farm. Animal manure is used for fertilisation (farm in question or neighbouring farm)		
2	Average integration of crop and livestock production. Most of the animal feed is produced on the farm or on a neighbouring farm (including pasture), animal manure is used for fertilisation (farm in question or neighbouring farm)		
3	High integration of crop and livestock production. All animal feed is produced on the farm (including pasture). Animal manure is used for fertilisation (farm in question or neighbouring farm), animal traction is used		
Sub-criterion 2.2. Crop rotations and associations			
0	No crop rotation or crop association	Permanent grasslands not included	3
1	Less than 50% of the cultivated area is in crop rotations or used for crop associations		
2	More than 50% of the cultivated area is in crop rotations or used for crop associations		
3	All of the cultivated area is in crop rotations or used for crop associations		

Scale of characterisation			Additional notes	Max. score
Score	Description of the situation			
	Main variable	Secondary variable (if applicable)		
Sub-criterion 2.3. Integration of trees in the agricultural production system				
0	Few or no trees present		- The management of commons is not included in this characterisation, which focuses on the level of the individual farm - Variants are possible: e.g. situation 3 may also correspond to "Little hedging, but agroforestry practised on almost all plots"	3
1	Low to average presence of trees: a few hedges or a few trees on certain plots			
2	Average to high presence of trees: quite significant presence of hedges or trees on the plots			
3	Very strong integration of trees: systematic hedging of plots or agroforestry practised on most plots			
Sub-criterion 2.4. Contribution of the agricultural production system to connectivity between the different components of the agro-ecosystem and landscape				
0	No contribution to connectivity: high uniformity within the farm's agro-ecosystem, no semi-natural areas or ecological compensation areas			3
1	Low contribution to connectivity: presence of a few isolated contributing elements, such as trees, shrubs, hedges, ponds, small semi-natural areas or ecological compensation areas			
2	Average contribution to connectivity: presence of several contributing elements (trees, shrubs, hedges, ponds) that are integrated with or adjacent to crops and grasslands; or significant presence of semi-natural areas or ecological compensation areas			
3	High contribution to connectivity: the agro-ecosystem presents a mosaic of diversified landscapes; or many elements such as trees, bushes, hedges and ponds are integrated with or adjacent to crops and grasslands; or presence of many semi-natural areas or ecological compensation areas			

CRITERION 3. SAVING AND RECYCLING OF ELEMENTS			
Sub-criterion 3.1. Recycling of organic matter and nutrients			
0	All products and joint products of the production system are exported from the system or destroyed		3
1	The products and joint products of the production system that are not exported are recycled on site (decomposition, burning, consumption by animals, transfers to other crops), including neighbouring farms		
2	The products and joint products of the production system that are not exported are recycled on site (decomposition, burning, consumption by animals, transfers to other crops), including neighbouring farms.		
3	Specific practices are implemented to limit carbon and nitrogen losses over the course of the cycles (composting of manure, nitrate-fixing intermediate crops, collection of runoff from manure, etc.)	Practices such as recycling residues from the ecosystem (leaves, branches) or from urban consumers (composted peelings, treated sewage sludge) are also implemented	
Sub-criterion 3.2. Water management			
0	In dry regions, no practices for collecting or economising water		3
1	In dry regions, just one practice for collecting or economising water		
2	In dry regions, two practices for collecting or economising water		
3	In dry regions, a variety of practices for collecting or economising water		
		Not applicable for areas where there is no risk of a water deficit	

Scale of characterisation			Additional notes	Max. score
Score	Description of the situation			
	Main variable	Secondary variable (if applicable)		
	Sub-criterion 3.3. Energy			
0	No production or use of renewable energies			3
1	Most of the energy used is acquired on the market			
2	Most of the energy used comes from renewable energies from the farm in question or from neighbouring farms (animal traction, wind, water, wood, biogas, solar)			
3	All of the energy used comes from renewable energies from the farm in question or from neighbouring farms (animal traction, wind, water, wood, biogas, solar)			
CRITERION 4. AUTONOMY OF THE SYSTEM RESULTING FROM VALORISATION OF THE ECOSYSTEM'S RESOURCES, SYNERGIES, AND SAVING AND RECYCLING OF ELEMENTS				
Sub-criterion 4.1. Overall autonomy with respect to inputs and other means of production				
0	Very low overall autonomy: the net value-added of the production system represents less than 20% of gross product (NVA/GP < 0.20)			3
1	Relatively low overall autonomy: the net value-added of the production system represents between 20% and 50% of gross product (0.20 < NVA/GP < 0.50)			
2	Relatively high overall autonomy: The net value-added of the production system represents between 50% and 80% of gross product (0.50 < NVA/GP < 0.80)			
3	Very strong overall autonomy: the net value-added of the production system represents over 80% of gross product (NVA/GP > 0.80)			

Sub-criterion 4.2. Fertilisation practices		
0	Synthetic fertilisers are used regularly on all crops and grasslands; or no/low use of synthetic fertilisers results from no/poor access to these inputs with no alternative system for managing fertility	3 Excluding permanent grasslands
1	Fertilisation of crops and grasslands is based mainly on synthetic fertilisers, with the use of some organic fertilisers too (manure, slurry, compost, green manures, plant residues)	
2	Fertilisation of crops and grasslands is based mainly on organic fertilisers (manure, slurry, compost, green manures, plant residues), with the use of some synthetic fertilisers too	
3	Fertilisation of crops and grasslands is based solely on organic fertilisers (manure, slurry, compost, green manures, plant residues)	
Sub-criterion 4.3. Sanitary and phytosanitary protection		
0	Phytosanitary protection and sanitary protection for livestock are based exclusively on the use of pesticides and synthetic veterinary products	3 Mandatory and highly recommended vaccines are not taken into consideration here
1	Phytosanitary protection and sanitary protection for livestock are based mainly on the use of pesticides and synthetic veterinary products, in addition to the use of biological-control practices or biological products	
2	Phytosanitary protection and sanitary protection for livestock are based mainly on the use of biological-control practices or biological products, in addition to the use of pesticides and synthetic veterinary products	
3	Phytosanitary protection and sanitary protection for livestock are based exclusively on the use of biological products and a wide variety of biological-control practices, including in terms of prevention, as part of an integrated-biological-protection system	

Scale of characterisation			Additional notes	Max. score
Score	Description of the situation			
	Main variable	Secondary variable (if applicable)		
Sub-criterion 4.4. Genetic resources				
0	All plant genetic resources (seeds, seedlings) and animal genetic resources (animals, animal semen) are acquired from off the farm for each production cycle			3
1	Most plant genetic resources (seeds, seedlings) and animal genetic resources (animals, animal semen) are acquired from off the farm for each production cycle			
2	Most plant genetic resources (seeds, seedlings) and animal genetic resources (animals, animal semen) come from the farm or are acquired through exchanges with other peasant farmers			
3	All plant genetic resources (seeds, seedlings) and animal genetic resources (animals, animal semen) come from the farm or are acquired through exchanges with other peasant farmers			
CRITERION 5. SOIL PROTECTION				
Sub-criterion 5.1. Practices to prevent erosion and protect soil				
0	In areas at risk of erosion, there are no practices for preventing erosion or protecting soil		Not applicable to areas where there is no risk of erosion	3
1	In areas at risk of erosion, there are a few practices for preventing erosion and protecting soil			
2	In areas at risk of erosion, there are a significant number of practices for preventing erosion and protecting soil			
3	In areas at risk of erosion, there is an integrated system for preventing erosion and protecting soil which includes a combination of different practices			

Sub-criterion 5.2. Soil cover			
0	All soils are tilled or left bare (no residues or cover crops) after harvests		3
1	Less than 50% of the cultivated area is protected by residues or cover crops in the months following harvests		
2	More than 50% of the cultivated area is protected by residues or cover crops in the months following harvests		
3	All of the cultivated area is protected by residues or cover crops in the months following harvests		
CRITERION 6. CONTRIBUTION TO TERRITORIALISATION AND TO THE ECOLOGICAL VIABILITY OF THE FOOD SYSTEM			
Sub-criterion 6.1. Valorisation of local varieties and species, and of local know-how for food preparation			
0	No valorisation of local varieties and species, or of local know-how for food preparation. Whether foods are from the farm or purchased, their preparation is based exclusively on exogenous varieties and species	Certain varieties and species were introduced over the course of history. They shall be considered "local" as long as they have been integrated into practices and can be reproduced locally	3
1	Food preparation is only occasionally based on the valorisation of local varieties and species, and on local know-how. Whether foods are from the farm or purchased, their preparation is based mainly on exogenous varieties and species		
2	Food preparation is based mainly on the valorisation of local varieties and species, and on local know-how		
3	Food preparation is based exclusively on the valorisation of local varieties and species, and on local know-how		

Scale of characterisation			Additional notes	Max. score
Score	Description of the situation			
	Main variable	Secondary variable (if applicable)		
Sub-criterion 6.2. Products marketed in the territory				
0	There is no local market, or no product from the farm is marketed to final consumers in the territory		Territory refers to the community, neighbouring communities and nearby urban centres (to be defined more precisely depending on the context)	3
1	A small share of the production marketed to final consumers is sold at a local market or at territorial level			
2	Most of the production marketed to final consumers is sold at a local market or at territorial level			
3	All of the farm's marketed production is marketed to final consumers within the territory			
Sub-criterion 6.3. Relationships with consumers				
0	No links with consumers			3
1	Direct links with consumers exist, but are relatively limited (small proportion of the products marketed)			
2	Significant direct links with consumers exist (significant proportion of the products marketed)			
3	Strong links with consumers exist (most of the products marketed)			

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Chapter 6. Evaluation of the conditions necessary for the development of agroecology

Claire Kieffer, Prémila Masse, Adeline Derkimba, Laurent Levard

Part 3. Tool sheet

1. Guide for interpreting the agrarian landscape and establishing zoning	Samir El Ouaamari, Pierre Le Ray, Laurent Levard, Kevin Jestin (Senegal study)
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The *Guide for the evaluation of agroecology* proposes an approach and methodological tools for assessing the effects of agroecological practices and systems on the agro-environmental and socio-economic performance of agriculture, and for assessing the conditions necessary for the development of agroecology. It aims to: help development stakeholders better design their projects, programmes and public policies in support of agroecology; facilitate the creation of references (performance and conditions necessary for development); and assist farmers so that they can better evaluate the results of their practices and thus have guidance for making decisions.

This Guide is divided into three parts. The first part presents the **general approaches for one-off evaluations and for monitoring and evaluation**. The second part consists of **evaluation sheets** covering either agro-environmental and socio-economic aspects that may be impacted by agroecology, or the conditions necessary for the development of agroecology. The third part proposes additional methodologies in the form of **tool sheets**.

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