Tool for Agroecology Performance Evaluation (TAPE) - Test version

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Food and Agriculture Organization of the United Nations

TAPE

TOOL FOR AGROECOLOGY PERFORMANCE EVALUATION

PROCESS OF DEVELOPMENT AND GUIDELINES FOR APPLICATION

TEST VERSION

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ACRONYMS

ADB	Asian Development Bank
AFSA	Alliance for Food Sovereignty in Africa
ALiSEA	Agroecology Learning Alliance in South-East Asia
AVSF	Agronomes et *Vétérinaires Sans Frontières* - Agronomists and Veterinarians Without Borders
CAET	Characterization of Agroecological Transition
CARI	*Centre d'Actions et de Réalisations Internationales* - Center of International Actions and Achievements
CIMMYT	*Centro Internacional de Mejoramiento de Maíz y Trigo* - International Maize and Wheat Improvement Center
CIRAD	*Centre de coopération Internationale en Recherche Agronomique pour le Développement* - French Agricultural Research Centre for International Development
COAG	Committee on Agriculture
EX-ACT	Ex-Ante Carbon-balance Tool
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FHI	Family Health International
FIES	Food Insecurity Experience Scale
FoEI	Friends of Earth International
GIRA	*Grupo Interdisciplinario de Tecnología Rural Apropiada* – Interdisciplianry Group of Appropriate Rural Technology
GKP	Global Knowledge Product
GLEAM	Global Livestock Environmental Assessment Model
GRET	*Groupe de Recherche et d'Échanges Techologiques* – Research and Technological Exchange Group
GSARS	Global Strategy to Improve Agricultural and Rural Statistics
GTAE	*Groupe de Travail sur les Transitions Agroécologiques* – Working Group on Agroecological Transitions
HDDS	Household Dietary Diversity Score
HLPE	High Level Panel of Experts on Food Security and Nutrition
ICRAF	International Centre for Research in Agroforestry
IDA	Index of Agrobiodiversity
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization

INRA	*Institut National de la Recherche Agronomique* – French National Institute of Agronomic Research
INTA	*Instituto Nacional de Tecnología Agrícola* – Argentinian National Agricultural Technology Institute
IPES-Food	International Panel of Experts on Sustainable Food Systems
IRD	*Institut de Recherche pour le Développement* – Research Institute for Development
LEAP	Livestock Environmental Assessment and Performance
LUME	*Método de análise econômico-ecológica de agroecossistemas* - Method of Economic and Ecological Analysis of Agroecosystems
MAELA	*Movimiento Agroecológico de América Latina y el Caribe* – Agroecological Movement of Latin America and the Caribbean
MESMIS	*Marco para la Evaluación de Sistemas de Manejo de recursos naturales incorporando Indicadores de Sustentabilidad* - Framework for the Evaluation of Natural Resource Management Systems Incorporating Sustainability Indicators
NGO	Non-Governmental Organization
PAN	Pesticides Action Network
PAR	Platform for Agrobiodiversity Research
PPP	Purchasing Power Parity
ROPPA	*Réseau des Organisations Paysannes et des producteurs Agricoles de l'Afrique de l'Ouest* - Network of Farmers' Organizations and Agricultural Producers of West Africa
SAFA	Sustainability Assessment of Food and Agriculture Systems
SEEA AFF	System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries
SHARP	Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists
SDG	Sustainable Development Goals
SOCLA	*Sociedad Científica Latinoamericana de Agroecología* – Latin-American Scientific Society of Agroecology
TEEB	The Economics of Ecosystems and Biodiversity
TWG	Technical Working Group
UN	United Nations
UNAM	*Universidad Autónoma Nacional de México* – National Autonomous University of Mexico
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
WEAI	Women's Empowerment in Agriculture Index
WHO	World Health Organization
ZBNF	Zero Budget Natural Farming

SECTION 1

INTRODUCTION

- WHY DO WE NEED TO ASSESS AGROECOLOGY?
- BACKGROUND AND MANDATE
- TARGETED AUDIENCE AND HOW TO USE THIS DOCUMENT

1.1 WHY DO WE NEED TO ASSESS AGROECOLOGY?

Agroecology is at the same time **a science, a social movement and a practice** (Wezel *et al.*, 2009). Since its origins in the 1930's when scientists started to use it as the application of ecological principles to agriculture, its scale and dimension have grown tremendously. In the 1960's, social concerns for environment and opposition to industrialized agriculture gave agroecology another dimension as a form of social movement, in particular in Latin America, but also in Western Europe to some extent. Later in the 1980's, agroecology was finally described as a set of agricultural practices, with particular focus on alternatives to synthetic fertilizers and pesticides, soil and agrobiodiversity conservation techniques. With an initial scope at field/plot level, agroecology extended later to the level of the agroecosystem and, more recently, to the whole food system, including agricultural supply chains in their entirety but also consumers.

Because of these developments and of the various origins of the term, which also led to various translations in different languages, there have been confusions with the definition of agroecology. Today, all three natures of agroecology as a science, a movement and a practice, still co-exist. Practitioners, scientific experts, advocates and producers contribute to make agroecology an approach to producing, processing and consuming food that includes environmental, social and economic concerns. They are developing various processes and frameworks to support the transition towards more agroecological food systems.

Agroecology is also generating **growing political interest** for its potential to make our food systems more sustainable. There is an increasing amount of evidence demonstrating positive impacts of agroecology, especially on the environment and on households' incomes. But these results remain fragmented because of heterogeneous methods and data, differing scales and timeframes. Knowledge gaps still remain. In addition, much of the evidence lies in the "grey literature" (case studies, descriptions of communities' experiences, field observations, etc.) that are usually highly context dependent and not peer reviewed. There is a need for global and harmonized evidence on the multidimensional performances of agroecology to inform the policy making process. This evidence needs to be built with a diversity of actors, operating in different scales, timeframes, and contexts and dovetailed into their existing work.

1.2 BACKGROUND AND MANDATE

Since 2014, FAO has played a leading role in facilitating **global and regional dialogue** on agroecology through nine regional and international multi-stakeholder meetings, bringing together more than 2,100 participants from 170 countries. These meetings helped identify needs and priorities to scale up agroecology as a strategic approach to achieve Zero Hunger and the other Sustainable Development Goals (SDGs).

Each of the regional meetings produced a set of recommendations agreed upon by the participants. A clear and consistent recommendation was the need to strengthen and consolidate

PHOTO Duck herd in rice fields varied landscape, Indonesia.

the evidence base on agroecology. This is an important step to identify successful agroecological experiences to scale up, and to advocate for greater policy and financial support for agroecology. For example, the International Symposium on Agroecology in China called on stakeholders to: "*Identify and develop indicators on environmental, social, cultural and economic dimensions of agroecology at different spatial scales (farm, society, national level) and gather data on agroecology, including on the very long term. FAO should establish a working group to contribute to this task.*"

The process of global and regional dialogue culminated in the **2nd International Symposium on Agroecology in 2018**, bringing together the lessons learned from the regional meetings. The 2nd Symposium marked a shift of focus from dialogue to action. The Chair's Summary of the Symposium (FAO, 2018a) and various recommendations from countries and partner organizations stressed the need for FAO to "*take the lead on developing methodologies and indicators to measure sustainability performance of agricultural and food systems beyond yield at landscape or farm level, based on the 10 elements of agroecology and experience in developing indicator 2.4.1*".

In 2018, the **26th Committee on Agriculture** welcomed the Scaling up Agroecology Initiative, supported the 10 Elements of agroecology and *"requested FAO to assist countries and regions to engage more effectively in the transition processes towards sustainable agriculture and food systems by strengthening normative, science and evidence-based work on agroecology*, ***developing metrics, tools and protocols*** *[Ed addition] to evaluate the contribution of agroecology and other approaches to the transformation of sustainable agriculture and food systems."*

In 2019, The High Level Panel of Experts of the Committee on Food Security published a report (HLPE, 2019) on "Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition". This report recommends in particular to *establish and use comprehensive performances measurement and monitoring frameworks for food systems*, with specific recommendations for FAO to *encourage data collection at national level, documentation of lessons learned and information sharing at all levels, to facilitate the adoption*

of agroecological and other innovative approaches and foster transitions towards SFSs; and *in collaboration with member countries, assess and document the contribution of agroecological and other innovative approaches to food security and nutrition at national and global levels*.

FAO is well-positioned to lead this work in collaboration with key partners. Through the regional and international meetings, FAO has built a global network of partners including research institutions, civil society and producer organizations working together on agroecology. At the same time, FAO has a unique interface and experience working with governments and policymakers – the end users of the data and information that will be created.

FAO also plays an important global role on data and statistics for food, agriculture and rural development. FAO is the custodian agency for 21 SDG indicators and has experience in **developing SDG indicator 2.4.1** on the "proportion of agricultural area under productive and sustainable agriculture." Across FAO's Departments, there is a rich experience in developing methodologies, tools and frameworks, including the World Agriculture Watch, Sustainability Assessment of Food and Agriculture systems (SAFA) and the Women's Empowerment in Agriculture Index, among many others.

1.3 TARGETED AUDIENCE AND HOW TO USE THIS DOCUMENT

The targeted audience of this document are the **global and regional communities of practice** on agroecology, which include scientists, advocates, producers and extension workers. Policy makers and staff from NGOs and international organizations or funding institutions are also part of the targeted audience.

This document provides **guidance on how to assess agroecology** by carrying out a diagnostic of production systems with regard to various dimensions (environmental, social, economic…) and in a variety of contexts (production systems, communities, territories, agro-ecological zones, etc.). It explains how the analytical framework proposed by FAO was developed, what its underlying principles are and what its methodological components are.

This document can be used to develop projects aiming to build evidence and collect data about sustainable agriculture and the particular role of agroecological approaches. It can also be used to analyze how existing efforts to measure agroecology can contribute to building globally relevant and harmonized evidence. Because the process for the development of this framework included consultations and a review of other existing frameworks for the assessment of agroecology in diverse contexts, these other frameworks can be used to help compare situations and performance.

PHOTO In the next page: Man watering crops in diversified landscape in Lubumbashi, Katanga province, Democratic Republic of Congo

SECTION 2

DEVELOPING A GLOBAL ANALYTICAL FRAMEWORK ON AGROECOLOGY

- OBJECTIVES
- PROCESS
- FOUNDING PRINCIPLES
- KEY ATTRIBUTES FROM EXISTING FRAMEWORKS
- A STEPWISE APPROACH
- SCALE OF ASSESSMENT, DATA COLLECTION AND SAMPLING METHODOLOGY

To respond to the Committee on Agriculture (COAG- one of FAO's governing bodies) request, FAO, within its Strategic Program 2 on Sustainable Agriculture, was tasked with developing a Global Knowledge Product on Agroecology, as one of seven cross-sectoral Global Knowledge Products (GKPs) designed to provide innovative global solutions in sustainable agriculture through interdisciplinary collaboration. The knowledge product consists of tools to support evidence-based decision-making: **a global analytical framework and a supporting database** to assess the multi-dimensional performance of agroecology.

While the analytical framework provides the theory, background, and proposed approach to measure performance and assess agroecology in terms of metrics and methods, the global database will be the repository of data populated from the application of the framework in case studies in a diversity of production systems and regions. The database will allow analyses within particular contexts and will provide snapshots of performance at different scales across geographical locations at differing time scales, (for example before and after the implementation of a project). This FAO database will guarantee anonymity of the system where the data was collected and use modern data protection protocols and standards.

2.1 OBJECTIVES

The general objective of the analytical framework and the database is to **produce evidence on the performance of agroecological systems** across the environmental, social & cultural, economic, health & nutrition, and governance dimensions of sustainability to support agroecological transitions at different scales, in different locations, through different timeframes and to support context-specific policy making on agroecology. In simplified words, the analytical framework aims at providing a diagnostic of agricultural performance across many dimensions to move beyond standard measures of productivity (e.g. yield/ha) and better represent the benefits and tradeoffs of different agricultural systems.

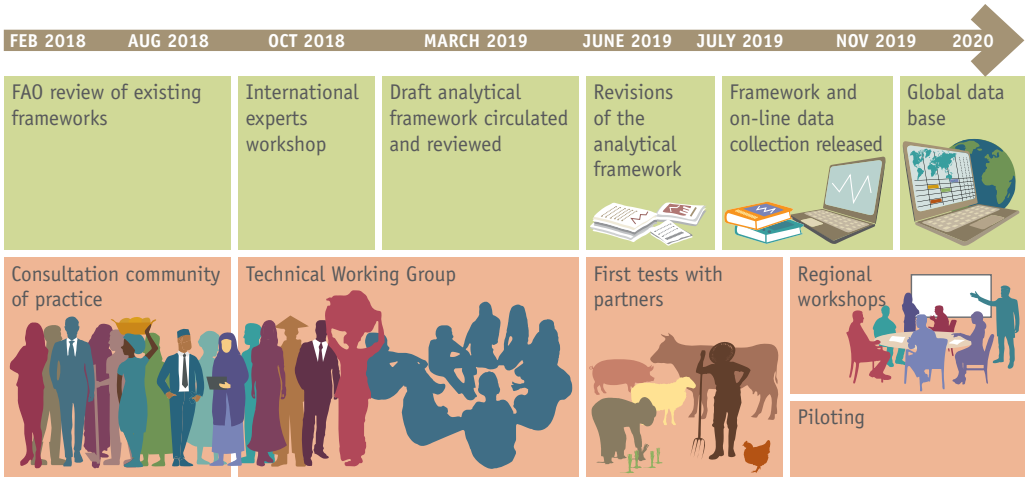
The specific objectives are to:

- **Build knowledge and empower producers** through the collective process of producing data and evidence on their own practices;
- **Support agroecological transition** processes at different scales and in different locations by proposing a diagnostic of performances over time and by identifying areas of strengths/weaknesses and enabling/disabling environment;
- **Inform policy makers and development institutions** by creating references on the multi-dimensional performance of agroecology and its potential to contribute to the SDGs.

2.2 PROCESS

The analytical framework is built upon ongoing work by FAO and by partners. It adapts existing frameworks to assess agroecology. FAO has therefore adopted a participatory approach, which included the following steps and is summarized in Figure 1. These steps included:

FIGURE 1 **Process and timeline for the development of a global analytical framework on agroecology**



- A review of existing frameworks and indicators for the assessment of agroecology and more generally of approaches to promote sustainable agriculture (February-May 2018);
- An FAO internal consultation with technical units and decentralized offices, to draft a set of indicators (February-September 2018);
- A public survey with more than 400 participants to identify missing existing analytical frameworks and discuss the draft set of indicators (August-September 2018);
- An international expert workshop[1] (8-9 October 2018, FAO, Rome) to present a selection of existing frameworks developed by partners and to discuss how the existing frameworks can contribute to the FAO global analytical framework; to review the draft set of indicators and agree on the way forward;
- A draft analytical framework developed with the support of a Technical Working Group formed during the workshop based on the feedback from expert and on the conclusions of the workshop (October 2018-May 2019);
- First tests of the draft analytical framework in a selection of case studies and projects (June-September 2019) and subsequent reporting on its strengths and weaknesses in order to further refine;

[1] Names and occupation of participants to the Workshop are listed in the Annex 1.

» Regional workshops to present TAPE and build capacity in the countries to use it (starting with in RAP and RLC regions in 2019) and release of final framework to be tested as well as on-line data collection tool.

2.3 FOUNDING PRINCIPLES

During the participatory process of development, 20 principles were established for the development of the analytical framework, which were validated and completed during the international expert workshop. The analytical framework should:

1. Build as much as possible on the strengths of **existing frameworks**, tools, methodologies, initiatives and data.
2. Be **widely applicable**, balancing the need to measure the holistic (but not exhaustive) nature of agroecology and its context specificity.
3. Be **theoretically robust but operationally flexible** to be adaptable to specific contexts across all agricultural production systems and sectors.
4. Measure key data, **minimizing the cost** of data collection, especially the burden on producers in providing data.
5. Be **tested** by relevant partners for review, validation and further adaptation.
6. Be developed and applied in a **participatory manner** that includes governments, researchers, civil society, producers and consumers' organizations engaged in agroecology.
7. Generate evidence for agroecology that can be used by stakeholders at **local, national and global levels** to advocate for public policies and financial support. By analyzing the impacts of agroecological systems, the results should also be useful at **the territorial level** (e.g. in developing and monitoring community responses and projects).
8. Collect data that focus on the **farm/household and community/territorial** levels as a priority but allowing for aggregation at higher level.
9. Build a **long-term partnership for data-collection**, including investments in capacity development at the local level.
10. Draw on and combine **different sources of knowledge**, including knowledge from science and practice that includes qualitative and quantitative data at different spatial and temporal scales.
11. Apply a socio-ecological systems approach that is able to address **integrated production systems** (crops-livestock-trees-fish).
12. Include a **limited number of core criteria** with flexible indicators based on agreed dimensions that are universally relevant and that are necessary for a coherent and global assessment of agroecological systems.
13. Use criteria and indicators that allow the **characterization** of agroecological levels of transition and assess key **performance** of agroecological systems.

14. Include performance indicators that reflect the **contribution of agroecology to the SDGs** as a means to engage policymakers.
15. Ensure that the characterization of agroecological systems identifies local reference values to compare agroecological and other systems **based on the 10 Elements of Agroecology**.
16. **Disaggregate data** by age, gender and diversity of producers when possible, as well as location and time.
17. Simplify the indicators as much as possible and **involve producers in data collection**; 'Citizen Science' can be complemented by other methods.
18. **Highlight the contribution of agroecology to global challenges and trends**, especially food security and nutrition, climate change adaptation and mitigation, biodiversity, and land degradation.
19. **Include key enabling/disabling factors** to the agroecological transition.
20. Analyze **trade-offs and synergies** between the 10 Elements and also between SDGs.

2.4 KEY ATTRIBUTES FROM EXISTING FRAMEWORKS

Recently, efforts to assess agroecology have resulted in the development of a number of frameworks, focusing on different dimensions of sustainability or different regions of the world, targeting mostly scientists and extension workers in agriculture. Table 1 present a non-exhaustive list of those frameworks and of their attributes that were incorporated in this framework as well as the differences. This was based on preliminary review conducted by FAO and on the international expert workshop and the participatory definition of the founding principles.

This framework therefore builds on other existing ones and should be seen as complementary. Indeed, the data collection and field work already carried out by partners as well as their experience in assessing agroecology in a variety of contexts and countries can contribute the testing and refining of the framework proposed here.

2.5 A STEPWISE APPROACH

To be aligned with these principles, a stepwise approach was developed, inspired by the Evaluation of Natural Resource Management Systems, or MESMIS by its Spanish acronym (López-Ridaura *et al.* 2002). MESMIS is a reference evaluation framework commonly used in Latin America, which provides principles and guidelines for the derivation, quantification and integration of context-specific indicators through a participatory process involving local actors. The MESMIS evaluation cycle features an inextricable link between system evaluation, system design and improvement.

The stepwise approach is summarized in Figure 2 and described in section 3. It is based on two core steps (1 and 2) complemented by a preliminary description of context and systems (step 0), with the inclusion of a facultative typology (step 1bis) and a final analysis and participatory interpretation of results (step 3). Step 0 should be conducted at a community or territorial level in addition to a farm or household level in order to provide a more complete preliminary description of the context and systems. The three diagnostic steps (Step 0, 1, and 2) are meant to be undertaken using one on-line survey in its entirety and lasting no more than 4 hours with the farm or household as the unit of measure. The survey is meant to be accessible and easy to implement. Further information on sampling methodology and inference space for data collection is available in section 2.6.

TABLE 1 **Key attributes retained from a number of existing frameworks reviewed and main differences**

FRAMEWORK	KEY ATTRIBUTES RETAINED	DIFFERENCES
MESMIS – Marco para la Evaluacíon de Sistemas de Manejo de recursos naturales incorporando Indicadores de Sostenibilidad (GIRA-UNAM)	» Participatory » Step-wise » Hierarchical » Flexible » Starts with contextualization	Indicators can be quantified by different method vs protocol provided in this framework
GTAE – Groupe de Travail sur les Transitions Agroécologiques (CIRAD-IRD-AgroParistech) – Memento pour l'évaluation de l'agroécologie	» Simple and reasonably time consuming » Allows integration in broader systems of monitoring and evaluation » Almost all criteria are common	Initial step of complete agrarian diagnostic not included in this framework Some criteria are proposed as advanced as they require more time and resources.
SOCLA – Sociedad Científica Latinoamericana de Agroecología, Method to assess sustainability and resilience in farming	» Soil health assessment used as core criteria » Almost all other criteria common » Participatory and simple	In depth crop health assessment not included in this framework
Sustainable Intensification Assessment Framework (Michigan State University)	» Not focused on particular practices » Addresses different scales (field/animal, farm/ household, community/ territory) » All 6 domains are common	Some of the criteria/indicators are included as advanced and not core in this framework
LUME - Método de Análise Econômino-Ecológica de Agroecossistemas (AS-PTA & MAELA)	» Based on MESMIS method » Almost all criteria/indicators are common » Valuing the invisible non-monetary economy	Centrality of the principle of autonomy vs one of the aspects to assess in this framework
Measuring the impact of ZBNF, the Zero Budget Natural Farming (State Dept of Agriculture, Andhra Pradesh & Amrita Bhoomi Center)	» Participatory and possible self-assessment » Large number of common indicators /impact	Method largely left to implementer to define

>>>

FRAMEWORK	KEY ATTRIBUTES RETAINED	DIFFERENCES
The Economics of Ecosystems and biodiversity - **TEEB** (ICRAF)	» Separates 2 steps: description of the system and analysis of the impacts » 4 dimensions of impacts are included (and this framework adds a 5th)	Economic assessment so based on 4 capitals, which is not the entry point in this framework
Sustainable Rural Livelihoods approach (CIRAD)	» Includes an analysis of the context (institutions, household activities...) » Could be adapted for this framework by integrating the 10 elements in the qualification of assets	Not participatory
Participatory methodologies from Malawi and Tanzania (Cornell University)	» Assessing systems in transition » Participatory and based on interviews	Does not prescribe indicators
SAFA - Sustainability Assessment of Food and Agriculture systems (FAO)	» Includes 4 dimensions of sustainability (environment, social, economy and governance), which are 4 of the 5 dimensions on this framework » Aims to be universal/global	Time consuming (21 themes and 58 sub-themes, 118 indicators) Targets enterprises (farms or companies)

FIGURE 2 **The global analytical framework of agroecology step by step**

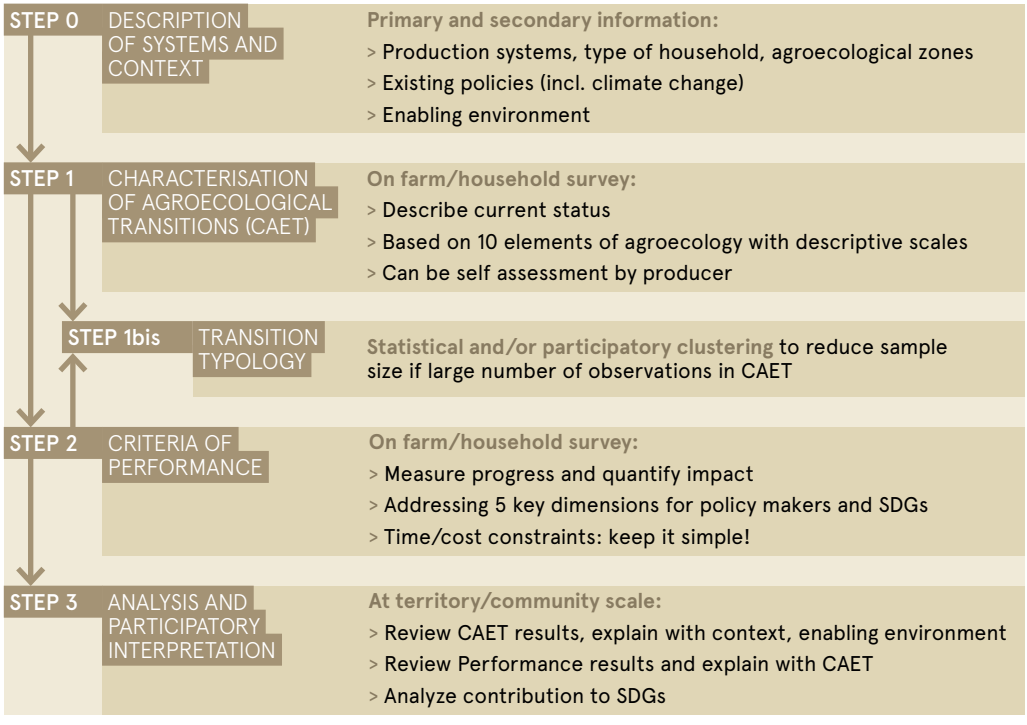


PHOTO Agricultural valley landscape with river terraces and railway, Germany.

Once the context and production systems have been described on the basis of primary and secondary information (Step 0), the characterization of agroecological transitions (CAET, Step 1) provides a description of the current status of the level of transition to agroecology of the systems assessed (farm, pastoralist, household, community). This description is based on the 10 Elements of Agroecology proposed by FAO and can be completed as a self-assessment by producers or as a guided exercise with other intermediaries.

Depending on the number of systems assessed in the same relative vicinity (territory, project, food shed, etc.), a typology of transitions resulting from the CAET can be established (Step 1bis and also see section 2.6 about sampling methodology and inference space).

The performance of the system is then assessed on the basis of a short list of core performance criteria (Step 2), which are also based on a survey at the farm or household level. Most of these criteria are directly linked with SDG indicators. The main constraints for the selection of criteria of performance were the founding principles requiring harmonized and consolidated evidence and to remain simple and based on a limited set of criteria/indicators. However, advanced indicators and methodologies can complement Step 2 to inform specific sustainability interests.

Steps 0, 1 and 2 can be completed together in the online survey form, with a farm or household as the smallest unit of measure within a particular territory or vicinity. Numerous experimental units within the same territory or vicinity across a spectrum of agroecological production should all be sampled in order to create inference spaces on the relative performance of these systems (section 2.3). If these units are homogeneous and meet other statistical robustness parameters, they may be aggregated to then provide a “snapshot” at a territorial level of the performance of agroecological systems.

Finally, an analysis of the results from the steps and a participatory interpretation of this analysis are performed (Step 3). The results of the CAET and the identification of strengths and weaknesses in the systems assessed may be correlated or discussed by the enabling environment and the profile or context of Step 0. In turn, the performance assessed in Step 2 are analyzed in the light of the CAET results: links between strong (or weak) elements of agroecology may correlate with good (or poor) performances.

2.6 SCALE OF ASSESSMENT, DATA COLLECTION AND SAMPLING METHODOLOGY

While the farm/household is the elementary unit of measure for TAPE, the framework requires data from and aims to provide results at the scale of the territory/community. Indeed, while the elementary unit for agricultural management is the farm/household, the territory/community is the scale where a number of processes necessary for the agroecological transition take place.

Step 0 and Step 1 both require data for higher scales than the farm/household, in terms of enabling environment and descriptions of the agroecosystem (Step 0) and to complete the survey for the elements of Co-creation and Sharing of Knowledge, Circular and Solidarity Economy and Responsible Governance (Step 1 CAET).

Data collection for Step 2 (Criteria of performances) is conducted at the farm/household level, but results can be upscaled from their aggregation to the territory/community level, in particular in the case of the application of Step 1 bis, the typology of transitions to reduce the size of the sample of systems to be assessed based on the result of the CAET.

Step 3 (Participatory analysis of results) is a critical step in order to interpret the results in the most accurate way for the community and to validate the upscaling from farm to territory level and to provide feedback on how the contextual and enabling factors determined in Step 0 may be impacting overall agroecology performance ascertained from Steps 1-2.

This aggregation requires in particular to define with care the sampling method, which is closely related to the objectives of the analysis. A stratified sampling is often used. Farms and/or household units are sampled within the same territory to provide a territorial inference space, under the hypothesis that units belonging to the same territory are more similar to each other than units in different territories and therefore any difference (variance) between observations belonging to the same territorial group come from their level of application of agroecological practices. This methodology can be adapted to any level of analysis; in fact, a strata can consist of a municipality, a watershed, a province, a region, and any other defined area.

If, due to time or budget constraints, it is not possible to survey all farms/households within a large territory, a random exclusion/inclusion of the observation units is recommended, after the identification of the adequate sample size. The sample size can be determined through various formula depending on the total size of the target population within the territory.

PHOTO Pollinators play an important role in healthy agro-ecosystems.
In the next page: Dates beans and legumes in local market, Morocco.

SECTION 3

TAPE, STEP BY STEP

- STEP 0. DESCRIPTION OF SYSTEMS AND CONTEXT
- STEP 1. CHARACTERIZATION OF AGROECOLOGICAL TRANSITION (CAET)
- STEP 1BIS (OPTIONAL). TRANSITION TYPOLOGY
- STEP 2. CORE PERFORMANCE CRITERIA
- STEP 3. JOINT ANALYSIS OF STEP 1 AND 2 AND PARTICIPATORY INTERPRETATION

3.1 STEP 0. DESCRIPTION OF SYSTEMS AND CONTEXT

General classification of productive systems and the context where they operate is a preamble to the characterization of agroecological transition and can be considered as a Step 0. This includes a description of the main socio-economic, environmental and demographic characteristics and contexts of the systems such as location, household size, productive assets, agro-ecological zone, landforms, forests, access to land, commodities produced and production systems in the region.

Step 0 also includes a description of the enabling (or disabling) environment for agroecological transition, at higher scales than the system assessed (e.g. provincial or national). For example, inventory of relevant policies for agroecology (favoring or limiting), institutional and legal framework, marketing structures for various types of products, socio-cultural, environmental, and/or historical drivers. This step can be conducted at a community or territorial level with a variety of actors (e.g. government agents, community leaders, community groups, farmers' cooperatives, NGO agents, extension agents, etc.), but also should be conducted for each farm or household sampled.

Existing constraints such as access to natural resources (land and water in particular) or capital, the impact of climate change and the existence (or not) of adequate policies to address these constraints are also be part of the context description.

Secondary information (published literature and existing meta-data, such as country reports by government and UN organizations, national statistics, NGO project documents etc.) and semi-structured consultation with key informants are the main sources of information for this Step. The elements to be collected for Step 0 are listed in the draft survey in Annex 2.

3.2 STEP 1. CHARACTERIZATION OF AGROECOLOGICAL TRANSITION (CAET)

Step 1 consists of characterizing the level of transition to agroecology of agricultural systems (e.g. farms, households, communities/territories) based on the 10 Elements of Agroecology (FAO, 2018d) as proposed by FAO (2018) and supported by its governing bodies (FAO, 2018b). The 10 elements are used as criteria to define semi-quantitative indices that take the form of descriptive scales with scores from 0 to 4 (a modified Likert-type scale).

For example, for the element of "Diversity", the relevant indices are (i) Diversity of crops, (ii) Diversity of animals, (iii) Diversity of trees, and (iv) Diversity of activities, products and services (Table 2). The score of the first index for this element ranges for 0 to 4, depending on how diversified crop production is. The scores of the four indices are summed (for example 2+3+3+4=12) and the totals are standardized on a scale from 0 to 100 percent (12/16=75 percent) to obtain the general score for the element "Diversity". The same method is applied to all 10 elements. The total number of indices to be scored in the CAET is 37. Details of the descriptive scales for all 37 are provided in Annex 2.

The CAET can be based on direct surveys with producers/household members/community leaders or by revisiting existing databases from previous characterizations of production systems. The CAET may be implemented in about one hour on a farm, in household or community.

TABLE 2 **Characterization of Agroecological Transitions (CAET): Descriptive scales and scores for the element of "Diversity"**

	INDEX	0	1	2	3	4
DIVERSITY	Crops	Monoculture (or no crops cultivated)	One crop covering more than 80% of cultivated area	Two or three crops	More than 3 crops adapted to local and changing climatic conditions	More than 3 crops and varieties adapted to local conditions. Spatially diversified farm by multi-, poly- or inter-cropping
	Animals (including fish and insects)	No animals raised	One species only	Several species, with few animals	Several species with significant number of animals	High number of species with different breeds well adapted to local and changing climatic conditions
	Trees (and other perennials)	No trees (nor other perennials)	Few trees (and/or other perennials) of one species only	Some trees (and/or other perennials) of more than one species	Significant number of trees (and/or other perennials) of different species	High number of trees (and/or other perennials) of different species integrated within the farm land
	Diversity of activities, products and services	One productive activity only (e.g. selling only one crop)	Two or three productive activities (e.g. selling 2 crops, or one crop and one type of animals)	More than 3 productive activities	More than 3 productive activities and one service (e.g. processing products on the farm, ecotourism, transport of agricultural goods, training etc.)	More than 3 productive activities, and several services

Once the general scores for each element are calculated, each system may be represented in a radar-type diagram as illustrated in Figures 3 and 4.

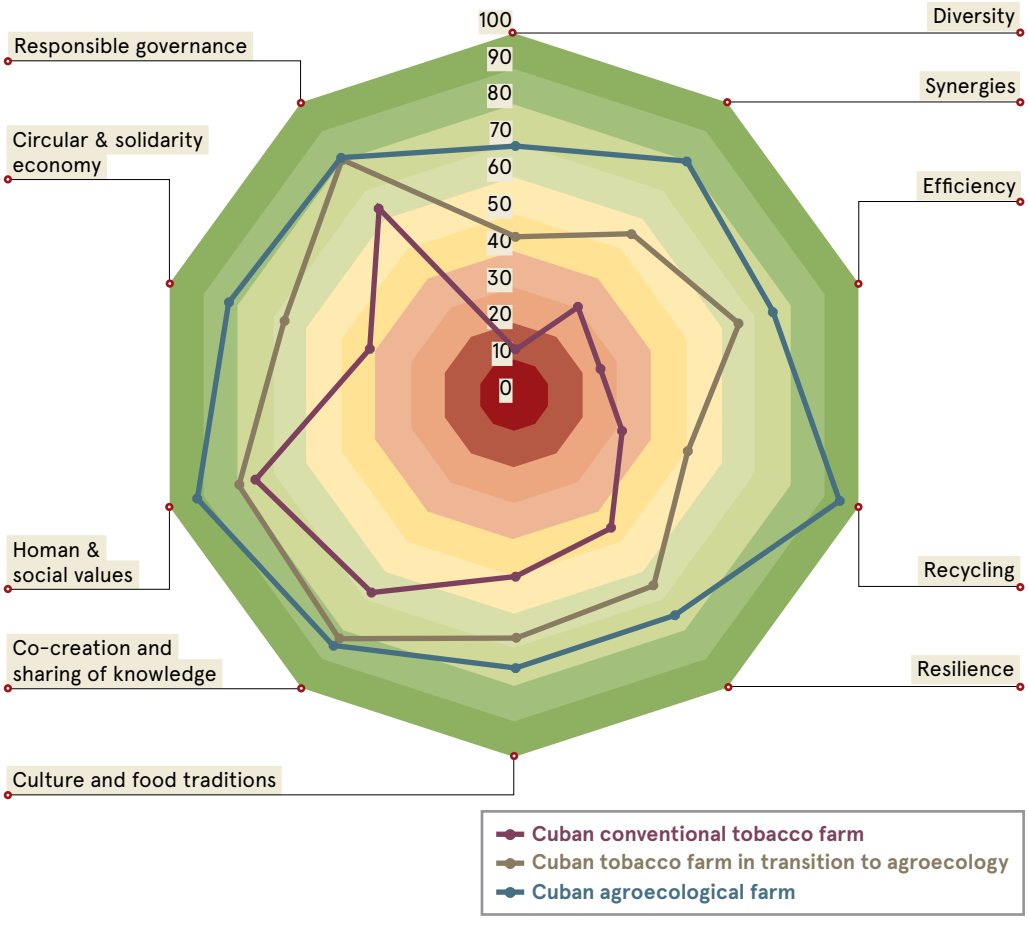
Step 1 can be completed as a self-assessment by producers or community leaders or as guided exercise by technicians, NGO workers, scientists or government agents. While no prescriptive threshold is defined, systems with high scores across all 10 elements are considered already well-engaged in the agroecological transition.

In order to reflect specific priorities or specificities in the local context, weights can be assigned to each element (or index within one element), in Step 3 in consultation with stakeholders during the interpretation phase. It is not recommended to add any weights until Step 3, in order to provide harmonized data. In this case, weights should be applied uniformly across the sampling space (territory, community, etc.) and the average score should be calculated as a weighted average.

PHOTO Women selling varied vegetables in local market, Chad.

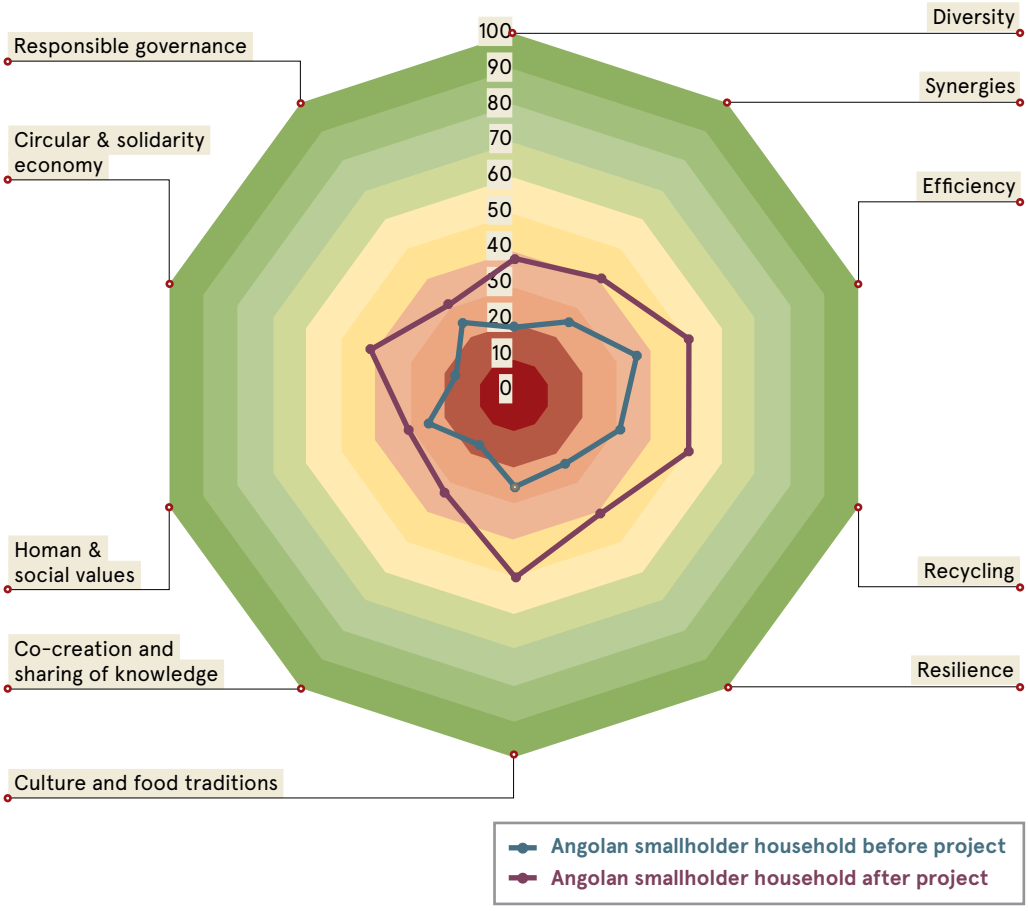
The scores can be used for quick comparisons to reveal differences between systems (e.g. aggregates of farms, communities etc.) in terms of degree of transition to agroecology. For example, Figure 4 shows the scores of the CAET calculated for three tobacco-producing farms at different level of agroecological transition. The three farms are managed by families and are all situated in the same territory in Cuba (Pinar del Río province), where the environment is highly enabling to the process of transition thanks to the governmental support for agroecology, a secure access to land, and the existence of a widespread methodology for co-creation and sharing of knowledge between farmers. The first farm is producing tobacco as monoculture in a conventional way (red line), while the other two farms have been engaged in processes of agroecological transition for three years (green line, recent) and ten years (blue line, advanced). The latter is already more diversified in terms of crop and animal production, recycles more organic matter and nutrients, and makes better use of the available ecosystem resources (Lucantoni *et al.*, 2018). The exercise can support self- and peer-reflection and inform discussion on how to go further in the agroecological transition. For example, the farm that started its transition recently (the green one) can identify the elements of diversity, synergies and recycling as priorities, as its average scores for these elements are comprised between 50 and 70 percent, while they are over 70 percent in the farm that is more advanced in the transition (blue one).

FIGURE 3 **Visualization of the results of the CAET for three farms in Western Cuba at different stages of agroecological transition: monoculture in conventional production, recent transition, and advanced transition. (Lucantoni *et al.*, 2018).**



The example in Figure 4 illustrates the use of the CAET to assess the impacts of a project (or a policy, a subsidy, a new regulation, a new technology, etc.), when conducted before and after its implementation. This case shows the evolution of a smallholder farm before and after the implementation of an internationally funded 3-year project, in the area of Central Angola (Bié province), where poverty is widespread, agricultural land has been degraded by harmful practices, producers are mostly excluded from decision-making processes, and agroecology has no official support. The project aimed to improve producers' livelihoods and nutrition through the diversification of agricultural production with well-adapted and nutritious crops, reducing dependence on synthetic fertilizers and enhancing the use of organic ones, improving the natural fertility of the soil through enhancing ecosystem services, promoting good nutritional practices, and reintroducing animals in the agroecosystem for an improved use of biomass. The average scores for the 10 Elements range between 10 and 30 percent before the project and between 30 to 50 percent after the project, showing need for further improvements in the medium-long term.

FIGURE 4 **Visualization of the results of the CAET for a vulnerable smallholder farm in a degraded agricultural area of Central Angola, before and after a project for sustainable rural development and improved nutrition.**



3.3 STEP 1BIS (OPTIONAL). TRANSITION TYPOLOGY

When a large number of cases are assessed using the CAET within a relatively homogeneous territory or spatial scale and are shown to be fairly homogeneous in their variances, it may be desirable (or necessary in some cases) to draw upon a subsample of systems (or case studies) before proceeding with the performance criteria (Step 2). Selecting these case studies may require some form of simplification of the diversity of systems observed. Such simplification can be done by means of a system typology. Step 1bis is proposed as an **optional step** that consists of analyzing and categorizing the results of the CAET by means of a typology, which is relevant when working at local, territorial or regional levels and when sampling resources are limited and various systems are homogeneous.

The objectives of a typology are (i) to identify common patterns that may contribute to better target policies or development action, and (ii) to reduce the wide diversity of situations that can be found on the ground into a few manageable types or categories, from where case studies and performance criteria can be undertaken using the next step of the assessment. Methods for delineating typologies are abundant in the scientific literature (Alvarez *et al.*, 2014, Tittonell *et al.*, 2010; Teixeira *et al.*, 2018), and they range from participatory self-categorization by members of a community, to statistical typologies most often using multivariate techniques, to expert-based typologies without any statistical method, etc. The description of statistical typologies exceeds the scope of this document. However, as a general guide, when the number of cases assessed through CAET is small, in the order of no more than 20 or 30 cases, then their categorization can be based on expert knowledge or simply on direct observation. On the contrary, with a large sample of systems assessed and when using dimension reduction techniques such as principal component analysis, the ratio between the number of variables and the number of cases should be in the order of 1 to 5, minimally 1 to 3. Since the framework proposes the use of 37 indices, the database should contain > 120 observations for a proper balance between variables and cases with such classification methods.

The simplest way to categorize systems in agroecological transition is by the stage in which they are in the transition (for example non-agroecological, incipient transition, advanced transition, model agroecological system). To guide this categorization, it may be useful to use the average score of all 10 elements as a basis, and define relevant ranges for each category. For example, one may assume that scores <50 percent are non-agroecological systems (that may be market oriented conventional agriculture as well as subsistence level), from 50 to 70 percent are in transition to agroecology, >70 percent are advanced agroecological systems. But, this classification should be conducted in a participatory manner and ensure that the breaks are representative of the ecological, social, and economic realities of the systems.

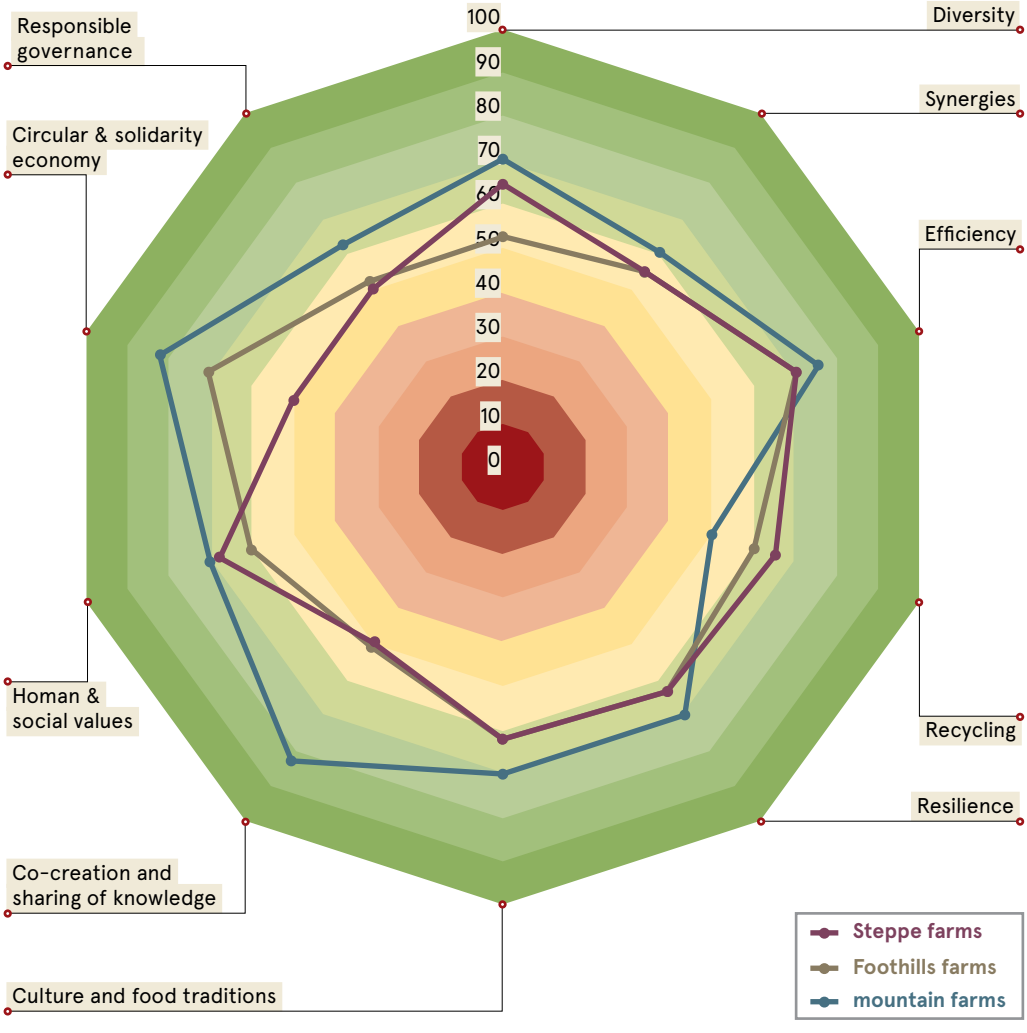
Step 1bis also consists of selecting representative systems as experimental units (e.g. farms, household, communities, etc.) for the assessment of performances in Step 2. The number of units per type of system may be balanced (e.g. five units per category) or weighed by the distribution of units within each type, or by selecting units only from certain types of interest and not from others, etc. Whenever possible, experimental units should represent each type or category, both in terms of the mean (or modal) pattern and its variation. A no less important aspect to be considered when selecting experimental units is the characteristic of the farm, the household, the family, the main respondents (men or women) etc., as established in Step 0.

The CAET and transition typology method were tested in Patagonia, Argentina, between December 2018 and March 2019. Table 3 5 presents the result of the CAET conducted on 25 farms. Average scores in each of the 10 elements are presented for each individual farm. The 25 farms were then classified according to 3 types based on their ecosystem (mountain, foothills and steppes) and results were averaged within each type to produce the radar diagram presented in Figure 5. This type of diagram can be used to identify the strengths and weaknesses of each type of system/farm with regard to the 10 Elements of Agroecology. For example, in the case presented in Figure 5, farms of the type “mountain” show strong co-creation and sharing of knowledge but weaker recycling, while “steppe” farms are stronger on recycling but weaker on circular economy and co-creation and sharing of knowledge. Results show that mountain farms in Patagonia have, on average, a higher level of transition to agroecology (CAET =69 percent) than steppes and foothills farms (CAET=60 percent).

TABLE 3 Results of the CAET for 25 farms in Patagonia, Argentina (Tittonell *et al.*, 2019, unpublished)

Elements of Agroecology	HC	TA	CE	FA	MM	VA	DH	RC	OG	CC	LL	FL	AH	ND	MV	S/N	SC	AS	BT	LS	SR	T	NP	DM	DC
Recycling	55	65	40	5	50	25	40	50	50	55	75	55	50	30	25	50	60	65	50	60	70	65	65	85	75
Responsible Governance	63	44	63	38	63	81	88	31	63	31	56	63	63	44	50	56	50	50	69	31	56	63	50	56	56
Synergies	40	45	45	50	50	35	40	75	65	75	75	75	60	30	60	65	55	55	55	65	65	70	40	60	55
Diversity	56	69	56	44	44	44	44	75	75	81	75	81	69	81	94	75	63	31	44	56	50	50	56	63	31
Co-creation & sharing of knowledge	58	50	100	67	50	83	100	50	67	50	92	83	100	33	50	33	58	50	50	33	50	67	67	33	42
Resilience	44	38	69	50	69	69	69	63	63	56	88	88	88	81	81	56	50	69	25	50	69	75	38	63	63
Human & social values	58	38	67	46	71	79	63	71	88	75	71	92	46	67	58	67	67	58	58	50	58	46	63	71	71
Culture & food tradition	13	13	88	63	81	63	75	81	69	69	69	69	75	81	56	75	25	63	56	63	56	50	63	81	69
Efficiency	75	55	80	70	90	75	85	70	65	80	50	80	70	75	70	55	65	60	75	63	60	70	65	70	70
Circular & Solidarity Economy	58	58	83	50	83	100	83	75	83	92	83	83	75	83	75	58	50	42	75	75	83	75	42	42	67

FIGURE 5 Visualization of the CAET for 25 farms in Patagonia (Argentina) after using the Step 1-bis Transition Typology (Tittonell *et al.*, 2019, unpublished).



3.4 STEP 2. CORE PERFORMANCE CRITERIA

This step consists of assessing the performance of systems (e.g. farms, households, territories) on the key dimensions considered relevant to sustainable food and agriculture and to achieve the Sustainable Development Goals (SDGs). The key dimensions were identified during the International Expert Workshop on Multidimensional Assessment of Agroecology (8th-9th October 2018, FAO Rome). They were described as priority areas of work for policy makers to make food and agriculture more sustainable. These 5 key dimensions are strategic to frame the results of the assessment and communicate them in order to inform policy processes:

- Environment & climate change
- Health & nutrition
- Society & culture
- Economy
- Governance

Step 2, similarly to Step 1, should be relevant to all contexts, agroecological zones and production systems but simple enough to use in a limited amount of time and with limited resources. The criteria used to assess the performance of systems should be able to generate harmonized data across regions but should also be flexible enough in order to reflect specific priorities in the local context. Step 2 should also be simple, feasible, easily communicable, and require a minimum of training to be applied, which was one of the strongest recommendations from the expert workshop and the Technical Working Group.

In order to comply with these recommendations, a generalist approach was used based on the existing sustainability assessment frameworks (such as MESMIS), in which criteria are defined for each dimension, and then indicators are defined for each criterion. A short list of 10 core criteria was drafted from an initial list of over 60 indicators, on the basis of the results of the on-line consultation and of the expert workshop. This short list of 10 core criteria is the bare minimum that should be assessed systematically in order to generate evidence on the multidimensional performance of agroecology:

1. Secure land tenure (or mobility for pastoralists)
2. Productivity (and stability over time)
3. Income (and stability over time)
4. Added value
5. Exposure to pesticides
6. Dietary diversity
7. Women's empowerment
8. Youth employment
9. Agricultural biodiversity
10. Soil Health

The short list of core criteria doesn't aim at being exhaustive in assessing sustainability. Each criterion individually does not provide a detailed assessment within the main dimension it addresses. Additionally, one criterion can address several dimensions. However, as a whole list, the 10 core criteria represent an innovative multidimensional framework of qualitative and quantitative criteria for agriculture that moves beyond measurement of performance based on one or a few indicators (e.g. yield, income). For example, secure land tenure is only one aspect of governance that can support more sustainable food and agriculture. Other aspects of governance include existing policies (addressed in Step 0), access to genetic diversity (addressed by core criteria 2 under the main dimension Environment) or to water, among others.

The core criteria all have simple indicators that were identified by FAO with experts in each of the technical fields concerned. All indicators/measurements are collected with a farm/household survey that is derived from existing metrics related to the concerned core criteria. The collection of data is conducted after Step 1 (CAET) on the same day. Parts of the survey are conducted with women and some data are collected as disaggregated by sex (dietary diversity, women's empowerment, youth employment). Another part of the survey is conducted as transect walks on the farm/territory (agrobiodiversity). The indicators for each criteria are presented in detail in the following sub-sections and summarized in Table 4. Protocols and questionnaire for data collection can be found in Annex 2.

As it was noted of high importance at the expert workshop, links with SDG indicators were identified for each criterion. Some are explicit links, which means that the indicator considered in the framework corresponds exactly to the SDG indicator or sub-indicator at national level. This is the case of Agricultural biodiversity and Youth employment opportunity, for example. Some links are more indirect, since indicators for agroecology, which are collected initially at a farm/household level, cannot be directly aligned with indicators collected at the national level for SDG reporting by countries. For example, this is the case of core criterion number 3 (Net income) and how it links to SDG indicators 1.2.1 (Proportion of population living below the national poverty line, by sex and age).

It is imperative that systems are assessed using all 10 core criteria to create robust data on the multidimensional performance of agroecology and to explain the performance linked with the results of the CAET. The different stages in the agroecological transition assessed in the CAET reflect on various levels of performance, but is also helpful to identify priority areas for improvement. For example, high efficiency and low human and social values scores in the CAET could result in good performance in income but poor performance for women's empowerment and dietary diversity.

This step 2 should contribute to estimating the performance of agroecology in all types of regions and environments but also to measuring progress towards the SDGs through time. Results are meant to populate a public global database developed by FAO that will allow further analysis and identification of priorities for countries and regions, but also for producers and communities.

In order to address the potential need for additional criteria, the short list is complemented with a number of additional criteria if time and resources allow. These additional criteria -what we are calling "Advanced Criteria"- can answer specific local priorities or the needs of a particular

project, for example. They may also require more advanced methodologies and therefore not be easily implemented within the households and/or communities.

A number of advanced criteria was already identified in the process of developing this analytical framework and are summarized in Table 5: e.g. water use, climate change mitigation, decent work and resilience to climate change. More can be added with further testing of the framework. The important thing is that all 10 core criteria need to be collected to provide the multi-dimensional visualization of a particular system. The advanced indicators are meant to be added to the core criteria.

TABLE 4 **10 Core criteria of performance of agroecology and their links to SDG indicators**

MAIN DIMENSION	#	CORE CRITERIA OF PERFORMANCE	PROPOSED METHOD OF ASSESSMENT IN SURVEY	SDG	SDG INDICATORS
Governance	1	Secure land tenure (or mobility for pastoralists)	Type of tenure over land: property, lease + duration, verbal, not explicit (**SDG 1.4.2, 5.a.1 and 2.4.1 sub-indicator 11**) Existence and use of pastoral agreements and mobility corridors	1 2 5	1.4.2 2.4.1 5.a.1
Economy	2	Productivity	Farm output value per hectare (**SDG 2.4.1 sub-indicator 1**) Farm output value per person	2	2.3.1 2.4.1
	3	Income	Outputs - inputs - operating expenses – depreciation + other income (**SDG 2.4.1 sub-indicator 2**)	1 2 10	1.1.1, 1.2.1 and 1.2.2 2.3.2 2.4.1 10.2.1
	4	Added value	Net income +rents +taxes +interests – subsidies	10	10.1.1 10.2.1
Health & nutrition	5	Exposure to pesticides	Quantity applied, area, toxicity and existence of risk mitigation equipment and practices	3	3.9.1 3.9.2 3.9.3
	6	Dietary diversity	Minimum Dietary Diversity for Women (FAO and FHI 360, 2016)	2	2.1.1 2.1.2 2.2.1 2.2.2 2.4.1
Society & Culture	7	Women's empowerment	Abbreviated Women's Empowerment in Agriculture Index, A-WEAI (IFPRI, 2012)	2 5	2.4.1 5.a.1 5.a.2
	8	Youth employment opportunity	Access to jobs, training, education or migration (**SDG 8.6.1**)	8	8.6.1
Environment	9	Agricultural biodiversity	Relative importance of crops varieties, livestock breeds, trees and semi-natural environments on farm (**SDG 2.4.1 sub-indicator 8.1, 8.6 and 8.7**)	2 15	2.4.1 2.5.1
	10	Soil health	Adapted SOCLA rapid and farmer friendly agroecological method to assess soil health (Nicholls *et al.*, 2004)	2 15	2.4.1 15.3.1

PHOTO Selection of traditional dishes, Viet Nam.

TABLE 5 **Non-exhaustive list of possible advanced criteria identified and their associated methodologies for assessment**

MAIN DIMENSION	ADVANCED CRITERIA	POSSIBLE METHODOLOGIES FOR ASSESSMENT	SDG
Economy	Resilience	Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) (FAO, 2019d)	1 2 8
Health & nutrition	Food security & nutrition	» Food self-sufficiency ratio: production x100/ (production +purchases -sales) » Nutritional value of agricultural production	2 3
Society & Culture	Decent work	Decent Work Indicators for agriculture and rural areas (FAO, 2015a)	8
Environment	Water	» Water use efficiency (e.g. LEAP guidelines for livestock (FAO, 2019e)) » Water pollution (e.g. LEAP guidelines on nutrient use (FAO, 2018c))	3 6
	Climate change mitigation	» GHG emissions (e.g. Ex-Act (FAO, 2019a), GLEAM-i (FAO, 2019b), Cool Farm tool (Cool Farm Alliance, 2019)) » Carbon sequestration (under development for GLEAM) » GTAE Memento pour l'évaluation de l'agroécologie (Levard *et al.*, 2019)	13

Once the data for Step 2 are collected for all 10 indicators, performance is assessed using the "traffic light" approach (also used for example by SDG 2.4.1 and SAFA), in which three sustainability levels are considered for each sub-indicator:

- **Green: desirable**
- **Yellow: acceptable**
- **Red: unsustainable**

This approach allows identification, for each theme, of conditions of critical unsustainability (red), conditions that can be considered desirable (green) and, in between, intermediate conditions that are considered acceptable but would need to improve (yellow). While thresholds are proposed in this document for each of the 10 criteria, they should be reviewed and possibly revised by the participative interpretation of results (Step 3).

3.4.1 SECURE LAND TENURE (OR SECURE MOBILITY FOR PASTORALISTS)

Equitable access to land and natural resources is key to social justice and gender equality, but also to providing incentives for the long-term investments that are necessary to protect soil, biodiversity and ecosystem services and increase resilience to system stressors.

Responsible and effective governance can support the transition to sustainable and gender-transformative food and agricultural systems. Transparent, accountable and inclusive governance mechanisms are necessary to create an enabling environment that supports producers to transform their systems following agroecological concepts and practices.

Agroecology is tied to the concept of food sovereignty. It aims to make producers autonomous and self-sufficient, and to define their own models of development. Agroecology plays a central role in rural social movements, in particular in the context of land redistribution. Therefore, it can be expected that the transition to agroecology is closely linked to a change in land tenure of farmers and/or secure mobility for pastoralists.

The first criterion is based on **SDG indicators 1.4.2, 2.4.1 and 5.a.1**, adapted to holding or community level and completed with specific indicators for pastoralists:

- Existence of legal recognition of access to land (mobility for pastoralists)
- Existence of formal document and presence of name on it
- Perception of security of access to land
- Existence of the right to sell, bequeath, and inherit land, always disaggregated by gender

All questions must be answered for both men and women, in order to comply with the prescriptions of the above-mentioned SDG indicators, which require data disaggregated by gender.

The indicators are then used in the following way to score the criteria of land access:

- **Green (desirable):**
  Has a formal document with the name of the holder on it
  AND has perception of secure access to land
  AND has at least one right to sell/bequeath/inherit any of the parcel of the holding;
- **Yellow (acceptable):**
  Has a formal document with the name of the holder on it
  AND perception of insecure access to land
  AND/OR no right to sell/bequeath/inherit the land
  OR
  Has a formal document even if the name of the holder is not on it
  OR
  has no document but has perception of secure land AND has at least one right to sell/bequeath/inherit the land;
- **Red (unsustainable):**
  No document possessed
  AND perception of insecure access to land
  AND/OR no right to sell/bequeath/inherit the land.

These indicators also inform indicator 1.4.2 (proportion of total adult population with secure tenure rights to land, with legally recognized documentation, and who perceive their rights to land as secure, by sex and type of tenure) as well as 2.4.1 sub-indicator 11 (Secure tenure rights to land). When disaggregated by sex, it is also directly linked to indicator 5.a.1: (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure.

3.4.2 **PRODUCTIVITY**

Measuring productivity provides information on the amount of resources necessary (for example, land, capital and labor in classic economic terms, but also water or nutrients) to produce a given quantity or volume of product. It is usually a measure of the relationship between the sum of all inputs and all outputs in physical terms. Improving the volume of production over time relative to the amount of inputs used is an important aspect of performance. Improvements in agricultural productivity contribute to achieve food security in a world with limited resources. They can also contribute to reduce environmental impacts of agriculture.

A simple observation of the change in outputs per ha or per animal over the last decades can provide basic information on productivity. Yields per hectare have increased substantially for almost all agricultural products: cereals have grown from a global average productivity of 16.5 t/ha in 1967 to 40.7 t/ha in 2017 (+147 percent); in the same period, pulses yields have increased from 6 to 10 t/ha (+67 percent); vegetables from 106 to 188 t/ha (+77 percent); roots and tubers from 111 to 132 t/ha (+19 percent) (FAOSTAT, 2019). Yields per animal have also increased, although to various extents. Between 1961 and 2017, average milk yield per dairy cow improved from 1 769 kg to 2 430 kg per year while average chicken carcass weights went from 1.15 kg to 1.64 kg. In poultry, in particular, feed conversion ratios have increased significantly, reducing the amount of feed to produce 1kg of meat, which is partly due to breeding and shortening fattening periods. However, these various metrics cannot be aggregated and do not reflect synergies between plants and animals (or trees) that are happening in most farms in the world. In addition, the conspicuous increase in the use of non-renewable inputs has been key for rising yields in the last decades, but these results have been achieved through an increased carbon footprint and the externalization of environmental and social costs.

In 2000, integrated production systems generated close to 50 percent of the world's cereals: 41 percent of maize, 86 percent of rice, 64 percent of sorghum, and 67 percent of millet production (Herrero *et al.*, 2012). These systems also produced the bulk of livestock products in the developing world (75 percent of the milk and 60 percent of the meat), and employed millions of people on farms, in formal and informal markets, at processing plants, and at other stages of the value chain (FAO, 2010). Agricultural diversification is an important strategy for achieving food security in Africa (Waha *et al.*, 2018). Diversified production systems can enhance the overall productivity: for example, field experiments conducted by using the Land Equivalent Ratio for comparing monocultures with farms producing with agroecological practices of intercropping and polycultures have shown better outputs in terms of total biomass produced (Kintl 2018, Jaggi *et al.* 2004, Dupraz *et al.* 2009, Metwally *et al.* 2018).

Productivity metrics therefore need to go beyond the mere calculation of yield per hectare (or per animal) and allow aggregation of the various agricultural products. The method proposed here is based on the one of **SDG indicator 2.4.1 and in particular sub-Indicator 1 (Farm output value per ha), with an addition of farm output value per person working on holding** (farm/production system/community), in order to better account for productivity in large extensive systems such as pastoralism. This criterion therefore also informs indicator 2.3.1 (Production per labor unit).

The **farm output** corresponds to the volume of agricultural output at farm level taking into account production of multiple outputs, e.g. crop and livestock. Since the volume of agricultural outputs is not measured in commensurate units (e.g. not all outputs are measured in tons, and tons of different outputs represent different products), outputs are aggregated in terms of value (i.e. quantity multiplied by prices). The value of the (gross) production is calculated in local currency and converted to PPP$ (Purchasing power parity).

The survey collects data about the top 10 most important crops, the 10 most important animal products, and the 10 most important activities/services within the system assessed. For every product, the survey collects data about the quantity produced, the quantity sold, and the price at the gate. The choice to collect data only about the top 10 elements is due to time and cost constraints, but it is recommended to group similar elements in order to give as much information as possible. For example, all vegetables species and varieties can be grouped in the same category, and so can be all poultry species, if needed.

The **farm agricultural land** area is defined as the area of land used for agriculture within the farm[2].

The **number of persons** working on the farm/community is the total number of working persons on the holding, including family and paid labor, in full time equivalents. If children under 12 are contributing to farm labor (e.g. herding), they account for 50 percent of an adult equivalent.

The calculated ratios are then used in the following way to score the criteria of productivity per ha:

- **Green (desirable):**
  Productivity value per ha is ≥ 2/3 of the national average value of production per hectare/year;
- **Yellow (acceptable):**
  Productivity value per ha is ≥ 1/3 and < 2/3 of the national average value of production per hectare/year;
- **Red (unsustainable):**
  Productivity value per ha is < 1/3 of the national average value of production per hectare/year.

And similarly, to score the criteria of productivity per person:

- **Green (desirable):**
  Productivity value per person is ≥ 2/3 of the national average value of production per person;

[2] According to the SEEA-AFF classification and the classification of the World Agricultural Census 2020

PHOTO Young women with cabbages from their own managed vegetable garden, Ethiopia.

- **Yellow (acceptable):**
  Productivity value per person is ≥ 1/3 and < 2/3 of the national average value of production per person;
- **Red (unsustainable):**
  Productivity value per person is < 1/3 of the national average value of production per person.

The national average value of production as well as the total agricultural land area can be obtained in FAOSTAT and World Bank data bases. The employment in agriculture (in number of persons) is also available in FAOSTAT, as well as the agriculture value added per worker.

Advanced methodologies: Total factor productivity

An advanced method of assessment of productivity can be based on the total factor productivity (Ludena 2007, Abed and Acosta 2018), to take into account (i) the total amount of products/outputs at farm or territory level (crops, animals, trees, fish) and (ii) the total amount of inputs such as land, capital and labor, but also resources like water and nutrients:

$$TFP = \frac{Outputs\ of\ crops + livestock + trees + fish}{Inputs\ of\ land + capital + labor + water + nutrients}$$

Where outputs and inputs are measured in price equivalent to be added.

Stability of productivity over time

Productivity can be affected by external drivers such as climate or market shocks, or pests and diseases. Resilience is the ability of a system to recover after a shock and find a stable state again. It is an emerging property that depends on the characteristics of the systems and how it operates. For example, diversification and integration of sub-sectors can help producers reducing their vulnerability should a single crop, livestock species or other commodity fail. Reducing dependence on external inputs, can also reduce producers' vulnerability to economic risk. Such improvements can substantially contribute to the households' resilience and stability of productivity over time.

3.4.3 INCOME

An important part of sustainability in agriculture is the economic viability of the system. This is driven to a large extent by profitability– that is, the net income that the producer/household is able to earn from farming operations relative to the investment in land, labor and other assets. System profitability is one of the key measures on which many decisions are based and is considered a main driver of agricultural policies and the potential changes in policies thereof.

Availability and use of information on farm economic performance, i.e. profitability, will support better decision making both at micro and macro-economic level. Since performance measures drive behavior, better information on performance can alter behavior and decision-making by government and by producers, in large scale commercial farming, medium scale and small-scale agriculture production.

Improving producers' efficiency through the enhancement of biological processes and reduction of costs from external inputs can increase net income of producers and create more inclusive and innovative markets that reconnect producers and consumers in a circular and solidarity economy (van der Ploeg *et al.,* 2019). For example, adopting agroecological practices increases farm profitability in 66 percent of cases analyzed by D'Annolfo *et al.* (2017).

The method of assessment needs to capture whether the level of income earned by the producer is reasonable while taking into account factors of production and assets employed. Incomes from all productive activities should be included, which are all likely important in the context of assessing the sustainability of living in rural areas. This indicator is based on the method used for **SDG indicator 2.4.1, and in particular the sub-Indicator 2 (Farm net income)**, and for **SDG 2.3.2 (income of small-scale food producers)** and for the **evaluation of economic performance** from Levard *et al*. (2019).

TABLE 6 **Calculation of the family net income (Levard *et al*. 2019)**

FAMILY NET INCOME =
Gross product (value of agricultural production: crops, livestock, fish, trees) (+subsidies)
- Cost of inputs and taxes (seeds, fertilizers, pesticides, feed, veterinary services)
- Cost of hired labor
- Loans, interest and cost of renting land
- Depreciation of machinery and equipment

In this way, income is not a reflection of monetary availability only, as households that produce their own food can have a better score and their food self-sufficiency is reflected in the formula. Moreover, special attention should be put on the value of inputs provided by the household. This includes labor provided by the household: the opportunity cost of labor needs to be factored in.

The results should be converted into Purchasing Power Parity (PPP) (OECD, 2018) to allow intercountry comparisons. The calculated income is then used in the following way to score the criteria of income:

- **Green (desirable):**
  Family net income/family worker > Median income in similar agroecosystem (e.g. from farm monitoring systems)
  OR (if not available) > Median income from Farm activities (data from RuLIS (FAO, 2019c))
  OR (if not available) > median national income (from national statistics)
- **Yellow (acceptable):**
  Family net income/family worker > national poverty line (as defined by the World Bank)
  AND < Median income in similar agroecosystem (e.g. from farm monitoring systems)
  OR (if not available) < Median income from Farm activities (data from RuLIS (FAO, 2019c))
  OR (if not available) < Median national income (from national statistics)
- **Red (unsustainable):**
  Family net income/family worker < national poverty line (as defined by the World Bank)

If data for the calculation of income is scarce and/or data to compare to average income in similar system or at national level is not available, an alternative method can be used based on the perception of income, similarly to sub-indicator 2 of SDG 2.4.1. In this case, the following way should be followed to score the criteria of income:

- **Green (desirable):**
  Perception that income is increasing AND > average income in the region
- **Yellow (acceptable):**
  Perception that income is stable AND = average income in the region
- **Red (unsustainable):**
  Perception that income is decreasing OR < average income in the region

This criteria also contributes to inform SDG 10 on reducing inequalities, and in particular, indicator 10.1.1 (Growth rates of household expenditure or income per capita among the bottom 40 per cent of the population and the total population) and 10.2.1 (Proportion of people living below 50 per cent of median income, by sex, age and persons with disabilities). It is also linked to indicators of poverty levels such as 1.1.1, 1.2.1 and 1.2.2.

Stability of income over time

In addition to the absolute value of income, its stability over time is an important indicator of the economic sustainability of a system and of its resilience in particular. Diversification and integration can reduce vulnerability of systems, should a single crop, livestock species or other commodity fail, by preventing high income variability. Reducing dependence on external inputs can also reduce producers' vulnerability to economic risk.

3.4.4 ADDED VALUE

While income is a basic indicator of how a system performs economically to sustain a household or a community, it doesn't provide information on how it performs in terms of creating wealth. Indeed, economic growth is less efficient in lowering poverty in countries with high initial levels of inequality or where the distributional pattern of growth favors the non-poor. Income inequality affects the pace at which growth enables poverty reduction (Ravallion 2004). For example, producers in situations of heavy debts may have low income because of high interest to pay every year. As another example, a producer owning large areas of land and generating high income from renting parts of his land would have a high income but not necessarily by creating value himself.

The analysis of income can be complemented by the added value (van der Ploeg *et al.*, 2019), after removing subsidies and income from renting land or other assets, and adding taxes, interest on loans and salaries paid for labor:

TABLE 7 **Calculation of the gross added value (Levard *et al*. 2019)**

GROSS ADDED VALUE =
Family net income (calculated in 3.4.3)
- Subsidies and income from rented land
+ Cost of hired labor
+ Loans interests and cost of renting land

The calculated gross added value can then be used in the following way:

- **Green (desirable):**
  Gross added value/family worker > 1.2 x median gross added value in similar agroecosystem (e.g. from farm monitoring systems)
  OR (if not available) > 1.2 x national agricultural GDP per agricultural worker (FAOSTAT)
- **Yellow (acceptable):**
  Gross added value/family worker < 1.2 x median gross added value in similar agroecosystem (e.g. from farm monitoring systems) AND > 0.8 x median gross added value in similar agroecosystem
  OR (if not available) < 1.2 x national agricultural GDP per agricultural worker (FAOSTAT) AND > 0.8 x national agricultural GDP per agricultural worker (FAOSTAT)
- **Red (unsustainable):**
  Gross added value/family worker < 0.8 x median gross added value in similar agroecosystem (e.g. from farm monitoring systems)
  OR (if not available) < 0.8 x national agricultural GDP per agricultural worker (FAOSTAT)

This indicator contributes to inform SDG indicator 10.1.1 (Growth rates of household expenditure or income per capita among the bottom 40 per cent of the population and the total population) and indicator 10.2.1 (Proportion of people living below 50 percent of median income, by sex, age and persons with disabilities)

3.4.5 EXPOSURE TO PESTICIDES

Chemical pesticides are extensively used in crop production to control harmful pests and prevent crop yield losses or product damage. Around 3.5 million tons of active ingredient of pesticide have been used in 2018 (FAOSTAT 2018). Because of high biological activity and, in certain cases, long persistence in the environment, pesticides can cause undesirable effects to human health and to the environment (soil, water, flora and fauna).

Producers and farmworkers can be routinely exposed to high levels of pesticides, usually much greater than those of consumers. Producers' exposure mainly occurs during the preparation and application of the pesticide and during the cleaning-up of application equipment. Producers who mix, load, and apply pesticides can be exposed to these chemicals due to spills and splashes, direct contact as a result of faulty or missing protective equipment, or even drift. However, producers can be exposed to pesticides even when performing activities not directly related to pesticide use, e.g. producers who perform manual labor in areas treated with pesticides can face major exposure from direct spray, drift from neighboring fields, or by contact with pesticide residues on the crop or soil. This kind of exposure is often underestimated.

Pesticide use has led to various human/animal diseases and injured human fecundity and intelligence quotient (IQ) in the past years (Chen *et al.,* 2004; Zhang *et al.,* 2011; Zhang, 2018). The major pesticides for human poisonings were highly toxic organophosphorus pesticides, which accounted for 86.02 percent of the total cases (Zhang *et al.,* 2011). Pesticides can be considered highly hazardous if they present particularly high levels of acute or chronic hazards to human health or the environment, particularly for women and children. High acute human toxicity refers to product properties that can cause immediate health effects.

Hazards to the environment include contamination of water resources and soils, and acute or chronic toxicity to non-target organisms that may lead to disruption of ecosystem functions, such as pollination or natural pest suppression. Global pesticide use has also resulted in biodiversity loss: neonicotinoids have been identified as a key contributor to the decline in the number of pollinators worldwide. Furthermore, both species and abundance of insects have declined during the past decades and pesticide use is one of the major factors (Nirmal Kumar *et al.,* 2013; Zhang *et al.,* 2011; Sánchez-Bayo and Wyckhus 2019). Producers' exposure to pesticides can be reduced through the correct use of the appropriate type of personal protective equipment in all stages of pesticide handling and, overall, through a reduced use of pesticides. Both men and women should be provided with this information and with the appropriate equipment and measures to reduce risks on their health. Measures to reduce pesticide use include those that promote the use of organic non-harmful pesticides and the integrated management of pests based on ecosystem approaches. A fundamental measure of the benefits of agroecology is therefore the degree to which it reduces the use of harmful, and often costly, pesticides.

This criterion is based on the sub-indicator 7 of SDG 2.4.1 (management of pesticides), and more specifically on the quantity of organics and synthetic pesticides applied, their level of toxicity (highly/moderately/slightly, according to Damalas and Koutroubas 2016) and the existence (or not) of mitigation techniques (use of protection before and after spraying, signaling the sprayed areas etc.) when applying the pesticides and for other people living and working around the interested area (Ross *et al.*, 2015). The use of organic pesticides and the implementation of beneficial practices for the ecological management of pests that can substantially reduce the need of chemicals are also considered. The data collected from the survey are then used to score the criteria of exposure to pesticides:

- **Green (desirable):**
  Quantity of organic pesticides used ≥ Quantity of synthetic pesticides used
  AND pesticides of class I and II (highly and moderately toxic) are not used
  AND at least 4 of the listed mitigation techniques are used when applying chemical pesticides;
  OR
  Chemical pesticides are not used
  AND organic pesticides AND/OR other integrated techniques for pest management are used
- **Yellow (acceptable):**
  Quantity of synthetic pesticides used > quantity of organic pesticides used
  AND producers do not use pesticides of class I (Highly toxic)
  AND at least 4 of the listed mitigation techniques are used when applying the chemicals
  AND organic pesticides and/or other integrated techniques are also used
- **Red (unsustainable):**
  Producers use highly hazardous pesticides (Class I) and/or illegal pesticides
  OR
  producers use pesticides of class II and/or III (Moderately toxic and Slightly or relatively non- toxic) with less than 4 of the listed mitigation techniques
  OR
  producers use chemical pesticides of any class AND no organic pesticides and no other integrated techniques are used.

These indicators also contribute to inform sub-indicator 7 of SDG indicator 2.4.1 (Management of pesticides) as well as indicator 3.9.1 (Mortality rate attributed to household and ambient air pollution), 3.9.2 (Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene and 3.9.3 (Mortality rate attributed to unintentional poisoning).

3.4.6 DIETARY DIVERSITY

Today, there are still large gaps in food supply across the world, especially for nutrient-dense food groups. For example, the supply of fruits varies from 53kg/capita/year in Southern Africa to over 100kg in North America. The supply of tree nuts varies between 0.7kg/capita/year in Central Africa to 6kg in Western Europe. The supply of dairy products varies from 18kg/capita/year in South Asia to over 200 kg/capita/year in North America (in milk equivalent).

To address the imbalances in our food systems and move towards a zero-hunger world addressing all forms of malnutrition (hunger, micro-nutrient deficiencies and obesity), increasing production alone is not sufficient. Re-balancing food habits, promoting healthy food production and consumption, and supporting the right to adequate food are all elements of an agroecological transition (FAO 2018). For example, species richness, one measure of biodiversity, has been found to be highly correlated with micronutrient adequacy in human diets (Lachat *et al.*, 2018).

Obtaining detailed data on household food access or individual dietary intake can be time consuming and expensive. It requires a high level of technical skill both in data collection and analysis. Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods and is also a proxy for nutrient adequacy of the diet of individuals.

The indicators proposed for this framework are the ones selected for the **Minimum Dietary Diversity for Women** (FAO and FHI 360, 2016). Women are considered a proxy of the nutritional status of the household and these data are directly collected with them. The dietary diversity scores consist of a simple count of 10 food groups consumed over the preceding 24 hours:

1. Grains, white roots and tubers, and plantains;
2. Pulses (beans, peas and lentils);
3. Nuts and seeds;
4. Dairy;
5. Meat, poultry, fish;
6. Eggs;
7. Dark green leafy vegetables;
8. Other vitamin A-rich fruits and vegetables;
9. Other vegetables;
10. Other fruits.

The dietary diversity questionnaire has been standardized and is of universal applicability; as such it is not culture, population, or location specific.

The results are then analyzed in the following way to score the criteria of dietary diversity:

Green (desirable):	Yellow (acceptable):	Red (unsustainable):
MDD score ≥ 7	5 ≥ MDD score < 7	MDD score < 5

This criterion also contributes to inform SDG indicator 2.4.1 and in particular the sub-Indicator 10 (Food Insecurity Experience Scale- FIES). It also informs 2.1.1 (Prevalence of undernourishment), 2.1.2 (Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale -FIES), 2.2.1 (Prevalence of stunting) and 2.2.2 (Prevalence of malnutrition).

Advanced methodologies

Individual dietary diversity scores aim to reflect nutrient adequacy. Studies in different age groups have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet. Dietary diversity scores have been validated for several age/sex groups as proxy measures for macro and/or micronutrient adequacy of the diet. The assessment of dietary diversity can be conducted for all sex and age groups present in the household or the community, in addition to women, who are used as a proxy.

The Food Insecurity Experience Scale (FIES) (Ballard, Kepple and Cafiero, 2013) is a tool that provides information on the demographic characteristics and geographic location of food insecure sub-populations. This level of information is obtained by asking people directly about their experience of food insecurity (FAO 2017b).

After several years of methodological development and three years of data collection in over 140 countries, this metric of food insecurity is a reliable and valuable contribution to global food security monitoring. FIES is a metric of severity of food insecurity at the household or individual level that relies on peoples' direct yes/no responses to eight brief questions regarding their access to adequate food. It is a statistical measurement scale similar to other widely-accepted statistical scales designed to measure unobservable traits such as aptitude/intelligence, personality, and a broad range of social, psychological and health-related conditions.

FIES is one of the two indicators chosen to measure the SDG 2.1 (By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round). It is also one of the eleven sub-indicators chosen to measure advancement on indicator 2.4.1 (Proportion of agricultural area under productive and sustainable agriculture).

3.4.7 WOMEN'S EMPOWERMENT

Globally, women make up almost half of the agricultural workforce. They also play a vital role in household food security, dietary diversity and health, as well as in the conservation and sustainable use of biological diversity, in building resilient livelihoods and in transforming food systems. But in spite of this, they face persistent obstacles, economic constraints, and remain economically marginalized and vulnerable to violations of their rights, while their contributions often remain unrecognized. For example, in a study by Smith and Haddad (2015), food quantity only accounted for an estimated 18 percent of reduced stunting, food quality contributed 15 percent and women's education contributed 22 percent to the total reduction in stunting.

Women contribute approximately 43 percent of all agricultural labor in low and middle-income countries. This share reaches at least 50 percent in many countries in sub-Saharan Africa and elsewhere, especially where poverty is particularly entrenched, and women have few other employment opportunities. Yet they tend to have poorer access to productive assets, such as land and capital, inputs and technology, as well as services. Their decision-making capacity therefore remains limited, including in community decisions over natural resources. (FAO and ADB, 2013).

For example, in sub-Saharan Africa, the agricultural productivity levels of female farmers are between 20 to 30 percent lower than those of male farmers, because of the gender gap in access to resources (FAO, 2011). Globally, rural women experience poverty and exclusion disproportionately, and fare worse than rural men as well as urban women and men on every gender-sensitive indicator for which data are available. Women and girls also face a higher risk of undernourishment – about 60 percent of people living in hunger are female. Addressing pervasive gender inequality will generate multiple benefits in terms of food security and poverty alleviation (FAO, 2017c).

Placing a strong emphasis on human and social values and seeking to address gender inequalities by creating more opportunities for women is part of an agroecological transition. Women can develop higher levels of autonomy by building knowledge, through collective action and creating opportunities for commercialization, and enhancing their negotiation and leadership skills. Opening spaces for women and girls to become more autonomous can empower them at household, community levels and beyond – for instance, through participation in producer groups, and increasing their access to agricultural services and rural institutions.

The Women's Empowerment in Agriculture Index (WEAI) is a survey-based index designed to measure the empowerment, agency, and inclusion of women in the agricultural sector. The WEAI has been used extensively since 2012 by a variety of organizations to assess the state of empowerment and gender parity in agriculture, to identify key areas in which empowerment needs to be strengthened, and to track progress over time. It measures the roles and extent of women's engagement in the agriculture sector in five domains of empowerment: (1) decisions about agricultural production, (2) access to and decision making power over productive resources, (3) control over use of income, (4) leadership in the community, and (5) time use (Table 8). It also measures women's empowerment relative to men within their households.

The survey collects data by following the **Abbreviated version of the Women's Empowerment in Agriculture Index (A-WEAI)** (IFPRI, 2015) retaining its five domains of empowerment, but the 10 indicators are reduced to 6, one per domain: (i) Input in productive decisions (ii) Ownership of assets, (iii) Access to credit (iv), Control over use of income, (v) Group membership, (vi) Workload.

TABLE 8 **Score and weights of the indicators to calculate the A-WEAI**

DOMAINS	AREAS OF ASSESSMENT	ANSWER	SCORE	WEIGHT
Productive decisions	About CROPS PRODUCTION, ANIMAL PRODUCTION, OTHER ECONOMIC ACTIVITIES	» Myself or Both of us » My Husband or Someone else	1 0	¼
	About MAJOR & MINOR HOUSEHOLD EXPENDITURES	» Myself or Both of us » My Husband or Someone else	1 0	¼
	Perception of decision making about CROPS PRODUCTION, ANIMAL PRODUCTION, OTHER ECONOMIC ACTIVITIES	» No decision » Just little decisions » Some decisions » In great part/totally	0 0.33 0.66 1	¼
	Perception of possibility of decision making about MAJOR & MINOR HOUSEHOLD EXPENDITURES	» No decision » Just little decisions » Some decisions » In great part/totally	0 0.33 0.66 1	¼

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DOMAINS	AREAS OF ASSESSMENT	ANSWER	SCORE	WEIGHT
Access to and decision-making power about productive resources	Secure land tenure for men and women (From the results of 3.4.1)	» Green for women » Yellow for women, yellow or red for men » Yellow for women, green for men » Red for women, red for men » Red for women, yellow for men » Red for women, green for men	1 0.75 0.5 0.25 0.1 0	¼
	Access to credit	» Possible for women in secured channels » Possible for women in non-official channels only, possible for men non-official channels only » Possible for women in non-official channels only, possible for men in official channels » Not possible for women, not possible for men » Not possible for women, possible in non-official channels for men » Not possible for women, possible in secured channels for men	1 0.75 0.5 0.25 0.1 0	¼
	Ownership of CROPS, SEEDS, ANIMALS, and OTHER PRODUCTIVE ASSETS	» Myself or Both of us » My Husband or Someone else	1 0	¼
	Ownership of MAJOR & MINOR HOUSEHOLD ASSETS	» Myself or Both of us » My Husband or Someone else	1 0	¼
Control over use of income Leadership in the community	Decisions about the use of the revenue generated by CROP PRODUCTION, ANIMAL PRODUCTION and OTHER ECONOMIC ACTIVITIES	» I did not contribute or I contributed in few decisions » I contributed in some decisions » I contributed in almost all the decisions	0 0.5 1	1
	If these groups exist in your community, how often do you participate in their activities and meetings? WOMEN'S ASSOCIATIONS AND ORGANIZATIONS	» Never/almost never » Sometimes » Most of the times » Always	0 0.33 0.66 1	½
	COOPERATIVES FOR RURAL PRODUCTION Social Movements, Union of Rural Workers, Political Groups, Religious Groups, Training for, Capacity Development, Other	» Never/almost never » Sometimes » Most of the times » Always	0 0.33 0.66 1	½
Time use	More than 10.5 hours spent working per day	» Women no » Women yes, men yes » Women yes, men no	1 0.5 0	½
	Time spent in AGRICULTURAL ACTIVITIES + FOOD PREPARATION & DOMESTIC WORKS + OTHER GAINFUL ACTIVITES	» Women's time > men's » Women's time < = men's	0 1	½

Each domain weights for 20 percent of the overall average score for A-WEAI. The score for each domain is calculated with the following rules and then then standardized on a percentage scale. The criteria is then scored according to the following rule:

Green (desirable):	Yellow (acceptable):	Red (unsustainable):
A-WEAI ≥80%	A-WEAI ≥60% and <80%	A-WEAI <60%

These indicators directly inform SDG indicator 5.a.1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure and 5.a.2: Proportion of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control.

Advanced methodologies

The original version of the WEAI with 10 indicators can be used as advanced methodology when more detailed information on women's empowerment is needed.

In order for them to be functional and comparable in the backdrop of international statistical data, the proposed indicators could also be triangulated with the core decent work indicators drawn from the 4 principles of decent work (ILO 2013), namely:

- Standards and fundamental principles, rights at work ('is the work legal and sound?')
- Employment ('does the employment provide a living?')
- Social protection ('does the work provide benefits not included in the wage – like insurance, pension, etc. – that are essential to workers?')
- Social dialogue ('do the workers have chance to express their opinions, via labour union, legal procedures, etc.?')

3.4.8 YOUTH EMPLOYMENT OPPORTUNITIES

In many countries, rural youth face a crisis of employment. Globally, some 620 million young people are neither working nor studying, and 1.5 billion are working in agriculture and in self-employment (World Bank, 2013). About one-third of migrants are aged from 15 to 34 years (UNDESA 2012). High rates of unemployment and underemployment are among the root causes of distress out-migration from rural areas (FAO 2016).

Approaches to agriculture that are based on knowledge and skilled labour, such as agroecology, can provide a promising solution as a source of decent jobs, by offering rural employment opportunities that meet the aspirations of rural youth and contribute to decent work (FAO 2018). For example, Dorin (2017) showed that innovations requiring investments that save labour may not be seen as desirable where labour is more readily available than monetary resources, making labour-saving technologies less advantageous.

Monitoring the extent of decent work in agriculture, especially for young people, is thus relevant in assessing progress towards sustainable agriculture. A common indicator for measuring the creation of decent jobs for youth in rural areas has not been established yet. For this framework, we propose to follow the approach of SDG indicator 8.6.1 and collect data on the **proportion of youth (aged 15–24 years) in the household/community not in education, employment or training.**

This data is then compared with the **number of young people working in agricultural activities** (within the system assessed), the **number of youth in education**, the **number of those working outside** (but living in the system) and the **number of those who have emigrated**. We will also combine these data with **young people's perception of the agricultural work** by asking them if they would like to continue the activity of their parents/family or if they would emigrate if they had the chance. To the extent possible, the collection of this data should be sex-disaggregated to better highlight the differences between boys and girls of different age.

The criterion is calculated as the non-weighted average of two indices (employment and emigration) calculated separately using the following indicators, scores and weights:

TABLE 9 **Indicators, weights and scores for the calculation of the criteria on Youth employment opportunities**

DOMAIN	INDICATORS	SCORE	WEIGHT
Employment/activity	% of young people working in the agricultural production of the system assessed	1	½
	% of young people in education or training	1	
	% of young people working outside but currently living in the system assessed	0.5	
	% of young people not in education, nor working in agricultural nor in other activities	0	
	% of young people who already left the community for lack of opportunities	0	
Emigration	% of young people who want to continue the agricultural activity of their parents	1	½
	% of young people who would emigrate, if they had the chance	0.5	
	% of young people who already left the community for lack of opportunities	0	

A score of 0 has been assigned to situations considered individually as unfavorable and 1 to those considered favorable. 0.5 is given to intermediate situations.

The following thresholds are used for the final average score of employment and emigration:

Green (desirable):	Yellow (acceptable):	Red (unsustainable):
Score ≥70%	Score ≥50% and <70%	Score <50%

Advanced methodologies

When a more in-depth focus on youth employment is required, the indicators of the percentage of emigration from rural areas (as a proxy for local opportunities for young people) can also be used. Surveys assessing whether young people want to be a producer or not, and/or if they want to work in rural environment or if they would emigrate if they had the chance also exist that can contribute to better inform this criterion.

3.4.9 AGRICULTURAL BIODIVERSITY

Agricultural biodiversity is the diversity of crop species and varieties, livestock species and breeds, wild plants, pollinators, soil biota and other aquatic and terrestrial organisms that make agricultural and food production possible (PAR 2018). Meeting the challenges of climate change, improving nutrition and health, and achieving a transformation towards more sustainable and equitable production systems all require the conservation of agricultural biodiversity. Increasing agrobiodiversity is key for the process of transition to agroecology to ensure food security and nutrition while conserving, protecting and enhancing natural resources and ecosystem services.

Areas of the world with higher agricultural diversity produce more nutrients (Herrero *et al.* 2017). Very small, small and medium-sized farms, found mostly in traditional and mixed production systems, produce more food and nutrients in the most populous (and food insecure) regions of the world than large farms in modern food systems (Pengue and Gemmill-Herren, 2018). In addition, 5 billion people are estimated to live in traditional and mixed food systems, which is about 70 percent of the world's population (Pengue and Gemmill-Herren 2018, Ericksen 2008, UNEP 2016, HLPE 2017). Numerous studies have found a positive relationship between diversified farming systems and human nutritional outcomes for smallholder farms (Bellon *et al.* 2016, Demeke *et al.* 2017, Jones *et al.* 2014, Powell *et al.* 2015). Mixed crop-livestock farming systems occur in nearly all agro-ecological zones, are estimated to cover 2.5 billion hectares globally, and to produce 90 percent of the world's milk supply and 80 percent of the meat from ruminants (Herrero *et al.* 2013).

The presence of trees on agricultural land can be used as an indicator of biodiversity: Zomer *et al.* (2016) estimate that more than 10 percent tree cover can be found on over 45 percent of agricultural land globally, with an estimated carbon sequestration of 0.7 Gt CO_2 per year between 2000 and 2010. The number of local and transboundary livestock breeds at the global level, estimated at 8 127 (of which 5 584 mammalian species and 2 543 avian species) is also an indicator of agricultural biodiversity (FAO, 2015).

Assessments of agricultural biodiversity use methods drawn from a range of disciplines, including anthropology, ethnobiology, genetics, botany, biogeography and ecology. They require approaches that integrate traditional and scientific knowledge and that can take account of different worldviews of diversity and the environment. Data collection procedures include commonly used methods such as household surveys and focus group discussions as well as specifically designed participatory methods.

Some studies also demonstrate the need to disaggregate data collection by sex, as both men and women play important but possibly different roles in the management, use and conservation of biodiversity and have different tasks and responsibilities in food production and provision.

Various elaborated methods were developed in different contexts, some are presented in this section as advanced methodologies. For this framework, a count of **crops species and varieties** and the relative **area occupied**, as well as a count of **animal species and breeds**, will be used to calculate a Gini-Simpson index of diversity for both crops and animals. These results will be then calibrated with an index of measuring natural vegetation and presence of pollinators.

The indicators of agricultural biodiversity proposed here follow the approach of sub indicator 8.1, 8.6 and 8.7 of SDG indicator 2.4.1. From the transect walk realized during the survey, data is obtained via the count of species and varieties of crops and trees grown in the system assessed, as well as a count of animal species and breeds raised. The area occupied by each crop is also collected during the survey. A Gini-Simpson index of diversity is then calculated, both for crops and animals:

$$1 - D = 1 - \Sigma\, p_i^2$$

in which p_i is the abundance and i the proportion of individuals found in the i-th species. For example, the Gini-Simpson index for animals of the following farm is: 1-0.28=0.72=72 percent

SPECIES/BREED	# OF INDIVIDUALS	EQUIVALENT IN LIVESTOCK UNIT	p_i	p_i^2
Cow breed 1	2	2	0.19	0.04
Cow breed 2	4	4	0.39	0.15
Sheeps	10	1.5	0.15	0.02
Chicken	20	2.8	0.27	0.07
Sum		**10.3**		**0.28**

The Gini-Simpson index for crops of the following farm is: 1-0.34=0.66=66 percent

SPECIES/VARIETY	AREA	p_i	p_i^2
Maize	6	0.43	0.18
Wheat	5	0.36	0.13
Potato variety 1	1	0.07	0.01
Potato variety 2	2	0.14	0.02
Sum	**14**		**0.34**

A third index called "Natural vegetation, trees and pollinators" is calculated as the average of the following 3 indicators and associated scores:

INDICATOR	ANSWER	SCORE
Beekeeping	No	0
	Yes, wild	0.5
	Yes, raised	1
Productive area covered by natural or diverse vegetation	Absent	0
	Small	0.25
	Medium	0.5
	Significant	0.75
	Abundant	1
Presence of pollinators and beneficial animals	Absent	0
	Little	0.33
	Significant	0.66
	Abundant	1

The averages of the 2 Gini-Simpson indices and the third one are used to score the criterion on agricultural biodiversity using the following thresholds:

Green (desirable):	Yellow (acceptable):	Red (unsustainable):
Average score is ≥70%	Average score is ≥50% and <70%	Average score is <50%

This criterion also directly contributes to informing 2.4.1 at national level. It also informs 2.5.1 (Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities).

Advanced methodology: the Index of Agrobiodiversity - IDA

The Index of Agrobiodiversity, or IDA (Leyva and Lores 2018), is a tool developed in Cuba that provides information, by means of a numeric value, on the necessary agrobiodiversity value for any given community. The calculation is based on a comparison between the existing level of agrobiodiversity and the level needed to meet the community's needs and interests (i.e. for its inhabitants, animals, natural resources and remaining life forms). This advanced methodology can therefore be used as a complement to the simple method described in this section when a particular focus on biodiversity and nutrition is made.

The IDA builds on known mathematical principles and aims to assess how agrobiodiversity supports diversified diets, including nutritional values for humans, for animals and for remaining life forms ("consumers") as well as for the protection of soil. Additionally, the IDA considers environmental protection, resilience, carbon capture, climate change and the sociocultural role of agrobiodiversity, underpinned by the educational role played by the dissemination of knowledge of the dietary value of plants, as well as their spiritual functions.

The IDA represents basic food groups and the degree to which these are satisfied through local production, in diversity and quantity. Assessing whether food needs for local demand are met is based on criteria established collectively through a series of participatory activities. These activities define desired values for particular species and compare them against existing values.

IDA uses four sub-indices: IFER (food for humans), IFE (food for animals), IAVA (to improve physical, chemical and biological properties of soil), and ICOM (complementary species). Each sub-index includes species that are considered food for each group. The robustness of each sub-index lies in the diversity and dominance of species, according to their food provisioning role and other functions. Given that the IDA is equal to the sum of the IFER, IFE, IAVA and ICOM sub-indices, divided by the number of sub-indices (four), it is assumed that the value of each sub-index is of equal importance.

The Livestock Environmental Assessment and Performance (LEAP) partnership has published a review of indicators and methods to assess biodiversity (Teillard *et al.*, 2016) conducted in a multistakeholder approach that includes scientists, private sector, civil society, NGOs and governments. More advanced methodologies can also be found in the Compendium of participatory methods for assessing agrobiodiversity (PAR, 2018).

3.4.10 **SOIL HEALTH**

Soil underpins agricultural output and ecosystem functioning. Sustaining the quantity and quality of organic matter in agricultural soils is thus a key element of sustainability in agriculture (FAO 2017a). Soil health covers the stabilization of soil structure, the maintenance of soil life and biodiversity, retention and release of plants nutrients and maintenance of water-holding capacity, thus making it a key criterion not only for agricultural productivity but also for environmental resilience (FAO 2005).

A number of practices used in agroecological systems can contribute to improve soil health, for example, minimal mechanical soil disturbance, organic fertilization from animal manure or compost, permanent soil cover (organic matter supply through the preservation of crop residues and cover crops), crop rotation for biocontrol and efficient use of the soil profile, rotational grazing management, and minimal soil compaction.

The indicators selected to assess soil health are the ones developed by the Latin American Society for Agroecology (SOCLA) and presented in Nicholls *et al. (2004)*. These indicators are applied and interpreted jointly by farmers and researchers. The method is conducted at the same time as the field walk for measuring 3.4.9 and is based on field measurements and assessment of agroecosystem properties that reflect soil quality and plant health. As measurements are based on the same indicators, the results are comparable and allow producers to monitor the evolution of the same agroecosystem along a timeline or make comparisons between systems in various transitional stages.

The **SOCLA 10 indicators of soil health** are:

1. Soil structure;
2. Degree of compaction;
3. Soil depth;
4. Status of residues;
5. Color, odor, and organic matter;
6. Water retention;
7. Soil cover;
8. Signs of soil erosion;
9. Presence of invertebrates;
10. Microbiological activity.

In the SOCLA method, each indicator is valued separately and assigned with a value between 1 and 5, according to the attributes observed in the soil (1 being the least desirable value, 3 a moderate or threshold value and 5 the most preferred value). In this framework, we simplified the number of scores from 10 to 5. For instance, in the case of the soil structure indicator, a value of 1 is given to a dusty soil, without visible aggregates; a value of 3 to a soil with some granular structure whose aggregates are easily broken under soft finger pressure; and a value of 5 to a well-structured soil whose aggregates maintain a fixed shape even after exerting soft pressure (Burket et al. 1998). Scores 2 and 4 are given for intermediate situations. The detail of the 10 indicators are provided in the questionnaires for data collection in Annex 4. Once all indicators are assessed, individual indicators can be presented in a radar type graphic or an average score of soil health can be calculated and the following thresholds can be used:

Green (desirable):	Yellow (acceptable):	Red (unsustainable):
Average score is ≥3.5	Average score is ≥2.5 and <3.5	Average score is <2.5

The assessment of soil health as proposed in this framework will contribute to inform SDG indicator 2.4.1 (Proportion of Agricultural area under productive and sustainable agriculture) and in particular its sub-indicator 4 (Prevalence of soil degradation). It will also inform SDG indicator 15.3.1 (Proportion of degraded land).

Advanced methodology: Soil Organic matter

Soil organic matter contains roughly 55-60 percent of carbon by mass, so knowing the quantity of soil organic matter can be used as a proxy for knowing soil organic carbon. Carbon sequestration is a fundamental strategy for climate change mitigation, and it can also be counted as an adaptation/resilience measure.

Quantification of soil carbon relies on laboratory analysis of soil samples, either through the quantification of all soil organic matter by means of loss on ignition (e.g., Hoogsteen *et al.*, 2015) or through the oxidation of soil carbon (e.g. Walkie and Black) and indirect calculation of soil organic matter. Soil organic carbon and soil organic matter are generally expressed as a

PHOTO Marunga Tsuma Joto ploughing his land with four of his bulls, Ndavaya, Kwale county, Kenya.

percentage of the total soil mass or, especially in the scientific and technical literature, in grams per kilogram (g kg^{-1}). One percent organic matter is equivalent to 10 g kg^{-1}. Yet assessing soil quality through soil organic matter requires considering the general characteristics of the soil and its environment. Coarser soils, with more sand and less clay or silt particles tend to store less organic matter. Soils in dry, hot environment contain also less organic matter than soils in wet or humid and cooler climates. As a result, an increase of e.g. 1 percent in soil organic matter may be substantial in a coarse soil in an arid environment – perhaps even a doubling of its initial amount – but it may represent only a marginal increase in a fine textured, wetland soil in a temperate environment.

3.4.11 OPTIONAL: SELECTION OF ADVANCED CRITERIA

Data to inform core criteria should be collected regardless of the location and the environmental context of the assessment in order to create a consistent, coherent, and comprehensive database across scale, space, time and dimensions of sustainability. However, in some specific contexts, there may be the necessity to complement the core list with advanced criteria to inform particular needs for projects, reports, inference spaces, etc. In most cases, advanced criteria require additional time and data collection or even specific tools and models, which prevents them from being systematically used in this framework due to its multidimensional, comprehensive but also simple nature.

A number of already identified advanced criteria are listed in Table 5 alongside the core criteria but without a number from the core list of 10. Suggested methods are also proposed for each of them. They include “Water use efficiency” (e.g. water productivity method) and “Water pollution” (e.g. LEAP guidelines for the assessment of nutrient use in livestock), “Climate change mitigation” and “Greenhouse gas emissions” (e.g. Ex-Act or GLEAM-I tool to estimate emissions), “Carbon sequestration”, “Food self-sufficiency”, “Nutritional value of the agricultural production”, “Happiness index”, and “Climate change resilience” (e.g.. SHARP tool).

Advanced criteria should complement the core criteria of performance to offer a more in-depth diagnostic in one particular dimension. But they shouldn’t replace them, as the balance between all dimensions of sustainability is guaranteed by informing all 10 core criteria in addition to the CAET.

3.5 STEP 3: JOINT ANALYSIS OF STEP 1 AND 2 AND PARTICIPATORY INTERPRETATION

Once Steps 0, 1 and 2 are completed and data have been collected, unified but diverse data for a particular unit will be available and will include data on the context and enabling environment, the current status of the system with regard to the 10 elements of agroecology and its performance with regard to the 10 core criteria.

Analysis of results to highlight strengths and weaknesses in the system can lead to identify trade-offs or synergies between elements of agroecology and also between sustainability dimensions. For example, a system with high synergies between plants and animals and high levels of recycling may perform poorly in terms of income if limited access to market is assessed in the CAET within the element "Circular and solidarity economy." Additionally, some systems may score poorly on secure land tenure but still have a high value for co-creation of knowledge based on traditional and localized practices.

This last step should be conducted in a participatory mode with the community in order to (1) verify the adequacy and performance of the framework; (2) confirm/revise the analysis (including the sampling and up-scaling from farm to territory and the thresholds used on Step 2) and identify synergies and trade-offs; and, (3) design possible ways forward in time, potentially utilizing the tool to monitor progress. This step should include:

- The review of CAET results (Step 1) and how the context and enabling environment collected in Step 0 can help explain these results, as well as a discussion on possible weighting of indices within each element to emphasize critical aspects in the analysis to ensure contextualized relevance;
- The review of the performance criteria results and how the data collected in Steps 1 and 0 can help explain these results, as well as a discussion on the thresholds applied to each of the criteria for the "traffic light" approach;
- The review of the aggregation of farm level results for an analysis at territory level as well as of the sampling method chosen;
- The analysis of how the performance criteria results can help inform the SDG indicators at more territorial and national levels: are the results in line with the country reporting or do they differ? Do they show synergies (similar performances for different criteria that can be explained by the same scores in the CAET) or trade-offs (high performance within one criterion seem to be linked to poor performance within another one and driven by the same CAET scores); and,
- The identification of ways of improving the performance by increasing the scores in the CAET and moving towards a more advanced stage in the agroecological transition.

PHOTO In the next page: **Women with soil samples in a participatory exercise, Nepal.**

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SECTION 4

TESTING TAPE

PHOTO Goats grazing on bunds in a rice paddy in Nhan My, Viet Nam.

In the second half of 2019, TAPE has started to be tested in a number of pilots or case studies, using the guidelines for application presented in this document. The purpose of the pilot studies is to validate or improve TAPE, with a particular emphasis on (i) the overall stepwise approach and (ii) the CAET and the Core Criteria of Performance. This is being done in a systematic way in each of FAO regions, starting with a workshop involving governments, scientists, producers' organizations and NGOs, in order to identify, strengthen and engage a community of practice on the process and utilization of the tool.

Pilots will be conducted by partners with the support of FAO, which will allow the testing and possible correction of the framework, as well as the collection of data and their inclusion into the database. Translation of TAPE, both in terms of language and of interpretation of the questionnaires, will be realized by partners in order to ensure local relevance of the tool.

Types of initiatives that can test the framework include: projects aiming at assessing sustainability in agriculture, farm networks engaged in monitoring multidimensional performance, investments in agriculture that want to monitor their impact on sustainability, farms, communities, and territories that want to measure their agroecological performance with an eye to improvement through time, etc. Additionally, prior collected data can be used to populate the tool to assess performance wherever possible in order to try to reduce enumeration time and increase efficiency.

Figure 6 presents the result of a test conducted on a farm in Thailand during the workshop in the Asia and Pacific region. The high level of diversity on the farm (rice, vegetables and fish production as well as activity as a training center), together with the relatively high score in circular economy (products sold directly to neighboring households through social media), explain the high level of productivity but also of income and added value compared to the average in the country. However, limited synergies and recycling were found between the different sub-production systems which explains the relatively low score in agricultural biodiversity (significant share of the farmland is in rice monocropping) as well as the high exposure to pesticides.

FIGURE 6 **Results of Step 1 and Step 2 applied to a farm in Thailand**

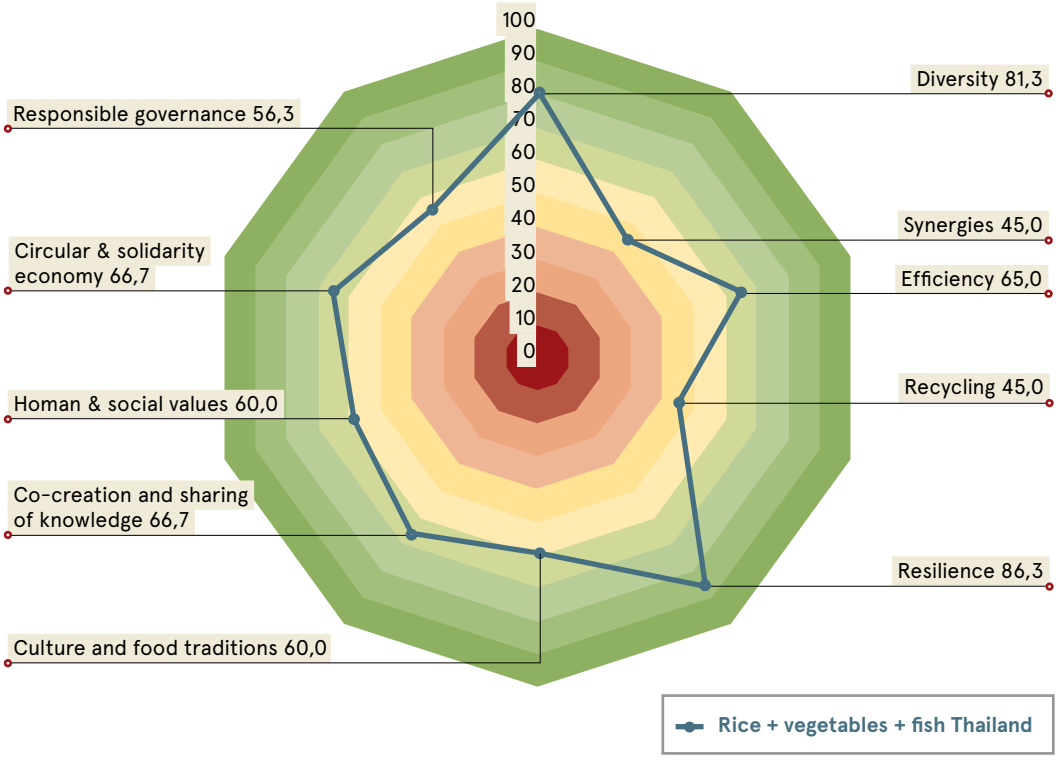

TABLE 10 **Results of core criteria of performance (Step 2) applied to a farm in Thailand.**

Core criteria of performance	RESULTS
Secure land tenure	No document but perception of secure land
Productivity	USD 9,460/ha/year (Average Thailand 1,678) USD 10,915/FWU/year (Average Thailand 3204) FWU = 1 Daughter + 0.3 Father
Income	(N/A) Income USD 9,567/FWU/year (Average Thailand? same agroecosystem?)
Added value	USD 10,376/FWU/year (Thailand 3204) Paid labor for paddy
Exposure to pesticides	Exposure to pesticides of class II (Moderately) with less than 4 of the listed mitigation techniques
Dietary diversity	Minimum Dietary Diversity for Woman = 8
Women's empowerment	A-WAEI 0.849 (but leadership component 0.497)
Youth employment	(N/A) Youth employment No young people in the household
Agricultural biodiversity	Gini-simpson 54.7% (1.2 ha paddy and 0.3 ha fruits + vegetables + fish pond)
Soil health	(N/A) Data not collected

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ANNEXES

- LIST OF PARTICIPANTS AT THE FAO EXPERT WORKSHOP ON MULTI-DIMENSIONAL ASSESSMENT OF AGROECOLOGY
- QUESTIONNAIRES

ANNEX 1: LIST OF PARTICIPANTS AT THE FAO EXPERT WORKSHOP ON MULTI-DIMENSIONAL ASSESSMENT OF AGROECOLOGY (8-9 OCTOBER 2018, ROME)

EXTERNAL PARTICIPANTS AND AFFILIATION	
David Amudavi	Biovision Africa Trust
Million Belay	AFSA
Rachel Bezner-Kerr	Cornell University
Jean-Luc Chotte	IRD
Ibrahima Coulibaly	ROPPA
Adelina Derkimba	CARI
Martín Drago	FoEI
Pierre Ferrand	GRET/ALiSEA
Andrea Ferrante	Schola Campesina
Émile Frison	IPES Food
Barbara Gemmill-Herren	ICRAF
Alberta Guerra	Action Aid
Judith Hitchman	Urgenci
Yodit Kebede	Wageningen University
Ashlesha Khadse	La Vía Campesina
Vijay Kumar	Government of Andhra Pradesh
Allison Loconto	Harvard University/INRA
Santiago López-Ridaura	MESMIS/CIMMYT
Ousmane Ly	Union des Jeunes Agriculteurs du Koyli Wirnde / ROPPA
Salimi Maede	Cenesta
Bertrand Mathieu	GTAE (GRET, CARI, Action Sud, AVSF)
Clara Nicholls	SOCLA
Delphine Ortega	La Vía Campesina
Alain Peeters	Agroecology Europe
Paulo Petersen	MAELA
Pierre Pujos	Farmer
Lucie Reynaud	GRET/ALiSEA
María Noel Salgado	MAELA
Éric Scopel	CIRAD

Sieglinde Snapp	Michigan State University
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Jean-François Soussana	INRA
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FAO DECENTRALIZED OFFICES	
Txaran Basterrechea	FAO Angola
Barbara Jarschel	FAO Regional Office for Latin America and the Caribbean (RLC)
Anne-Sophie Poisot	FAO India
Carolina Starr	FAO Regional Office for Europe and Central Asia (REU)
Duclair Sternadt	FAO Regional Office for Latin America and the Caribbean (RLC)
FAO DIVISIONAL FOCAL POINTS	
Edmundo Barrios	FAO Plant Production and Protection (AGP)
Caterina Batello	FAO Plant Production and Protection (AGP)
Abram Bicksler	FAO Plant Production and Protection (AGP)
Pierre-Marie Bosc	FAO Land and Water (CBL)
Guilherme Brady	FAO Partnership and South-South Cooperation (DPS)
Rémi Cluset	FAO Plant Production and Protection (AGP)
Maryline Darmaun	FAO Climate and Environment (CBC)
Frank Escobar	FAO Plant Production and Protection (AGP)
Jean-Marc Faurès	FAO Sustainable Agriculture (SP2)
Jimena Gómez	FAO Plant Production and Protection (AGP)
Amy Heyman	FAO Sustainable Agriculture (SP2)
Patrick Kalas	FAO Climate, Biodiversity, Land and Water (CBD)
Jeri Kelly	FAO Plant Production and Protection (AGP)
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Anna Korzenszky	FAO Partnership and South-South Cooperation (DPS)
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Félix Teillard	FAO Animal Production and Health Division (AGA)
Berhe Tekola	FAO Animal Production and Health Division (AGA)

ANNEX 2. QUESTIONNAIRES

STEP 0 – DESCRIPTION OF SYSTEMS AND CONTEXT

1. Country
2. Location (municipality, province)
3. Coordinates of the dwelling (if available)
4. Type of production system
5. Name of the system assessed

If you wish to assess a territory or a community, please note that Step 2 (criteria of performances) would have to be adapted to upscale household/farm results

6. How many people live in the household?
   - Men
   - Women
   - Youngsters
   - Children
7. How many of these work in the agricultural production system assessed?
   - Men
   - Women
   - Youngsters
   - Children

Productive activities

8. Total area in production (ha)
9. What are the productive agricultural outputs? Select as many as necessary
   - Crops, Animals (including fish), Trees, Other
10. What is the main intended destination of the agricultural production?
    - Sale
    - Mostly sale and a small part of self-consumption
    - Equally sale and self-consumption
    - Mostly self-consumption and a small part of sale
    - Self-consumption

Enabling environment

11. Describe shortly the natural context in which the system is found (e.g. type of agroecosystem, climate, elevation…) and the environmental challenges (e.g. droughts, floods, pollution…)

12. Describe shortly the public policy and market context that can support or limit the agroecological transition of the system (e.g. national or local regulations on agricultural production and trade, conservation areas, existence of label or mechanisms to recognize/ protect the origin of the product, local markets/fairs, participatory guarantee systems, community supported agriculture…)
13. Describe shortly the various actors interacting with the system and the potential groups or networks that can support the agroecological transition (e.g. extension services, cooperatives, knowledge platforms, producers' organization, participatory governance mechanisms such as food councils…)

STEP 1 – CHARACTERISATION OF AGROECOLOGICAL TRANSITIONS

1. DIVERSITY

CROPS

→ 0 - Monoculture (or no crops cultivated).

→ 1 - One crop covering more than 80 percent of cultivated area.

→ 2 – Two or three crops with significant cultivated area.

→ 3 - More than 3 crops with significant cultivated area adapted to local and changing climatic conditions.

→ 4 - More than 3 crops of different varieties adapted to local conditions and spatially diversified farm with multi-, poly- or inter-cropping.

ANIMALS (INCLUDING FISH AND INSECTS)

→ 0 - No animals raised.

→ 1 - One species only.

→ 2 - Two or three species, with few animals.

→ 3 – More than three species with significant number of animals.

→ 4 – More than three species with different breeds well adapted to local and changing climatic conditions.

TREES (AND OTHER PERENNIALS)

→ 0 - No trees (nor other perennials).

→ 1 - Few trees (and/or other perennials) of one species only.

→ 2 - Some trees (and/or other perennials) of more than one species.

→ 3 - Significant number of trees (and/or other perennials) of different species.

→ 4 - High number of trees (and/or other perennials) of different species integrated within the farm land.

DIVERSITY OF ACTIVITIES, PRODUCTS AND SERVICES

→ 0 - One productive activity only (e.g. selling one crop only).

→ 1 - Two or three productive activities (e.g. selling 2 crops or one crop and one type of animals).

→ 2 - More than 3 productive activities.

→ 3 - More than 3 productive activities and one service (e.g. processing products on the farm, ecotourism, transport of agricultural goods, training etc.).

→ 4 - More than 3 productive activities, and several services.

2. SYNERGIES

CROP-LIVESTOCK-AQUACULTURE INTEGRATION

The enumerator needs to consider the resources shared at community level. In the case of communal pastures for example, the corresponding feed inputs for animals are not considered as external. Are considered external only the feed purchased from the market.

→ 0 - No integration: animals, including fish, are fed with purchased feed and their manure is not used for soil fertility; or no animal in the agroecosystem.

→ 1 - Low integration: animals are mostly fed with purchased feed, their manure is used as fertilizer.

→ 2 - Medium integration: animals are mostly fed with feed produced on the farm and/or grazing, their manure is used as fertilizer.

→ 3 - High integration: animals are mostly fed with feed produced on the farm, crop residues and by-products and/or grazing, their manure is used as fertilizer and they provide traction.

→ 4 - Complete integration: animals are exclusively fed with feed produced on the farm, crop residues and by-products and/or grazing, all their manure is recycled as fertilizer and they provide more than one service (food, products, traction, etc.).

SOIL-PLANTS SYSTEM MANAGEMENT

→ 0 - Soil is bare after harvest. No intercropping. No crop rotations (or rotational grazing systems). Heavy soil disturbance (biological, chemical or mechanical).

→ 1 - Less than 20 percent of the arable land is covered with residues or cover crops. More than 80 percent of the crops are produced in mono and continuous cropping (or no rotational grazing).

→ 2 - 50 percent of soil is covered with residues or cover crops. Some crops are rotated or intercropped (or some rotational grazing is carried out).

→ 3 - More than 80 percent of soil is covered with residues or cover crops. Crops are rotated regularly or intercropped (or rotational grazing is systematic). Soil disturbance is minimized.

→ 4 - All the soil is covered with residues or cover crops. Crops are rotated regularly and intercropping is common (or rotational grazing is systematic). Little or no soil disturbance.

INTEGRATION WITH TREES (AGROFORESTRY, SILVOPASTORALISM, AGROSILVOPASTORALISM)

Consider also communal forest areas.

→ 0 - No integration: trees (and other perennials) don't have a role for humans or in crop or animal production.

→ 1 - Low integration: small number of trees (and other perennials) only provide one product (e.g. fruits, timber, forage, medicinal or biopesticides substances…) or service (e.g. shade for animals, increased soil fertility, water retention, barrier to soil erosion…) for humans crops and/or animals.

→ 2 - Medium integration: significant number of trees (and other perennials) provide at least one product or service.

→ 3 - High integration: significant number of trees (and other perennials) provide several products and services.

→ 4 - Complete integration: many trees (and other perennials) provide several products and services.

CONNECTIVITY BETWEEN ELEMENTS OF THE AGROECOSYSTEM AND THE LANDSCAPE

Consider the surrounding areas, the semi-natural environments and the potential zones of ecological compensation

→ 0 - No connectivity: high uniformity within and outside the agroecosystem, no semi-natural environments, no zones of ecological compensation.

→ 1 - Low connectivity: a few isolated elements can be found in the agroecosystem, such as trees, shrubs, natural fences, a pond or a small zone of ecological compensation.

→ 2 - Medium connectivity: several elements are adjacent to crops and/or pastures or a large zone of ecological compensation.

→ 3 - Significant connectivity: several elements can be found in between plots of crops and/or pastures or several zones of ecological compensation (trees, shrubs, natural vegetation, pastures, hedges, channels, etc.).

→ 4 - High connectivity: the agroecosystem presents a mosaic and diversified landscape, many elements such as trees, shrubs, fences or ponds can be found in between each plot of cropland or pasture, or several zones of ecological compensation.

3. EFFICIENCY

USE OF EXTERNAL INPUTS

Take into account all inputs needed for production, including energy, fuel, fertilizers, seeds, young animals, straw for artificial insemination, workforce, phytosanitary substances etc.

→ 0 - All inputs are purchased from the market.

→ 1 - The majority of the inputs is purchased from the market.

→ 2 - Some inputs are produced on farm/within the agroecosystem or exchanged with other members of the community.

→ 3 - The majority of the inputs is produced on farm/within the agroecosystem or exchanged with other members of the community.

→ 4 - All inputs are produced on farm/within the agroecosystem or exchanged with other members of the community.

MANAGEMENT OF SOIL FERTILITY

→ 0 - Synthetic fertilisers are used regularly on all crops and/or grasslands (or no fertilizers are used for lack of access, but no other management system is used).

→ 1 - Synthetic fertilizers are used regularly on most crops and some organic practices (e.g. manure or compost) are applied to some crops and/or grasslands.

→ 2 - Synthetic fertilisers are used on a few specific crop only. Organic practices are applied to the other crops and/or grasslands.

→ 3 - Synthetic fertilisers are only used exceptionally. A variety of organic practices are the norm.

→ 4 - No synthetic fertilisers are used, soil fertility is managed only through a variety of organic practices.

MANAGEMENT OF PESTS & DISEASES

→ 0 - Chemical pesticides and drugs are used regularly for pest and diseases management. No other management is used.

→ 1 - Chemical pesticides and drugs are used for a specific crop/animal only. Some biological substances and organic practices are applied sporadically.

→ 2 – Pests and diseases are managed through organic practices but chemical pesticides are used only in specific and very limited cases.

→ 3 – No chemical pesticides and drugs are used. Biological substances are the norm.

→ 4 - No chemical pesticides and drugs are used. Pests and diseases are managed through a variety of biological substances and prevention measures.

PRODUCTIVITY AND HOUSEHOLD'S NEEDS

Consider all types of assets, including animals, perennial tress etc.

→ 0 - Household's needs are not met for food nor for other essentials.

→ 1 - Production covers only household's needs for food. No surplus to generate income.

→ 2 - Production covers household's needs for food and surplus generates cash to buy essentials but doesn't allow savings.

→ 3 - Production covers household's needs for food and surplus generates cash to buy essentials and to have sporadic savings.

→ 4 - All household's needs are met both for food and for cash to buy all essentials needed and to have regular savings.

4. RECYCLING

RECYCLING OF BIOMASS AND NUTRIENTS

→ 0 – Residues and by-products are not recycled (e.g. left for decomposition or burnt). Large amounts of waste are discharged or burnt.

→ 1 - A small part of the residues and by-products is recycled (e.g. crop residues as animal feed, use of manure as fertilizer, production of compost from manure and household waste, green manure). Waste is discharged or burnt.

→ 2 - More than half of the residues and by-products is recycled. Some waste is discharged or burnt.

→ 3 - Most of the residues and by-products are recycled. Only a little waste is discharged or burnt.

→ 4 - All of the residues and by-products are recycled. No waste is discharged or burnt.

WATER SAVING

→ 0 - No equipment nor techniques for water harvesting or saving.

→ 1 - One type of equipment for water harvesting or saving (e.g. drip irrigation, tank).

→ 2 - One type of equipment for water harvesting or saving and use of one practice to limit water use (e.g. timing irrigation, cover crops).

→ 3 - One type of equipment for water harvesting or saving and various practices to limit water use.

→ 4 - Several types of equipment for water harvesting or saving and various practices to limit water use.

MANAGEMENT OF SEEDS AND BREEDS

→ 0 - All seeds and/or animal genetic resources (e.g. chicks, young animals, semen) are purchased from the market.

→ 1 - More than 80 percent of seeds/animal genetic resources are purchased from the market.

→ 2 - About half of the seeds are self-produced or exchanged, the other half is purchased from the market. About half of the breeding is done with neighbouring farms.

→ 3 - The majority of seeds/animal genetic resources are self-produced or exchanged. Some specific seeds are purchased from the market.

→ 4 - All seeds/animal genetic resources are self-produced, exchanged with other farmers or managed collectively, ensuring enough renewal and diversity.

RENEWABLE ENERGY USE AND PRODUCTION

→ 0 - No renewable energy is used nor produced.

→ 1 - The majority of the energy is purchased from the market. A small amount is self-produced (animal traction, wind, turbine, hydraulic, biogas, wood…).

→ 2 - Half of the energy used is self-produced, the other half is purchased.

→ 3 - Significant production of renewable energy, negligible use of fuel and other non-renewable sources

→ 4 - All of the energy used is renewable and/or self-produced. Household is self-sufficient for energy supply, which is guaranteed at every time. Use of fossil fuel is negligible.

5. RESILIENCE

STABILITY OF INCOME/PRODUCTION AND CAPACITY TO RECOVER FROM PERTURBATIONS

→ 0 - Income is decreasing year after year, production is highly variable despite constant level of input and there is no capacity to recover after shocks/perturbations.

→ 1 - Income is on decreasing trend, production is variable from year to year (with constant inputs) and there is little capacity to recover after shocks/perturbations.

→ 2 - Income is overall stable, but production is variable from year to year (with constant inputs). Income and production mostly recover after shocks/perturbations.

→ 3 - Income is stable and production varies little from year to year (with constant inputs). Income and production mostly recover after shocks/perturbations.

→ 4 - Income and production are stable and increasing over time. They fully and quickly recover after shocks/perturbations.

MECHANISMS TO REDUCE VULNERABILITY

With gender perspective

→ 0 - No access to credit, no insurance, no community support mechanisms.

→ 1 - Community is not very supportive and its capacity to help after shocks is very limited. And/or access to credit and insurance is limited.

→ 2 - Community is supportive but its capacity to help after shocks is limited. And/or access to credit is available but hard to obtain in practice. Insurance is rare and does not allow for complete coverage from risks.

→ 3 - Community is very supportive for both men and women but its capacity to help after shocks is limited. And/or access to credit is available and insurance covers only specific products/risks.

→ 4 - Community is highly supportive for both men and women and can significantly help after shocks. And/or access to credit is almost systematic and insurance covers most of production.

INDEBTEDNESS

→ 0 - Debt is higher than income.

→ 1 - Debt is more than half of the income. Capacity to reimburse is limited.

→ 2 - Debt is approximately half of the income.

→ 3 - Debt is limited and capacity to reimburse is total.

→ 4 - No debt.

DIVERSITY OF ACTIVITIES, PRODUCTS AND SERVICES

This index is the average score for the element of diversity already assessed

6. CULTURE & FOOD TRADITION

APPROPRIATE DIET AND NUTRITION AWARENESS

→ 0 - Systematic insufficient food to meet nutritional needs and lack of awareness of good nutritional practices.

→ 1 - Periodic insufficient food to meet nutritional needs and/or diet is based on a limited number of food groups. Lack of awareness of good nutritional practices.

→ 2 - Overall food security over time, but insufficient diversity in food groups. Good nutritional practices are known but not always enforced.

→ 3 - Food is sufficient and diverse. Good nutritional practices are known but not always enforced.

→ 4 - Healthy, nutritious, diversified diet. Good nutritional practices are well known and enforced.

LOCAL OR TRADITIONAL (PEASANT / INDIGENOUS) IDENTITY AND AWARENESS

→ 0 - No local or traditional (peasant / indigenous) identity felt.

→ 1 - Little awareness of local or traditional identity.

→ 2 - Local or traditional identity felt in part, or that concerns only part of the household.

→ 3 - Good awareness of local or traditional identity and respect of traditions or rituals overall.

→ 4 - Local or traditional identity strongly felt and protected, high respect for traditions and/or rituals.

USE OF LOCAL VARIETIES/BREEDS AND TRADITIONAL (PEASANT & INDIGENOUS) KNOWLEDGE FOR FOOD PREPARATION

→ 0 - No use of local varieties/breeds nor traditional knowledge for food preparation.

→ 1 – A majority of exotic/introduced varieties/breeds are consumed, or there is little use of traditional knowledge and practices for food preparation.

→ 2 - Both local and exotic/introduced varieties/breeds are produced and consumed. Local or traditional knowledge and practices for food preparation are identified but not always applied.

→ 3 – The majority of the food consumed comes from local varieties/breeds and traditional knowledge and practices for food preparation are implemented.

→ 4 – A number of local varieties/breeds are produced and consumed. Traditional knowledge and practices for food preparation are identified, applied and recognised in official frameworks and/or specific events.

7. CO-CREATION & SHARING OF KNOWLEDGE

PLATFORMS FOR THE HORIZONTAL CREATION AND TRANSFER OF KNOWLEDGE AND GOOD PRACTICES

With gender perspective. Platforms can be formal or informal organizations, farmer field schools, regular meetings, trainings, etc.

→ 0 - No platforms for co-creation and transfer of knowledge are available to producers.

→ 1 - At least one platform for the co-creation and transfer of knowledge exists but does not function well and/or is not used in practices.

→ 2 - At least one platform for the co-creation and transfer of knowledge exists and is functioning but is not used to share knowledge on agroecology specifically.

→ 3 – One or several platforms for the co-creation and transfer of knowledge exist, are functioning and are used to share knowledge on agroecology, including women.

→ 4 – Several well established and functioning platforms for the co-creation and transfer of knowledge are available and widespread within the community, including women.

ACCESS TO AGROECOLOGICAL KNOWLEDGE AND INTEREST OF PRODUCERS IN AGROECOLOGY

With gender perspective. Agroecological knowledge and practices may also be called in some other ways, and producers may know and apply them without knowing the word "agroecology". Focus on the actual practices and knowledge for the evaluation, and not on the formal knowledge of "agroecology" as a science.

→ 0 - Lack of access to agroecological knowledge: principles of agroecology are unknown to producers.

→ 1 - Principles of agroecology are mostly unknown to producers and/or there is little trust in them.

→ 2 - Some agroecological principles are known to producers and there is interest in spreading the innovation, facilitating knowledge sharing within and between communities and involving younger generations.

→ 3 – Agroecology is well known and producers are willing to implement innovations, facilitating knowledge sharing within and between communities and involving younger generations, including women and younger generations.

→ 4 - Widespread access to agroecological knowledge of both men and women: producers are well aware of the principles of agroecology and eager to apply them, facilitating knowledge sharing within and between communities and involving younger generations.

PARTICIPATION OF PRODUCERS IN NETWORKS AND GRASSROOT ORGANIZATIONS

With gender perspective.

→ 0 - Producers are isolated, have almost no relations with their local community and do not participate in meetings and grass-root organisations.

→ 1 - Producers have sporadic relations with their local community and rarely participate in meetings and grass-root organisations.

→ 2 - Producers have regular relations with their local community and sometimes participate in the events of their grass-root organisations but not as much for women.

→ 3 - Producers are well interconnected with their local community and often participate in the events of their grass-root organisations, including women.

→ 4 - Producers (with equal participation of men and women) are highly interconnected and supportive and show a very high engagement and participation in all the events of their local community and grass-root organisations.

8. HUMAN & SOCIAL VALUES

WOMEN'S EMPOWERMENT

→ 0 - Women do not normally have a voice in decision making, not in the household nor in the community. No organisation for women empowerment exists.

→ 1 - Women may have a voice in their household but not in the community. And/or one form of women association exist but is not fully functional.

→ 2 - Women can influence decision making, both at household and community level, but are not decision makers. They don't have access to resources. And/or some forms of women associations exist but are not fully functional.

→ 3 - Women take fully part in decision making processes but still don't have full access to resources. And/or women organisations exist and are used.

→ 4 - Women are completely empowered in terms of decision making and access to resources. And/or women organisations exist, are functional and operational.

LABOUR (PRODUCTIVE CONDITIONS, SOCIAL INEQUALITIES)

→ 0 – Agricultural supply chains are integrated and managed by agribusiness. Social and economic distance between landowners and workers. And/or workers don't have decent working conditions, make low wages and are highly exposed to risks.

→ 1 – Working conditions are hard, workers have average wages for the local context and may be exposed to risks.

→ 2 - Agriculture is mostly based on family farming but producers have limited access to capital and decision-making processes. Workers have the minimum decent labour conditions.

→ 3 - Agriculture is mostly based on family farming and producers (both men and women) have access to capital and decision-making processes. Workers have decent labour conditions.

→ 4 - Agriculture is based on family farmers which have full access to capital and decision-making processes in gender equity. Social and economic proximity between farmers and employees.

YOUTH EMPOWERMENT AND EMIGRATION

→ 0 - Young people see no future in agriculture and are eager to emigrate.

→ 1 - Most young people think that agriculture is too hard and many wish to emigrate.

→ 2 - Most young people do not want to emigrate, despite hard working conditions, and wish to improve their livelihoods and living conditions within their community.

→ 3 - Most young people (both boys and girls) are satisfied with working conditions and do not want to emigrate.

→ 4 - Young people (both boys and girls) see their future in agriculture and are eager to continue and improve the activity of their parents.

ANIMAL WELFARE [IF APPLICABLE]

→ 0 - Animals suffer from hunger and thirst, stress and diseases all year long, and are slaughtered without avoiding unnecessary pain.

→ 1 - Animals suffer periodically/seasonally from hunger and thirst, stress or diseases, and are slaughtered without avoiding unnecessary pain.

→ 2 - Animals do not suffer from hunger or thirst, but suffer from stress, may be prone to diseases and can suffer from pain at slaughter.

→ 3 - Animals do not suffer from hunger, thirst or diseases but can experience stress, especially at slaughter.

→ 4 - Animals do not suffer from stress, hunger, thirst, pain, or diseases, and are slaughtered in a way to avoid unnecessary pain.

9. CIRCULAR & SOLIDARITY ECONOMY

PRODUCTS AND SERVICES MARKETED LOCALLY

→ 0 - No product/service is marketed locally (or not enough surplus produced), or no local market exist.

→ 1 - Local markets exist but hardly any of the products/services are marketed locally.

→ 2 - Local markets exist. Some products/services are marketed locally.

→ 3 - Most products/services are marketed locally.

→ 4 - All products and services are marketed locally.

NETWORKS OF PRODUCERS, RELATIONSHIP WITH CONSUMERS AND PRESENCE OF INTERMEDIARIES

With gender perspective

→ 0 - No networks of producers for marketing agricultural production exist. No relationship with consumers. Intermediaries manage the whole marketing process.

→ 1 - Networks exist but do not work properly. Little relationship with consumers. Intermediaries manage most of the marketing process.

→ 2 - Networks exist and are operational, but don't include women. Direct relationship with consumers exist. Intermediaries manage part of the marketing process.

→ 3 - Networks exist and are operational, including women. Direct relationship with consumers exist. Intermediaries manage part of the marketing process.

→ 4 - Well established and operational networks exist with equal women participation. Strong and stable relationship with consumers. No intermediaries.

LOCAL FOOD SYSTEM

→ 0 - Community is totally dependent from outside for purchasing food supply and agricultural inputs and for the marketing and processing of products.

→ 1 - The majority of food supply and agricultural inputs are purchased from outside and products are processed and marketed outside the local community. Very few goods and services are exchanged/sold between local producers.

→ 2 – Food supply and inputs are purchased from outside the community and/or products are processed locally. Some goods and services are exchanged/sold between local producers.

→ 3 – Equal shares of food supply and inputs are locally available and purchased from outside the community and products are processed locally. Exchanges/trade between producers are regular.

→ 4 - Community is almost completely self-sufficient for agricultural and food production. High level of exchange/trade of products and services between producers.

10. RESPONSIBLE GOVERNANCE

PRODUCERS' EMPOWERMENT

With gender perspective

→ 0 - Producers' rights are not respected. They have no bargaining power and lack the means to improve their livelihoods and develop their skills.

→ 1 - Producers' rights are recognised but not always respected. They have small bargaining power and little means to improve their livelihoods and/or to develop their skills.

→ 2 - Producers' rights are recognised and respected for both men and women. They have small bargaining power but are not stimulated to improve their livelihoods and/or to develop their skills.

→ 3 - Producers' rights are recognised and respected for both men and women. They have the capacity and the means to improve their livelihoods and are sometimes stimulated to develop their skills.

→ 4 - Producers' rights are recognised and respected for both men and women. They have the capacity and the means to improve their livelihoods and to develop their skills.

PRODUCERS' ORGANIZATIONS AND ASSOCIATIONS

With gender perspective

→ 0 - Cooperation among producers is non-transparent, corrupted or non-existent. No existing organisation or they do not to distribute profits transparently and/or equally nor do they support producers.

→ 1 – One organisation of producers exists but its role is marginal and support to producers limited to market access.

→ 2 - One organisation of producers exists and provides support to producers for market access and other services (e.g. information, capacity development, incentives…), but women don't have access.

→ 3 - One organisation of producers exists and provides support to producers for market access and other services with equal access to men and women.

→ 4 – More than one organisation exist. They provide market access and other services, with equal access to men and women.

PARTICIPATION OF PRODUCERS IN GOVERNANCE OF LAND AND NATURAL RESOURCES

With gender perspective

→ 0 - Producers are completely excluded from the governance of land and natural resources. There is no gender equity in the governance of land and natural resources.

→ 1 - Producers participate in the governance of land and natural resources but their influence on decisions is limited. Gender equity is not always respected.

→ 2 - Mechanisms allowing producers to participate in the governance of land and natural resources exist but are not fully operational. Their influence on decisions is limited. Gender equity is not always respected.

→ 3 - Mechanisms allowing producers to participate in the governance of land and natural resources exist and are fully operational. They can influence decisions. Gender equity is not always respected.

→ 4 - Mechanisms allowing producers to participate in the governance of land and natural resources exist and are fully operational. Both women and men can influence decisions.

STEP 2 – CORE CRITERIA OF PERFORMANCE

Some sections of this step will ask information about expenditures, revenues or prices. Please specify the currency in which these values will be expressed: _____

LAND TENURE

Do you have any legal recognition of your land?
(for Pastoralists: is your mobility legally recognized?)

Mark only one per category

	MEN	WOMEN
Yes		
No		

If yes, which type of FORMAL DOCUMENT do you have?

Mark only one per category

	MEN	WOMEN
Title deed		
Certificate of customary tenure		
Certificate of occupancy		
Registered will or registered certificate of hereditary acquisition		
Registered certificate of perpetual / long term lease		
Registered rental contract		
Secure mobility corridor		
Other		

Secure land tenure: perception and rights:

Mark YES or NO per category

	MEN YES / NO	WOMEN YES / NO
If yes, is your NAME listed as owner / use right holder on the recognized documents?		
Do you PERCEIVE that your access to land is secure, regardless of whether this right is documented? (for Pastoralists: do you perceive that your mobility is secure?)		
Do you have the RIGHT TO SELL any of the parcels of the holding?		
Do you have the RIGHT TO BEQUEATH any of the parcels of the holding?		
Do you have the RIGHT TO INHERIT land?		

AGRICULTURAL BIODIVERSITY, INCOME AND PRODUCTIVITY

This part of the survey can be conducted using a farm walk or a combination of farm walk and household survey

OUTPUT AND EARNINGS

Take as reference the LAST YEAR of productive activity

CROPS AND TREES

Total revenue derived from crops and trees: _____

(Please express this value in the currency previously specified)

List top 10 most important crops or trees

NAME OF THE CROP SPECIES OR TYPE OF CROP	TOTAL PRODUCTION (kg)	QUANTITY SOLD (kg)	PRICE AT THE GATE (currency/kg)	LAND UNDER PRODUCTION (ha)	NUMBER OF VARIETIES/ SPECIES PRODUCED

Natural vegetation, trees and pollinators

Productive area covered by natural or diverse vegetation (natural pasture, grasslands, wildflower strips, stone or wood heaps, trees or hedgerows, natural ponds or wetlands, etc.). Consider communal land.

Mark only one:

	Abundant: more than 25% of the system is covered with natural or diverse vegetation
	Significant: at least 20% of the system is covered with natural or diverse vegetation
	Small: less than 10% of the system is covered with natural or diverse vegetation
	Absent: area covered with natural or diverse vegetation is negligible

Beekeeping

Mark only one

	Yes, bees are raised within the agroecosystem
	No, bees are not raised but are widespread within the agroecosystem
	No, bees are not raised and are rare within the agroecosystem

Presence of pollinators and other beneficial animals within the agroecosystem?

Mark only one oval.

	Abundant
	Significant
	Little
	Absent

ANIMALS

Total revenue derived from sale of animals: _____

Please express this value in the currency previously specified

List top 10 most important animal types

NAME OF THE ANIMAL SPECIES	TOTAL NUMBER OF ANIMALS RAISED	NUMBER OF DIFFERENT BREEDS WITHIN THIS SPECIES	QUANTITY SOLD	PRICE AT THE GATE (currency/animal)

ANIMAL PRODUCTS

Total revenue derived from animal products: _____

Please express this value in the currency previously specified

List top 10 most important animal products

NAME OF THE ANIMAL PRODUCT	TOTAL QUANTITY PRODUCED	QUANTITY SOLD	PRICE AT THE GATE (currency/unit)

OTHER ACTIVITIES / SERVICES

Total revenue from other activities/services
(e.g. renting, small industry, tourism, etc.): _____

Please express this value in the currency previously specified

List top 10 other activities/services

NAME OF THE ACTIVITY/ SERVICE PRODUCED OR PROVIDED	QUANTITY SOLD	TOTAL REVENUE

EXPENDITURES FOR INPUTS

Take as reference the LAST YEAR of productive activity. Please express this value in the currency previously specified

Total expenditures for FOOD for self- consumption: _____

Total expenditures for SEEDS: _____

Total expenditures for FERTILIZERS: _____

Total expenditures for FEED: _____

Total expenditures for VETERINARY SERVICES: _____

Total expenditures for LIVESTOCK PURCHASES: _____

Total expenditures for NON FAMILY WORKFORCE: _____

Number of people contracted: _____

For how many days? _____

ENERGY, MACHINERY AND MAINTENANCE

List top 10 machinery/equipment

Take as reference the LAST YEAR of productive activity. Please express this value in the currency previously specified

NAME OF THE MACHINERY/ EQUIPMENT	QUANTITY OWNED	PRICE PER UNIT	FOR HOW MANY YEARS HAVE YOU BEEN USING THIS MACHINERY/ EQUIPMENT?	HOW MANY MORE YEARS ARE YOU PLANNING ON USING IT/THEM (on average)?

Total expenditures for MACHINERY/EQUIPMENT and MAINTENANCE: _____

Total expenditures for FUEL: _____

Total expenditures for ENERGY: _____

Total expenditures for TRANSPORT: _____

FINANCIAL INFORMATION

Take as reference the LAST YEAR of productive activity. Please express this value in the currency previously specified

Total TAXES paid: _____

Total SUBSIDIES received: _____

Total INTEREST ON LOANS paid: _____

Total INCOME FROM RENTED LAND: _____

Total COST FOR RENTING LAND: _____

Qualitative perception of earnings and expenditures

How do you compare your income compared to three years ago?

	More income
	Same income
	Less income

EXPOSURE TO PESTICIDES

Consider the LAST 12 MONTHS as reference period

LIST TOP 10 CHEMICAL PESTICIDES USED

When selecting the level of toxicity for each pesticide, please refer to the table below:

CATEGORIES		SIGNAL WORD	ORAL LD_{50} (mg/kg)	DERMAL LC_{50} (mg/kg)	INHALATION LD_{50} (mg/L)
I	Extremely/highly toxic	DANGER POISON/ DANGER	0 to 50	0 to 200	0 to 0.2
II	Moderately toxic	WARNING	50 to 500	200 to 2000	0.2 to 2.0
III	Slightly toxic	CAUTION	500 to 5000	2000 to 20000	2.0 to 20
	Relatively non-toxic	CAUTION [optional]	5000+	20000+	20+

NAME OF THE PESTICIDE	LEVEL OF TOXICITY	AMOUNT OF ACTIVE INGREDIENT (%)	QUANTITY OF PRODUCT USED (l or g)	AMOUNT OF AREA IN WHICH THE PESTICIDE HAS BEEN USED (ha)	ON WHICH CROP?	FOR TREATING WHICH PEST?

TOTAL EXPENDITURE for CHEMICAL pesticides: _____

Mitigation strategies when applying?

Select as many as necessary.

	Mask
	Body protection (glasses, gloves, etc.)
	Special protection for women and children
	Visible signs of danger after spraying
	Community is informed of the danger
	Secure disposal of the empty containers after use
	Other:

List top 10 organic pesticides used

NAME OF THE ORGANIC PESTICIDE	SOURCE: SELF-PRODUCED OR PURCHASED?	QUANTITY USED (l or g)	AMOUNT OF AREA IN WHICH THE PESTICIDE HAS BEEN USED (ha)

TOTAL EXPENDITURE for ORGANIC pesticides: _____

Ecological management of pests

Select the techniques systematically applied within the system assessed. Select as many as needed.

	Cultural control (more resistant varieties are chosen for production; plants and fruits presenting signs of disease are removed manually; crops are grown in crop rotation and intercropping schemes, etc.)
	Plantation of natural repelling plants
	Use of cover crops to increase biological interactions
	Favor the reproduction of beneficial organisms for biological-control
	Favor biodiversity and spatial diversity within the agroecosystem
	Other:

Which type of pesticides are more important for your production?

	Chemical pesticides are more important
	Organic pesticides are more important
	Pesticides use in negligible (neither chemical nor organic) ecological management is more important
	Other:

Do you use antibiotics on your livestock?

	For treatment diseases only
	For prevention of diseases only
	For growth promotion
	I don't use antibiotics at all

YOUTH EMPLOYMENT AND EMIGRATION

Are there young members (15-24 years) in the system assessed? (including those emigrated and currently living outside it)

Yes / No

If you "Yes", please provide the following information:

Write a number per category. If one category is absent, write 0.

	MALE	FEMALE
Number of young people (mainly) working in the agricultural production of the system assessed		
Number of young people (mainly) in education/training		
Number of young people not in education/training nor working in agriculture, nor in other activities		
Number of young people (mainly) working outside but currently living in the system assessed		
Number of young people who have left the community/village for lack of opportunities		
Number of young people that would like to continue the agricultural activity of their parents		
Number of young people that don't want to work in agriculture and would emigrate if they had the chance		

WOMEN'S EMPOWERMENT

Survey to be conducted only with the main woman in the household without the presence of a man in a safe environment

Is the woman answering with the presence of a man? Yes / No
If yes: has the man refused to leave despite knowing that this? Yes / No

Education level

	MEN	WOMEN
Cannot read nor write		
Able to read and write		
Elementary		
High		
University		

TIME BURDEN

Leave the spot empty if a category is missing

Do you engage in other gainful activities outside agricultural production?

	MEN	WOMEN
Yes		
No		

If yes, what?

MEN: _____

WOMEN: _____

Share of working time spent working on AGRICULTURAL PRODUCTION within the system assessed

Mark only one per category

	MEN	WOMEN	MALE CHILDREN (<18)	FEMALE CHILDREN (<18)
None to little (<10%)				
Less than half (10%-39%)				
About half (40%-59%)				
Most/almost all (60%-99%)				
All (100%)				

Share of working time spent working on FOOD PREPARATION and other DOMESTIC WORKS

Mark only one per category

	MEN	WOMEN	MALE CHILDREN (<18)	FEMALE CHILDREN (<18)
None to little (<10%)				
Less than half (10%-39%)				
About half (40%-59%)				
Most/almost all (60%-99%)				
All (100%)				

Share of working time spent working on OTHER GAINFUL ACTIVITIES (outside agricultural production)

Mark only one per category

	MEN	WOMEN	MALE CHILDREN (<18)	FEMALE CHILDREN (<18)
None to little (<10%)				
Less than half (10%-39%)				
About half (40%-59%)				
Most/almost all (60%-99%)				
All (100%)				

In total, do you work more than 10.5 hours per day?

Mark only one per category

	MEN	WOMEN	MALE CHILDREN (<18)	FEMALE CHILDREN (<18)
More than 10.5 h/day				
Less than 10.5 h/ day				

DECISION MAKING

Do women make decisions on what to produce? Do women make decisions around what to do with the outputs produced (such as control over the income, and whether to consume at home)?

Mark only one per category

	MYSELF (Women)	MY HUSBAND (Men)	BOTH OF US	SOMEONE ELSE
Who is the owner of the CROPS and the SEEDS?				
When decision are taken about CROP PRODUCTION, who normally takes these decisions?				
Who is the owner of the ANIMALS?				
When decision are taken about ANIMAL PRODUCTION, who normally takes these decisions?				
Who is the owner of the assets for other economic activities within the household?				
When decision are taken about other economic activities within the household, who normally takes these decisions?				
Who is the owner of MAJOR HOUSEHOLD ASSETS? (house, machineries, etc.)?				
When decision are taken about MAJOR HOUSEHOLD ASSETS, who normally takes these decisions?				
Who is the owner of MINOR HOUSEHOLD ASSETS? (small tools, garden, etc.)?				
When decision are taken about MINOR HOUSEHOLD ASSETS, who normally takes these decisions?				

Decision-making about REVENUE:

Mark only one per category

	DID NOT CONTRIBUTE OR CONTRIBUTED IN FEW DECISIONS	CONTRIBUTED IN SOME DECISIONS	CONTRIBUTED IN MOST DECISIONS
How much did you contribute to the decisions about the use of the REVENUE generated through CROP PRODUCTION?			
How much did you contribute to the decisions about the use of the REVENUE generated through ANIMAL PRODUCTION?			
How much did you contribute to the decisions about the use of the REVENUE generated through OTHER ECONOMIC ACTIVITIES?			

PERCEPTION ABOUT DECISION-MAKING

Mark only one per category

	I THINK THAT I CANNOT TAKE ANY DECISION	JUST LITTLE DECISIONS	SOME DECISIONS	IN GREAT PART / TOTALLY
If you wanted, do you feel that you can take decisions about CROP PRODUCTION?				
If you wanted, do you feel that you can take decisions about ANIMAL HUSBANDRY?				
If you wanted, do you feel that you can take decisions about OTHER ECONOMIC ACTIVITES?				
If you wanted, do you feel that you can take decisions about MAJOR HOUSEHOLD'S EXPENDITURES?				
If you wanted, do you feel that you can take decisions about MINOR HOUSEHOLD'S EXPENDITURES?				

Do you have ACCESS TO CREDIT?

Mark only one per category

	MEN	WOMEN
Possible in official and secure channels (bank or similar)		
Possible in non-official channels		
Not possible. Access to credit is too hard or too risky		

LEADERSHIP

Men and women face different barriers to participation. Within the country/context, are both men and women within the household included and able to participate in the agroecology projects?

	THIS GROUP EXISTS IN YOUR COMMUNITY? YES/NO	HOW OFTEN DO YOU PARTICIPATE IN ACTIVITIES AND MEETINGS ORGANIZED BY THIS GROUP? (if it exists in your community)			
		Never / Almost never	Sometimes	Most of the time	Always
Women's associations and organizations					
Cooperatives for rural production					
Social movements					
Unions of rural workers					
Political groups linked to a party					
Religious groups					
Training organized for capacity development					
Others					

MINIMUM DIETARY DIVERSITY FOR WOMEN

Select what you ate or drank in the last 24 hours. Please include all foods and drinks, any snacks or small meals, as well as any main meals. Remember to include all foods you may have eaten while preparing meals or preparing food for others

Mark only one per category

FOOD GROUPS:	YES, I ATE IT IN THE LAST 24 HOURS	NO, I DID NOT EAT IT IN THE LAST 24 HOURS
GRAINS, WHITE ROOTS and TUBERS (bread, rice, pasta, flour, white potatoes, white yams, manioc / cassava / yucca, taro, etc)		
PULSES (beans, peas, fresh or dried seed, lentils or bean / pea products, including hummus, tofu and tempeh)		
NUTS and SEEDS (Tree nut, groundnut/peanut or certain seeds, or nut / seed "butters" or pastes)		
DAIRY products (Milk, cheese, yoghurt or other milk products but NOT including butter, ice cream, cream or sour cream)		
MEAT, POULTRY, FISH (Beef, pork, lamb, goat, chicken, fish, seafood, animal organs)		
EGGS from poultry or any other bird		
DARK GREEN leafy VEGETABLES (any medium to-dark green leafy vegetables, including wild / foraged leaves)		
DARK YELLOW or ORANGE FRUITS and VEGETABLES (mango, papaya, pumpkin, carrots, squash, orange sweet potatoes)		
other VEGETABLES (cucumber, eggplant, mushroom, onion, tomato, etc.)		
other FRUITS (avocado, apple, pineapple, etc.)		

SOIL HEALTH

For the soil assessment, choose a surface of the productive area that most reflects the average status of its soils.

Mark every category with a score comprised between 1 and 10 following examples.

INDICATORS	ESTABLISHED VALUE	CHARACTERISTICS	SCORE (from 1 to 10)
Structure	1	Loose, powdery soil without visible aggregates	
	3	Few aggregates that break with little pressure	
	5	Well-formed aggregates – difficult to break	
Compaction	1	Compacted soil, flag bends readily	
	3	Thin compacted layer, some restrictions to a penetrating wire	
	5	No compaction, flag can penetrate all the way into the soil	
Soil depth	1	Exposed subsoil	
	3	Thin superficial soil	
	5	Superficial soil (> 10 cm)	
Status of residues	1	Slowly decomposing organic residues	
	3	Presence of last year's decomposing residues	
	5	Residues in various stages of decomposition, most residues well-decomposed	
Color, odor, and organic matter	1	Pale, chemical odor, and no presence of humus	
	3	Light brown, odorless, and some presence of humus	
	5	Dark brown, fresh odor, and abundant humus	
Water retention (moisture level after irrigation or rain)	1	Dry soil, does not hold water	
	3	Limited moisture level available for short time	
	5	Reasonable moisture level for a reasonable period of time	
Soil cover	1	Bare soil	
	3	Less than 50% soil covered by residues or live cover	
	5	More than 50% soil covered by residues or live cover	
Erosion	1	Severe erosion, presence of small gullies	
	3	Evident, but low erosion signs	
	5	No visible signs of erosion	
Presence of invertebrates	1	No signs of invertebrate presence or activity	
	3	A few earthworms and arthropods present	
	5	Abundant presence of invertebrate organisms	
Microbiological activity	1	Very little effervescence after application of water peroxide	
	3	Light to medium effervescence	
	5	Abundant effervescence	

TAPE

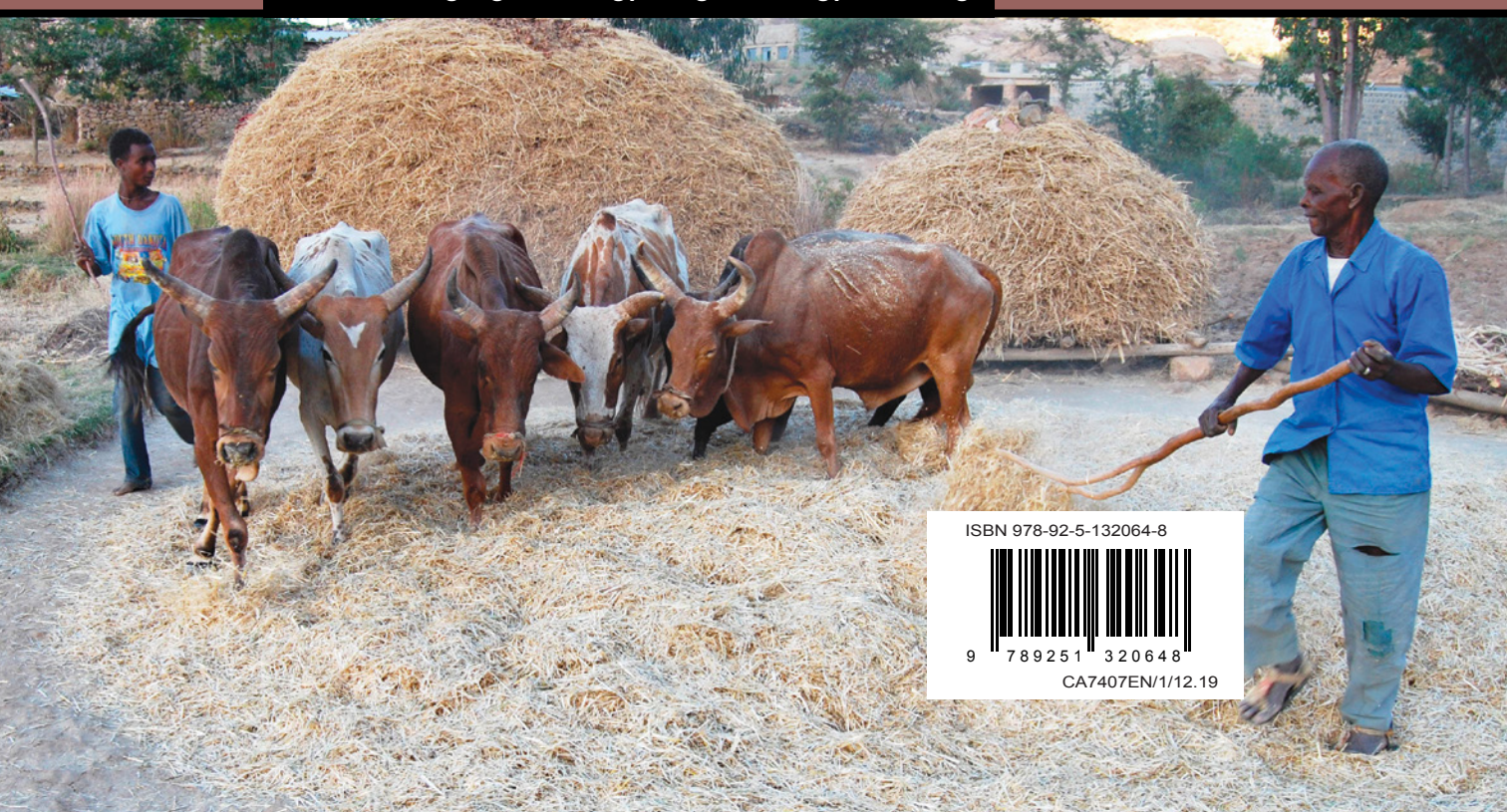
TOOL FOR AGROECOLOGY PERFORMANCE EVALUATION

PROCESS OF DEVELOPMENT AND GUIDELINES FOR APPLICATION

TEST VERSION

Agroecology has the potential to transform our food systems and make them more sustainable. It is generating growing political interest at national and international levels and harmonized evidence of its positive impact could support the transition. Developed via an extensive, multi-stakeholder participatory process, FAO's Tool for Agroecology Performance Evaluation (TAPE) aims to assess the multi-dimensional performance of agroecology in various contexts, territories and regions. This document explains how the tool was developed and what its underlying principles and methodological components are. It provides guidance on how to use TAPE to carry out a diagnostic of production systems, their agroecological transition and their contributions to various dimensions of sustainability. For more information, please contact agroecology@fao.org.

www.fao.org/agroecology | agroecology@fao.org



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