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Between Agroecology and Climate-Smart Agriculture: Where is the FAO heading?

A Study of FAO Agricultural Strategies in the Context of Climate Change and Food System Transformation

Bachelor's Degree Dissertation

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International Relations

May 2025

Abstract

In the context of growing environmental crises and the urgent need to transform food systems, this study analyzes how the Food and Agriculture Organization (FAO) projects position themselves between the paradigms of Agroecology (AE) and Climate-Smart Agriculture (CSA) as responds to food insecurity and climate change. Based on a structured analytical framework of ten indicators—covering ecological, socioeconomic and governance dimensions—it evaluates thirteen FAO projects to identify trends and orientations. The findings show that, although some projects incorporate agroecological practices, CSA-oriented approaches dominate, especially in areas related to economic models and governance. The study concludes that for FAO to effectively promote sustainable and just food systems, a more coherent and transformative commitment to agroecology is needed. Policy recommendations are provided to support participatory approaches and integrate food sovereignty more explicitly in project design and implementation.

Keywords: Agroecology (AE) Climate-Smart Agriculture (CSA), Food Security, Food Sovereignty, Climate Change, Food Systems, Food and Agriculture Organization of the United Nations (FAO), Participatory Governance.

Resum

En un context de crisi ambiental creixent i de necessitat urgent de transformar els sistemes alimentaris, aquest estudi analitza com els projectes de l'Organització de les Nacions Unides per a l'Alimentació (FAO) se situen entre els paradigmes de l'Agroecologia (AE) i l'Agricultura Climàticament Intel·ligent (CSA) com a resposta a la inseguretat alimentària i al canvi climàtic. A partir d'un marc analític estructurat amb deu indicadors—que incorporen dimensions ecològiques, socioeconòmiques i de governança—, s'avaluen tretze projectes de la FAO per identificar-ne tendències i orientacions. Els resultats mostren que, tot i que alguns projectes incorporen pràctiques agroecològiques, predominen els enfocaments orientats a la CSA, especialment en aspectes relacionats amb els models econòmics i la governança. L'estudi conclou que per promoure de manera efectiva sistemes alimentaris sostenibles i justos, la FAO necessita un compromís més coherent i transformador amb l'agroecologia. Finalment es presenten recomanacions per afavorir enfocaments participatius i integrar de manera més explícita la sobirania alimentària en el disseny i la implementació dels projectes.

Paraules clau: Agroecologia (AE), Agricultura Climàticament Intel·ligent (CSA), Seguretat Alimentària, Sobirania Alimentària, Canvi Climàtic, Sistemes Alimentaris, Organització de les Nacions Unides per a l'Alimentació i l'Agricultura (FAO), Governança Participativa.

Resumen:

En un contexto de crisis ambiental creciente y de necesidad urgente de transformar los sistemas alimentarios, este estudio analiza cómo los proyectos de la Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO) se posicionan entre los paradigmas de la Agroecología (AE) y la Agricultura Climáticamente Inteligente (CSA) como respuesta a la inseguridad alimentaria y al cambio climático. A partir de un marco analítico estructurado con diez indicadores —que abarcan dimensiones ecológicas, socioeconómicas y de gobernanza—, se evalúan trece proyectos de la FAO para identificar tendencias y orientaciones. Los resultados muestran que, aunque algunos proyectos incorporan prácticas agroecológicas, predominan los enfoques orientados a la CSA, especialmente en aspectos relacionados con los modelos económicos y la gobernanza. El estudio concluye que, para promover de manera efectiva sistemas alimentarios sostenibles y justos, la FAO necesita un compromiso más coherente y transformador con la agroecología. Finalmente se ofrecen recomendaciones para apoyar enfoques participativos e integrar de forma más explícita la soberanía alimentaria en el diseño e implementación de los proyectos.

Palabras clave: Agroecología (AE), Agricultura Climáticamente Inteligente (CSA), Seguridad Alimentaria, Soberanía Alimentaria, Cambio Climático, Sistemas Alimentarios, Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO), Gobernanza Participativa.

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1. Introduction: Agriculture, Climate Change and the search for sustainable food systems

The urgent need to transform food systems in the context of climate change has brought competing paradigms to the forefront of international debates. Agriculture today faces a dual challenge: it is both a significant contributor to environmental degradation and a sector highly vulnerable to the impacts of climate change (IPCC, 2019; FAO, 2021). How global institutions and national governments choose to address this challenge has profound implications not only for environmental outcomes but also for social justice, food access and rural livelihoods (HLPE, 2019).

Among the dominant frameworks emerging in response to the food-climate nexus are Climate-Smart Agriculture (CSA) and Agroecology (AE). While CSA focuses on technological innovation, productivity increases, and adaptation through efficiency, AE calls for a systemic transformation based on biodiversity, local knowledge and food sovereignty principles (Altieri et. al., 2015). The Food and Agriculture Organization (FAO) has increasingly referenced both frameworks, but the degree to which its projects embody transformative change remains contested.

This research examines how FAO projects position themselves along the CSA–AE continuum. It evaluates whether they reinforce conventional, market-centered models of development or support deeper agroecological transitions aligned with social and environmental justice goals.

In light of this focus, the study is guided by the following research question: To what extent do FAO projects promote agroecological principles over climate-smart approaches, and how does this alignment reflect broader tensions between food security and food sovereignty frameworks?

Based on this analysis, the study also aims to formulate recommendations to support FAO and its partner institutions in advancing more coherent and transformative agricultural strategies.

2. Understanding Food Systems

Food systems (FS) refer to the complex networks of actors and interconnected processes that transform raw materials from agriculture, forestry or fisheries into food products, delivering them from production through processing, distribution, consumption, and eventual disposal (FAO, 2018). While there are many small-scale food systems that serve local or regional populations, the past century has witnessed the rise of what some refer to as a global food system (León and Acín, 2015; Clapp, 2021; Puma et al., 2015; Gladek et al., 2016), linking different regions into an interdependent network.

This current global food system is dominated by a few large agribusiness and food distribution multinationals that operate under oligopolistic conditions (León and Acín, 2015). It relies on an agro-industrial production model, international trade in agri-food products and the standardization of diets worldwide. As a result, food supply chains increasingly depend on a limited range of processed and long-distance foods. In turn, reducing the consumption of fresh, local and seasonal products (León and Acín, 2015; Patel, 2013).

Over the past three decades, the global food system has strengthened its influence, pushing aside local food systems that are adapted to the specific characteristics of regions and cultures (ibid., 2015). This expansion has contributed to deepening inequalities. Despite producing enough food to feed the global population, the system fails to ensure equitable access: over 740 million people suffer from chronic hunger, while millions more experience obesity and diet-related health issues (FAO et al., 2024). This reflects the dual crises of malnutrition: undernutrition and overnutrition. These disparities are driven by factors such as unequal access to nutritious food, the promotion of processed and calorie-dense diets, and the concentration of wealth and power in the hands of a few corporations (León and Acín, 2015; Patel, 2013).

The consequences of this system extend beyond human health. It has triggered significant socioeconomic, cultural and environmental issues (see Annex I for further detail), including global food insecurity, which manifests in widespread hunger and malnutrition.

2.1. Climate Change and Agriculture

The agricultural sector is both a contributor to and a victim of climate change (IPCC, 2014). It ranks as the second-largest emitter globally after the energy sector, accounting for 11% of total emissions (OECD, 2023; Ge et al., 2024). This occurs primarily through methane (CH_4) from livestock and rice cultivation, nitrous oxide (N_2O) from synthetic fertilizers, and carbon dioxide (CO_2) from deforestation and land-use change (IPCC, 2021). Together with the rest of the food chain it is responsible for between 25-30% of global greenhouse gas emissions (Ritchie, 2021; Crippa et al., 2021).

Globally, agriculture occupies a substantial portion of the Earth's surface, covering approximately 38% of the total land area (FAO, 2021), and roughly half of the planet's habitable land (Gladek et al., 2016; Ritchie & Roser, 2019). It is also a major consumer of natural resources, using about 72% of freshwater withdrawals (FAO, 2023; UNESCO, 2024; World Bank, 2024).

At the same time, agriculture remains highly vulnerable to climate change, facing threats such as more frequent and intense extreme weather events, shifts in growing seasons and reduced water availability (FAO, 2020).

Faced with this dual role, international institutions have promoted various strategies to adapt and mitigate the agricultural sector's impacts. Climate-Smart Agriculture (CSA), introduced by the FAO in 2010, aims for a "triple win": increased productivity, enhanced resilience, and reduced emissions. CSA promotes technological innovations such as improved seed varieties, precision irrigation, climate insurance schemes and sustainable intensification techniques (FAO, 2013). However, CSA has been criticized for its technocratic approach, lack of attention to social inequalities, and potential for "greenwashing" industrial agriculture (Taylor, 2018; Rosén et al., 2018; Pimbert, 2017). Critics argue that CSA risks reinforcing the very structures that have made food systems environmentally and socially unsustainable.

In contrast, Agroecology (AE) offers a paradigm shift based on ecological principles, farmer-led innovation, and social equity (Altieri, 2018; Anderson et al., 2019). Agroecology proposes diversified farming systems, local governance of natural resources, and solidarity economies, seeking not merely to adapt existing models but to transform them. Thus, while CSA and AE both respond to the challenges posed by climate change, they embody different visions of agricultural development and food system governance (See Annex II for further detail).

2.2. Competing Food System Frameworks: Food Security vs. Food Sovereignty

The divergence between CSA and AE reflects deeper political debates about the future of food systems, particularly the competing frameworks of food security and food sovereignty. Food security, as defined by the FAO in 1996, refers to ensuring that all people have physical and economic access to sufficient, safe, and nutritious food. Rooted in a technocratic and market-oriented perspective, food security approaches often prioritize productivity increases, market integration, and food availability without addressing who controls production or distribution (Patel, 2009).

By contrast, food sovereignty, introduced by La Vía Campesina in 1996, emphasizes the right of peoples to define their own food systems, control natural resources, and prioritize local, culturally appropriate, and ecologically sustainable production (Nyéléni, 2007). Food sovereignty reframes food as a human right embedded in social and ecological relations, not merely an economic commodity.

Although CSA and AE are not direct institutional embodiments of these frameworks, they can be interpreted as policy responses that resonate with the underlying logics of food security and food sovereignty, respectively. CSA strategies tend to align with food security approaches emphasizing adaptation and productivity, while agroecology reflects the transformative aspirations embedded in food sovereignty movements. This conceptual framing provides the analytical foundation for assessing how FAO projects operationalize agricultural adaptation in the context of climate change.

As FAO engages with both CSA and agroecology, understanding the extent to which its projects align with either approach is crucial. This study examines whether FAO's agricultural initiatives primarily adopt CSA's productivity-driven framework or incorporate agroecological principles that promote food sovereignty.

3. Methodological and analytical framework

This research analyzes a selection of FAO projects using a qualitative and semi-quantitative methodology based on a structured scoring system. The objective is to assess to what extent these projects incorporate the principles of agroecology (AE) or align more closely with the logic of Climate-Smart Agriculture (CSA). The methodology is designed to move beyond simplistic labels and to pay close attention to how projects are implemented, who drives them, and what forms of knowledge and power they promote.

This approach has also been informed, in part, by the work of Paula Vicente (2024), whose undergraduate thesis analyzed FAO projects through the lens of food sovereignty and technological sovereignty. Her research offered valuable insights at the outset of this work and contributed to the development of the present work's methodological perspective.

The analysis is based on ten concrete indicators, grouped into four broad categories:

1. **Ecological sustainability**
    a. Biodiversity & soil health
    b. Climate resilience
    c. Environmental sustainability practices
2. **Socioeconomic resilience**
    a. Farmer participation & knowledge
    b. Market integration
    c. Economic model
3. **Resource management**
    a. Water & resource management
    b. Input intensity and type
4. **Innovation and productivity**
    a. Type of innovation
    b. Productivity strategies

3.1. Scoring process

Each project is reviewed based on available documentation, including project reports, technical briefs and relevant FAO web content. The assessment is conducted using ten indicators developed by the author, each of which is scored **on a scale from 1 to 5**, using whole numbers only. These scores are accompanied by qualitative justifications that explain the reasoning behind each rating.

The scoring reflects the degree to which a project aligns with the principles of **Climate-Smart Agriculture (CSA)**, **Agroecology (AE)**, or a **hybrid** of both approaches:

- A score of **1** indicates strong alignment with CSA principles, typically characterized by top-down, technical interventions and a reliance on external inputs.
- A score of **5** reflects strong alignment with agroecological principles, such as farmer-led innovation, ecological regeneration, and local knowledge systems.
- A score of **3** generally represents a hybrid approach, combining elements from both paradigms.

After scoring all ten indicators, a **total score** (maximum of 50) and an **average score** (between 1.0 and 5.0) are calculated for each project. The **average score** is then used to assign the project to one of five categories:

- 1–1.9: Strongly CSA-aligned
- 2–2.9: CSA-oriented
- 3–3.9: Hybrid
- 4–4.4: AE-oriented
- 4.5–5: Strongly AE-aligned

It is important to note that the classification is not rigid. Projects often include elements from multiple approaches, and categories may be adjusted as patterns and exceptions emerge through comparative analysis. For instance, the presence of biodiversity or farmer training does not automatically qualify a project as agroecological; what matters is how those elements are implemented—whether they are community-led and system-transforming or expert-driven and technocratic.

This scoring system is used inductively but reflexively, meaning that as more projects are analyzed, the criteria and interpretations may evolve to account for edge cases or emerging insights. The goal is not to force projects into fixed categories, but to use these classifications as analytical tools for critical comparison and policy reflection.

The scoring table used in this process is presented in Table 1. A more concrete definition of each indicator can be found in Annex III.

Table 1: Scoring table with indicators

Broad category	Indicator	CSA (Score 1)	Hybrid (Score 2-4)	AE (Score 5)
Ecological sustainability	Biodiversity and soil health (Are multiple crops promoted? Is soil managed ecologically?)	Mainly monoculture systems or simplified rotations; yield-focused. Soil managed with synthetic inputs; biodiversity not prioritized.	Some agroforestry but includes external inputs	Agroforestry, organic matter, diversified crops
	Climate resilience (Are local adaptation strategies or diverse crops part of the plan?)	Tech and improved crop varieties. Top-down technologies (e.g., stress-tolerant seeds, irrigation systems); limited local knowledge integration.	Mix of technological and ecological practices for adaptation.	Farmer-led adaptation using local knowledge, diversification, seed saving
	Environmental practices (Is there mention of pollution, carbon, or regenerative practices?)	Focus on emissions reduction or pollution control through tech (e.g., carbon tracking, fertilizer efficiency); no ecosystem regeneration.	Combination of emissions control with some regenerative practices (e.g., agroforestry)	Closed-loop nutrient cycles, minimal external inputs, ecosystem regeneration focus
Socioeconomic resilience	Farmer participation and knowledge (Are farmers co-creators or just recipients?)	Farmers receive training but are not involved in planning; passive participants (e.g., data collectors, recipients of aid). Top-down, expert driven solutions.	Consultative participation and combined knowledge systems	Farmer-led innovation, participatory research, and co-design
	Market integration (Does the project emphasize local, regional, or export markets?)	Priority to export or global markets; value chain integration without supporting local food systems	Integrated into mixed local and global markets; some cooperative elements	Support for local food systems, short value chains, cooperative/fair trade
	Economic model	Industrial, input-intensive,	Mixed market strategies, some	Solidarity economy,

	(Is the approach capital-intensive or cooperative/local economy- oriented?)	capital- driven productivity approach	eco-certification or premium markets	subsistence + local sale, community investment
Resource management and inputs	Water and resource management (Who manages water? What methods are used?)	Water controlled by centralized systems; high-tech irrigation and pricing strategies; lacks community input.	Mixed approaches: efficiency + conservation; some local input	Community-based management, traditional knowledge, watershed focus
	Input intensity and type (Are synthetic inputs dominant, reduced, or replaced?)	Dominated by synthetic inputs (fertilizers, pesticides); focus on efficient use rather than ecological alternatives.	Partial reliance on inputs with some ecological alternatives (e.g., IPM, compost)	Low to no external inputs; uses composting, green manure, biological control
Innovation and technology	Type of innovation (Is innovation top-down or community-driven?)	Innovation led by external experts or companies; emphasizes digital tools, biotech, or mechanization.	Locally adapted technologies; innovation shared across actors	Grassroots innovation; traditional practices adapted to new contexts
	Productivity strategies (Is the focus on yield alone or on diversification/resilience?)	Yield maximization via intensification; minimal focus on resilience or diversification.	Balance of yield, diversification and resilience	Focus on diverse systems and stable productivity under stress

Source: Own elaboration based on the authors cited in Annex II.

3.2. Case selection

The cases analyzed in this study were selected from the FAO Project Directory, an online platform that provides publicly available information about FAO's global initiatives. The initial pool consisted of over 115 projects. A multi-step filtering process was applied to narrow down the cases based on thematic relevance and data availability.

The first filter excluded projects not directly related to agriculture or food systems (e.g., those focused solely on fisheries, forestry or livestock). Next, projects were assessed for relevance to climate change and agricultural practices. Only those that explicitly mentioned adaptation, mitigation, resilience, or sustainability in the agricultural context were retained.

Further exclusion criteria included the availability and accessibility of documentation. Projects with insufficient public information, non-functional links, or documents available only in languages not spoken by the researcher (primarily French) were discarded. This process ultimately led to a final sample of 13 projects (See Annex X), which form the basis of the analysis.

The goal was not to achieve a statistically representative sample but to ensure thematic coherence and analytical depth across a set of cases that reflect FAO's practical engagement with food systems, climate change and agricultural models.

3.3. Limitations

This research faces some limitations. First, the availability and quality of information significantly shaped the case selection process. Many FAO projects lacked detailed documentation or included only basic summaries. In several instances, web links were inactive and some project documents were available only in languages not accessible to the researcher, which led to the exclusion of potentially relevant cases.

Second, each project presents its information in a different format, with varying levels of detail, structure and terminology. This lack of standardization complicated the application of the analytical framework and made it difficult to compare projects on equal terms. Some reports were extensive and included clear environmental and social components, while others provided limited insight into project design or outcomes.

Third, while the scoring system offers a structured approach to comparison, it remains interpretative. Each indicator's rating depends on qualitative judgments drawn from project descriptions, which may not always offer clarity or nuance needed for precise categorization. Therefore, the resulting scores should be understood as indicative rather than conclusive.

A further limitation is the conceptual ambiguity surrounding Climate-Smart Agriculture (CSA). As various scholars have noted (Pimbert, 2017; Taylor, 2018), CSA functions more as a flexible policy framework rather than a defined set of practices. Its vagueness complicates efforts to distinguish it from agroecology in practice, particularly when projects contain overlapping elements.

4. Analysis and discussion

This section presents the results of the analysis of FAO projects based on the scoring system developed in the methodological framework. To capture the complexity and nuances of project approaches, the results are organized into three analytical levels:

Indicator-level analysis: First, each of the ten indicators is analyzed independently. Projects were assigned a score between 1 and 5 for each indicator, reflecting their degree of alignment with Climate-Smart Agriculture (CSA), Agroecology (AE), or hybrid approaches. For every indicator, the distribution of project scores is presented using pie charts, followed by a qualitative interpretation. This level of analysis reveals which specific dimensions are more or less aligned with agroecological principles.

Broad category-level analysis: Second, the indicators are grouped into four broad categories: Ecological Sustainability, Socioeconomic Resilience, Resource Management and Innovation and Productivity. For each category, the average score across its corresponding indicators is calculated. This aggregation provides insights into broader trends within FAO projects, identifying which dimensions show stronger or weaker engagement with transformative agricultural models. The results are presented using a box and whisker plot and discussed qualitatively.

Project-level classification: Finally, an overall score for each project is obtained by calculating the average across all ten indicators. Based on this average, each project is classified into one of these five categories:

- Strongly CSA-aligned (1.0-1.9)
- CSA-oriented (2.0-2.9)
- Hybrid (3.0–3.9)
- AE-oriented (4.0-4-4)
- Strongly AE-aligned (4.5-5-0)

This project-level classification allows for a general overview of FAO's agricultural strategies, highlighting the extent to which projects lean towards CSA, AE or hybrid models.

By presenting the results at these three levels (indicator, category and project), the analysis aims to provide both detailed and systemic insights into the agricultural transformations promoted by the FAO, their internal tensions, and their implications for food sovereignty and climate adaptation.

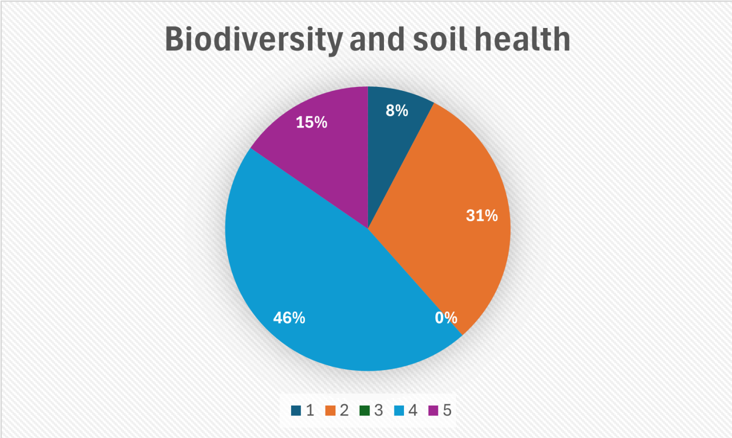
4.1. Analysis per indicator

Given space limitations, this section focuses on a selection of four key indicators that revealed particularly significant trends, divergences, or tensions between agroecological and climate-smart approaches. These indicators are: Biodiversity and Soil Health, Water and Resource Management, Farmer Participation and Knowledge, and Economic Model. They reflect critical dimensions where FAO projects exhibit notable variation in their alignment with agroecological principles. The full scoring results for all ten indicators are available in Annex IX.

Biodiversity and Soil health

This indicator evaluates whether projects promote diversified cropping systems, agroforestry, soil regeneration practices and ecological soil management. High scores reflect projects that actively foster biodiversity and soil health through agroecological approaches, while low scores reflect monoculture systems and reliance on synthetic inputs.

Figure 1: Distribution of project scores for the Biodiversity and Soil Health indicator.



Source: Own elaboration based on the information of the analysed projects

The distribution of scores indicates a general tendency toward agroecological alignment in biodiversity and soil health practices. Nearly half of the projects (46%) scored 4, suggesting a strong integration of diversified farming systems, agroforestry practices and ecological soil management techniques. An additional 15% of projects achieved the highest score of 5, demonstrating a deep application of agroecological principles.

However, 31% of the projects scored 2, signaling that although biodiversity and soil health are recognized, they are often addressed in more conventional or technocratic ways, without a full agroecological transition. Only one project (8%) scored 1, indicating a clear dominance of monoculture approaches and synthetic input use. Notably, no projects scored as 3, suggesting a limited presence of hybrid models that balance both CSA and AE elements in this dimension.

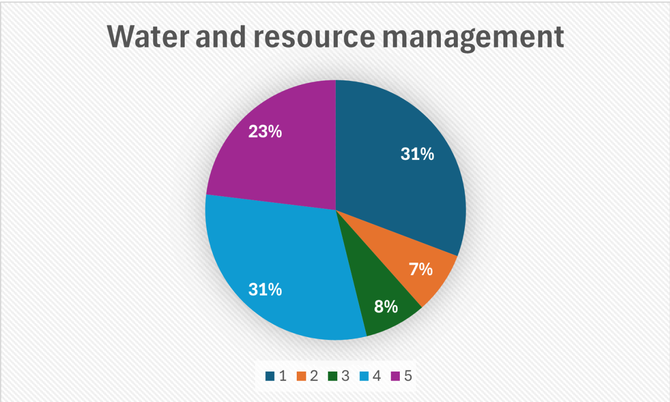
Overall, biodiversity and soil health emerges as one of the stronger dimensions in terms of agroecological orientation within FAO projects, although significant variability remains across cases.

Water and Resource Management

This indicator assesses how projects manage natural resources, particularly water and soil. Agroecological approaches prioritize community-led management, conservation practices, and decentralized systems (e.g., rainwater harvesting, participatory watershed management), while CSA strategies often promote efficiency-focused technologies and large-scale infrastructure projects (e.g., drip irrigation, reservoirs).

The scores for this indicator are highly polarized, with projects clustering either at the lower or higher ends of the scale. Around half of the projects promote centralized, efficiency-driven technologies aligned with CSA strategies, while the other half emphasize community-led conservation and decentralized natural resource management. For example, some projects integrate participatory watershed management or traditional rainwater harvesting methods. This division highlights deep inconsistencies across FAO initiatives regarding sustainable resource governance and raises questions about who controls access to and decision-making over water and land resources.

Figure 2: Distribution of project scores for the Water and Resource Management indicator



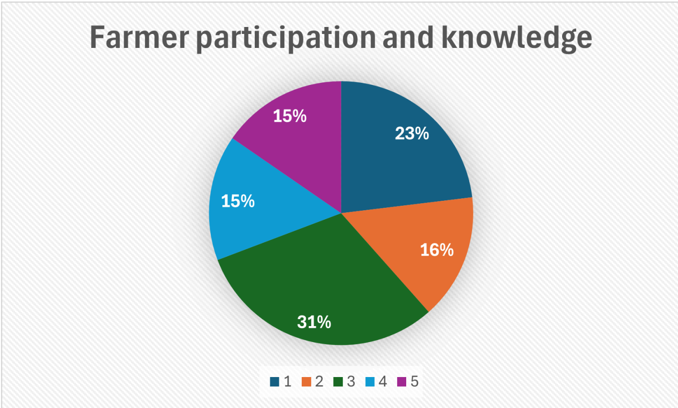
Source: Own elaboration based on the information of the analysed projects

Farmer Participation and Knowledge

This indicator measures the degree to which farmers are actively involved in co-creating and transmitting agricultural knowledge. Agroecological approaches emphasize participatory, horizontal exchanges (e.g., farmer-to-farmer learning, community research), while CSA strategies typically involve top-down technical assistance delivered by experts or external organizations.

The results reveal a predominance of hybrid approaches in farmer participation. While some projects score highly by promoting horizontal knowledge exchanges and farmer-led research, the majority combine participatory rhetoric with continued top-down technical assistance models. Training is often delivered by external experts with limited farmer input in the design phase. This suggests that while participation is increasingly valued in discourse, it is not fully embedded in project design and implementation. Farmer empowerment thus remains a partially achieved and unevenly operationalized goal within the analyzed projects.

Figure 3: Distribution of project scores for the Farmer Participation and Knowledge indicator.



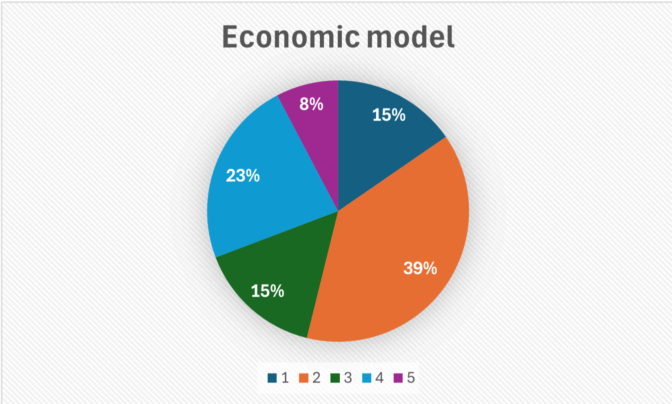
Source: Own elaboration based on the information of the analysed projects

Economic model

This indicator evaluates the type of agricultural economic model promoted by projects. Agroecological approaches support solidarity economies, cooperative structures, and self-sufficiency (e.g., farmer cooperatives, local processing), while CSA strategies often emphasize productivity, integration into value chains, and the promotion of agribusiness or competitive market participation.

These scores remain among the lowest across all indicators. Most projects continue to emphasize integration into competitive value chains and productivity-driven approaches, including contract farming and linkage to export markets. Only a minority promote solidarity economies, cooperatives, or local self-sufficiency models such as community-based processing or seed exchanges. This pattern reflects significant structural barriers to advancing agroecological economic alternatives within FAO initiatives and suggests that economic dimensions remain a major point of tension between CSA-aligned development logics and transformative agroecological frameworks.

Figure 4: Distribution of project scores for the Economic Model indicator.



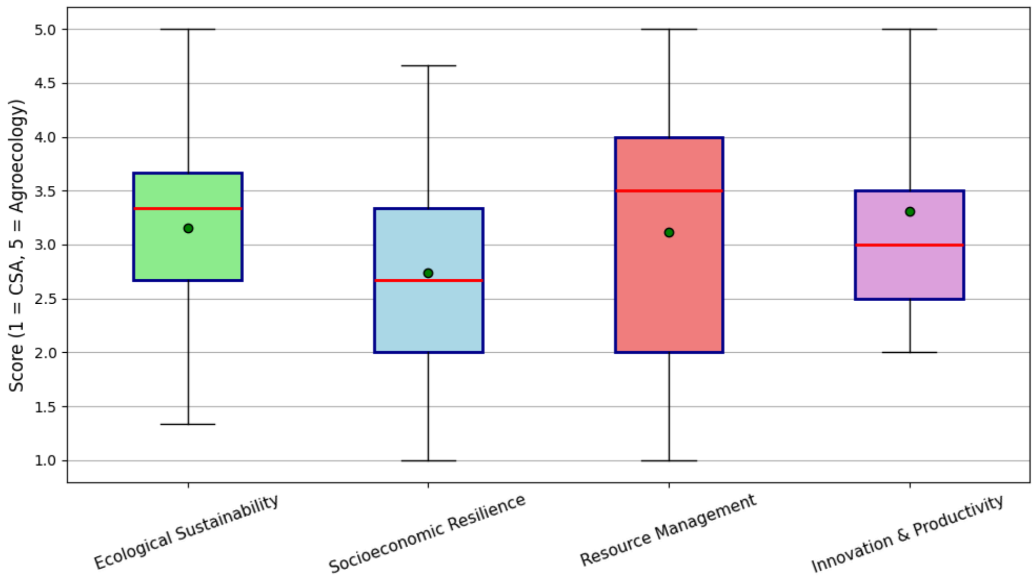
Source: Own elaboration based on the information of the analysed projects

4.2. Trends by broad category

This section synthesizes the results by grouping the ten indicators into four broad analytical categories: Ecological Sustainability, Socioeconomic Resilience, Resource Management, and Innovation and Productivity.

By examining average scores within each category, broader trends and patterns emerge, offering a more systemic understanding of how FAO projects align with agroecological principles, Climate-Smart Agriculture (CSA) strategies, or hybrid approaches across different dimensions of agricultural transformation.

Figure 5: Distribution of project scores by broad category.



Source: Own elaboration based on the information of the analysed projects

The distribution of project scores across the four broad categories reveals important differences in the degree of agroecological orientation. Ecological Sustainability and Innovation & Productivity show relatively higher median and mean scores, around 3.5, indicating a moderate tendency toward agroecological practices. However, both categories also display a considerable spread, with projects ranging from CSA-oriented approaches to strong agroecological alignment, suggesting internal variability in implementation strategies.

Socioeconomic Resilience presents a lower median and mean, approximately 2.7, reflecting a stronger prevalence of CSA-oriented and hybrid models. This suggests that, while some initiatives incorporate elements of solidarity economies and farmer participation, many projects still prioritize market-based frameworks. Resource Management is the most polarized category, with project scores covering almost the entire scoring range from 1.0 to 5.0. This dispersion highlights fundamental tensions between technological, efficiency-driven approaches and decentralized, community-led conservation strategies.

Overall, while agroecological elements are increasingly present in several dimensions, the heterogeneity of scores across and within categories illustrates that systemic agroecological transitions remain partial and uneven across the analyzed projects.

4.3. Overall project-level classification

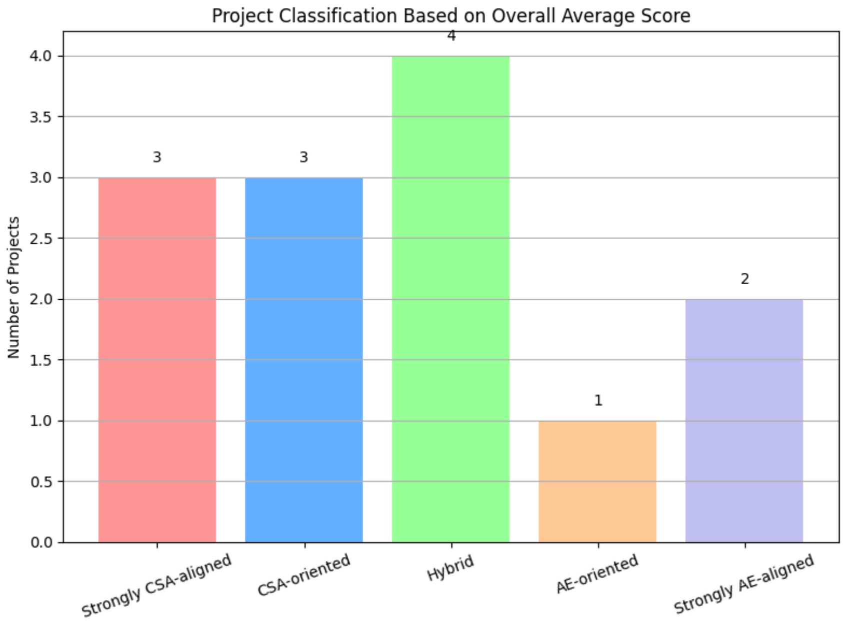
To complement the analysis of trends by broad categories, this section classifies each project based on its overall average score across all ten indicators. This classification captures the dominant orientation of each project, whether aligned more closely with Climate-Smart Agriculture (CSA), Agroecology (AE), or a hybrid model combining elements of both.

Projects were classified according to the following scoring intervals:

- 1.0 – 1.9: Strongly CSA-aligned
- 2.0 – 2.9: CSA-oriented
- 3.0 – 3.9: Hybrid
- 4.0 – 4.4: AE-oriented
- 4.5 – 5.0: Strongly AE-aligned

The following figure summarizes the distribution of project classifications.

Figure 6: Project classification based on overall average score across ten indicators.



Source: Author's elaboration based on FAO project data.

The classification of projects based on their overall average score reveals a heterogeneous distribution of orientations along the CSA–AE continuum. Out of the 13 projects analyzed, four (approximately 31%) were classified as Hybrid, combining elements of both Climate-Smart Agriculture and Agroecology. Three projects (23%) were classified as CSA-oriented and another three (23%) as strongly CSA-aligned, indicating that nearly half of the projects maintain a conventional adaptation and mitigation approach.

Conversely, only one project (8%) was categorized as AE-oriented, and two projects (15%) achieved a classification of strongly AE-aligned. This suggests that deep agroecological transformations remain relatively limited within the analyzed sample. Overall, while hybrid strategies are the most common, a significant proportion of projects still lean more closely toward CSA frameworks rather than fully embracing agroecological principles.

4.4. Discussion: Reflections and key tensions

The following discussion seeks to move beyond the quantitative classification presented above by engaging in a qualitative reflection on the practices, orientations and contradictions observed across the analyzed projects. By highlighting specific initiatives and concrete interventions, this section aims to deepen the understanding of how agroecological or

CSA-aligned approaches are operationalized in practice, and to identify structural patterns, tensions, and opportunities for systemic transformation within FAO's project portfolio.

4.4.1. Strong agroecological practices

Among the projects analyzed, a few stand out for their strong and explicit promotion of agroecological principles through specific interventions and field-level practices.

The “Kagera Transboundary Agro-Ecosystem Management Project (TAMP)” focused on the rehabilitation of degraded lands through concrete ecosystem-based interventions such as the establishment of tree nurseries, agroforestry systems, soil bund construction to prevent erosion, and participatory rangeland management. The project emphasized direct farmer participation through Farmer Field Schools, enabling smallholders to adopt mixed farming systems combining crops, livestock, and agroforestry species adapted to local conditions, while promoting traditional seed use and local soil fertility management techniques.

Similarly, the “Accenting Culture in Agriculture” initiative, operating within the GIAHS framework, preserved and revitalized traditional agricultural systems such as the Qochas in Peru (pre-Hispanic water harvesting systems), the underground aquifers of North African oases (Foggaras and Khettaras), and multi-layered agroforestry home gardens in Southeast Asia. Rather than replacing these systems with new technologies, the project documented, restored, and supported them as living heritage, combining conservation of biodiversity with food sovereignty strategies rooted in cultural practices.

Nevertheless, such initiatives remain exceptions rather than the norm within the FAO’s broader operational landscape.

4.4.2. CSA trends

Several projects demonstrated a strong alignment with Climate-Smart Agriculture (CSA) approaches by prioritizing technological solutions, productivity gains and integration into formal market systems over ecological regeneration or farmer-led adaptation. The FAO “Contract Farming” initiative centered on boosting productivity of specific cash crops through provision of improved seeds, fertilizers, and irrigation systems, typically organized around buyer-driven contracts. This model emphasized monoculture production, input intensification, and compliance with market standards, while largely sidelining practices such as crop diversification or participatory resource management.

Similarly, the “Global Partnership Initiative for Plant Breeding Capacity Building (GIPB)” heavily focused on developing drought and pest-tolerant crop varieties through advanced breeding techniques. Climate resilience in this case was approached through top-down scientific innovation, with farmers mainly positioned as end-users rather than co-creators of resilient systems. There was no systematic promotion of traditional seed systems, diversified cropping, or farmer-led breeding, reinforcing a technologically driven adaptation model.

Overall, these CSA-oriented projects prioritized efficiency, risk management and market competitiveness through technological and organizational innovations. However, they fell short of advancing principles such as diversity or farmer autonomy.

4.4.3. Internal tensions and Hybrid projects

Many projects revealed internal contradictions. For example, while some emphasized community participation discursively, the actual implementation relied on top-down technical training modules. Similarly, efforts to promote "market access" often prioritized global value chains over local food systems, undermining food sovereignty objectives.

Within the “E-Agriculture Strategy Guide”, despite its references to empowering farmers through information access, the actual digital interventions reinforced a top-down extension model, where expert-driven advice, input packages and market connectivity were prioritized over strengthening local innovation systems or farmer-to-farmer knowledge sharing.

Beyond internal contradictions, many projects demonstrated a broader pattern of hybridization, combining agroecological and CSA-oriented elements in different dimensions. Agroecological principles tended to be more visible in the ecological sustainability aspects of projects, such as the promotion of diversified farming systems, soil restoration techniques, and ecosystem-based approaches to land management. However, when addressing socioeconomic resilience and resource management, projects often reverted to CSA frameworks centered on technological solutions, input optimization, market integration and insurance schemes.

This fragmented adoption suggests that while FAO initiatives increasingly recognize the ecological foundations of agroecology, they often fall short of embracing its social, economic, and political dimensions. As a result, agroecological practices are integrated at the farm and ecosystem level, but broader systemic transformations—such as reconfiguring market relations, empowering local governance, or challenging input dependencies—remain marginal.

5. Recommendations

Based on the findings of this study, it is evident that while agroecological principles are increasingly recognized within FAO projects, their implementation remains partial and uneven. To promote systemic agroecological transitions, it is necessary to go beyond ecological practices at the farm level and address the socioeconomic, institutional, and political dimensions that sustain conventional agricultural models. The following recommendations aim to support FAO and partner institutions in advancing more integrated, coherent, and transformative approaches to food systems.

5.1. Project Design and Implementation

Promote genuine co-creation and participatory processes from design to implementation. Many projects analyzed emphasized community participation rhetorically but relied on top-down technical solutions in practice. To genuinely integrate agroecological principles, FAO should establish mechanisms that ensure farmers and local communities are engaged as equal partners from project conception through monitoring and evaluation. Approaches such as participatory action research, farmer-to-farmer learning exchanges, and local innovation platforms should be systematically integrated. The “KORE” platform offers a strong example here: it elevates local expertise by documenting farmer-led innovations and actively including communities in designing resilience activities. This model of co-creation—where communities are not just consulted but empowered to lead—should serve as a blueprint across FAO projects.

Prioritize local markets and solidarity economies. To avoid reinforcing dependence on volatile global value chains, projects should promote economic models that strengthen local and regional food systems. “KORE’s” support for home-grown school feeding programs, which link smallholder farmers directly to local institutions, demonstrates how short value chains can simultaneously boost livelihoods and community nutrition. Similar efforts to build cooperatives, communal processing units, and fair local procurement mechanisms should be prioritized to advance food sovereignty alongside resilience.

5.2. Monitoring and Evaluation

Standardize project reporting to enhance transparency and comparability. One of the main limitations encountered in this study was the diversity of project formats and information depth. FAO should develop more standardized reporting templates that allow for evaluation across agroecological dimensions, including social equity, biodiversity, knowledge co-creation, and energy use—not just productivity and emissions.

Include agroecological indicators in evaluation frameworks. Current monitoring systems prioritize quantifiable outputs (e.g., yields, income) but overlook transformative outcomes such as empowerment, governance, or ecological regeneration. FAO should expand its monitoring systems to include qualitative indicators aligned with agroecology's multidimensional nature.

6. Conclusion

This study has examined how FAO projects navigate the continuum between Climate-Smart Agriculture and Agroecology, using a three-level analytical framework encompassing indicators, broad categories, and overall project classification. The findings reveal a complex landscape marked by partial integration of agroecological principles—most consistently in ecological practices—alongside continued reliance on CSA-oriented strategies in economic and governance dimensions. Many initiatives operate within hybrid models, combining rhetorical commitments to participation and sustainability with technocratic, productivity-focused interventions.

These patterns reflect deeper tensions between the paradigms of food security and food sovereignty. While the former remains dominant in institutional frameworks, emphasizing availability, efficiency, and market integration, the latter calls for a more transformative approach—centering farmers' rights, ecological justice, and democratic control over food systems. The coexistence of CSA and AE within FAO programming illustrates how climate adaptation can serve as an avenue for either reinforcing or challenging the status quo.

Agroecology, in this context, represents more than a toolkit; it is a framework for systemic change. For FAO to meaningfully support agroecological transitions, it must move beyond selective integration of ecological techniques and address the structural, economic, and political drivers of unsustainable agriculture. This involves confronting entrenched power relations and institutional inertia, and requires a long-term commitment to equity, plurality, and ecological justice in food systems.

Ultimately, the question is not only how agriculture adapts to climate change, but what kind of food systems are being built in the process. If the FAO seeks to support just and resilient futures, it must go beyond and embrace agroecology as a transformative pathway toward food sovereignty.

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8. Annexes

Annex I - The Global Food System

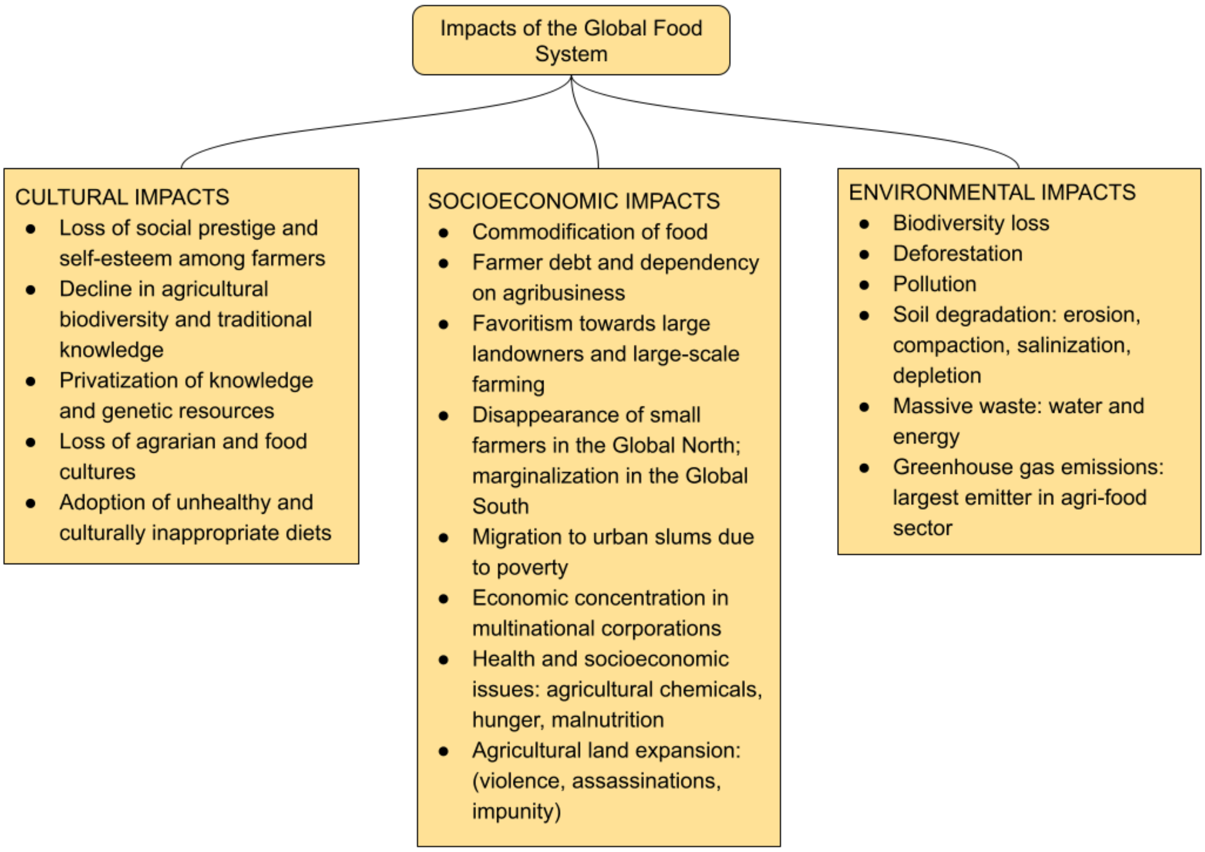


Figure 7: Mind map of the impacts of the global food system. Own elaboration based on León, A. P., & Acín, G. T. (*Ja volem el pa sencer,* 2015). Created by the author via *Google Drawings.*

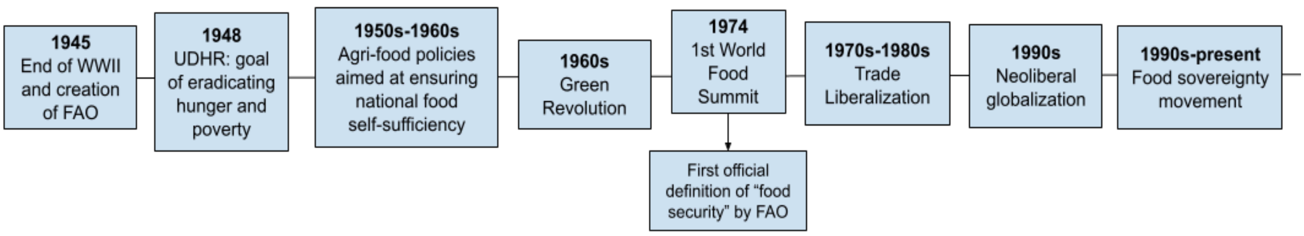


Figure 8: Timeline. Own elaboration based on León, A. P., & Acín, G. T. (*Ja volem el pa sencer,* 2015). Created by the author via *Google Drawings.*

Annex II - Comparative framework - Climate-Smart Agriculture (CSA) vs. Agroecology (AE)

	Climate-Smart Agriculture	**Agroecology**	**Sources**
Main objectives	Increase productivity, enhance resilience, and reduce greenhouse gas (GHG) emissions (*triple-win approach*)	Transform food systems through ecological principles and social justice	FAO (2013); Altieri et al. (2015); Pimbert (2017); Taylor (2018); Anderson et al. (2019)
Approach to climate change	Focuses on efficiency (e.g., improved seeds, precision agriculture, carbon sequestration)	Promotes biodiversity, ecosystem-based adaptation, and local knowledge	FAO (2010); Taylor (2018); Wezel et al. (2009). Anderson et al. (2019); Pimbert (2017)
Role of technology	Promotes high-tech solutions (e.g., drought-resistant seeds, digital farming)	Encourages low-input, farmer-led innovations adapted to local contexts	Pimbert (2017); Anderson et al. (2019); Azadi et al. (2021)
Knowledge system	Top-down, expert-driven (scientific research, agribusiness-led R&D)	Bottom-up, participatory (farmer-to-farmer exchange, co-creation of knowledge)	Anderson et al. (2019); Azadi et al. (2021); Taylor (2018)
Implementation strategies	Market-based, promotes integration into global value chains	Prioritizes local food systems, short supply chains, and food sovereignty	Pimbert (2017); Taylor (2018); Anderson et al. (2019)
Role of external inputs	Encourages climate-resilient inputs (fertilizers, pesticides, hybrid seeds)	Reduces dependence on external inputs, promotes organic and traditional farming	FAO (2013); Pimbert (2017); Borras and Franco (2018).
Actors involved	International organizations (FAO, World Bank, CGIAR), agribusiness, governments, Global Alliance for Climate-smart Agriculture (GACSA)	Small-scale farmers, local communities, social movements (La Vía Campesina)	Taylor (2018); Pimbert (2017); La Vía Campesina (2015); FAO (2013)
Impact on food	Often prioritizes food	Empowers farmers to	Anderson et al.

sovereignty	security over sovereignty, integrates smallholders into markets.	control their own food systems, promotes local autonomy	(2019); Pimbert (2017); Azadi et al. (2021)
Equity and power relations	Criticized for neglecting power asymmetries, can reinforce agribusiness dominance	Challenges corporate control, seeks to redistribute power to local communities	Taylor (2018); Pimbert (2017); Rosén et al. (2018); Borras and Franco (2018)
Economic model	Focuses on integrating farmers into global markets and value chains	Promotes local economies, circular food systems and diversified market outlets	Pimbert (2017); Taylor (2018); Azadi et al. (2021); Borras and Franco (2018)

Source: Own elaboration based on the authors cited throughout the table.

Annex III - Definition of Indicators

Indicator	**Definition**
1. Biodiversity & soil health	Refers to the integration of diverse crops, livestock, and soil organisms to enhance ecosystem services. AE emphasizes polycultures and organic matter; CSA may rely on technological soil amendments or GMOs for productivity.
2. Climate resilience	Measures the capacity of systems to adapt to climate stress. AE favors farmer-led, traditional knowledge systems (e.g., landraces, terraces), while CSA emphasizes engineered solutions like insurance and drought-tolerant hybrids.
3. Environmental sustainability practices	Practices that promote long-term ecological balance. AE prioritizes closed-loop systems and agroforestry; CSA includes carbon markets, sequestration projects, or pollution control technologies.
4. Farmer participation & knowledge	Degree to which farmers co-create and transmit knowledge. AE is participatory, emphasizing horizontal exchanges; CSA often involves top-down technical assistance.
5. Market integration	How projects support livelihoods and economic inclusion. AE promotes smallholder-driven local markets and fair trade; CSA integrates farmers into value chains, possibly increasing dependency on external inputs.

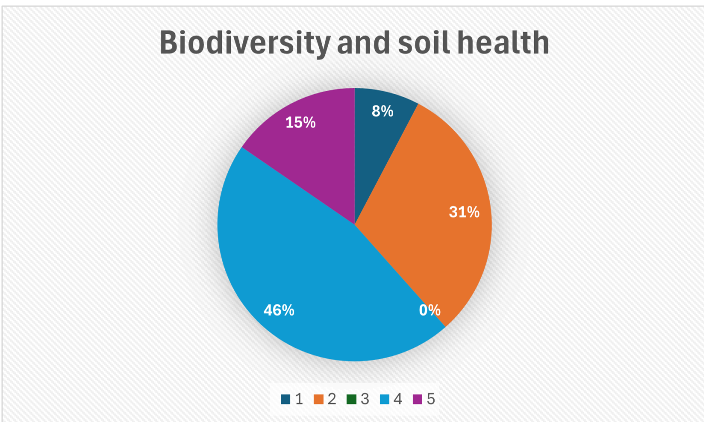
6. Economic model	Evaluates the type of agricultural economic model promoted. Agroecological approaches support solidarity economies, cooperative structures, and self-sufficiency (e.g., farmer cooperatives, local processing), while CSA strategies emphasize productivity, integration into value chains, and the promotion of agribusiness or competitive market participation.
7. Water and resource management	Analyzes the governance and sustainability of water and other natural resources. AE emphasizes community-managed, ecosystem-based practices; CSA often uses precision technologies and pricing mechanisms.
8. Input intensity & type	Focuses on the type and degree of dependency on external inputs. AE reduces chemical and fossil-based inputs; CSA seeks "efficient" synthetic input use and bioenergy expansion.
9. Type of innovation	Describes the type of innovation fostered. AE encourages traditional knowledge-based innovations (e.g., intercropping, agroforestry); CSA promotes tech-intensive solutions like mechanization.
10. Productivity strategies	The underlying logic of how productivity is pursued. AE centers on diversity and ecological synergy; CSA aims to increase yields through intensification, often via high-tech or monoculture models.

Source: Own elaboration based on the authors cited in Annex II.

Annex IV - Pie charts of the 10 individual indicators

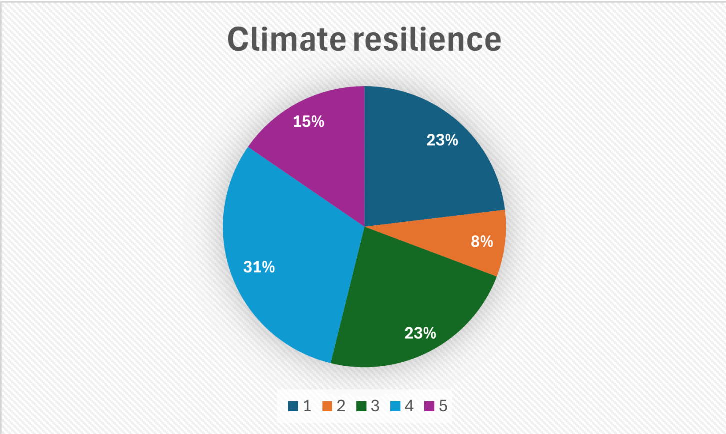
Ecological Sustainability

Figure A1: Distribution of project scores for the Biodiversity and Soil Health indicator.



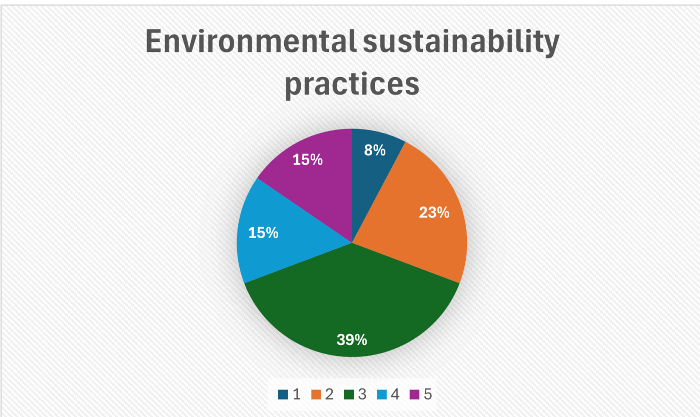
Source: Own elaboration based on the information of the analysed projects. This figure is also discussed in the main text as Figure 1.

Figure A2: Distribution of project scores for the Climate Resilience indicator.



Source: Own elaboration based on the information of the analysed projects.

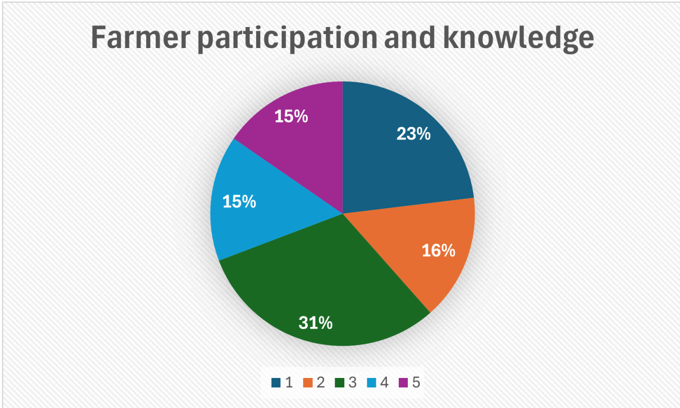
Figure A3: Distribution of project scores for the Environmental sustainability practices indicator.



Source: Own elaboration based on the information of the analysed projects.

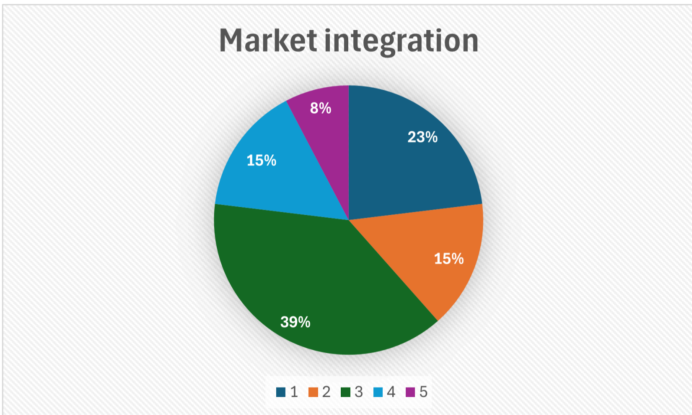
Socioeconomic Resilience

Figure A4: Distribution of project scores for the Farmer participation and knowledge indicator.



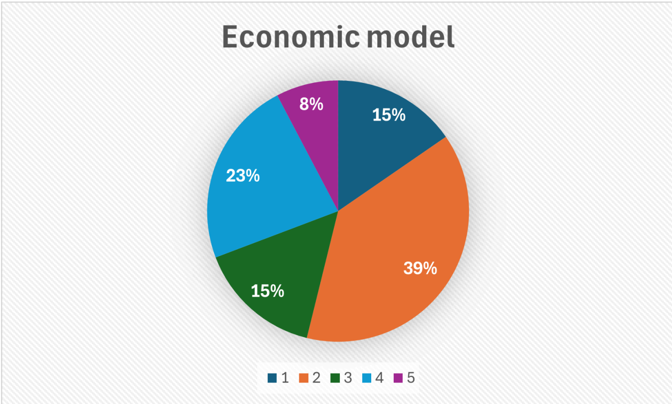
Source: Own elaboration based on the information of the analysed projects. This figure is also discussed in the main text as Figure 3.

Figure A5: Distribution of project scores for the Market integration indicator.



Source: Own elaboration based on the information of the analysed projects.

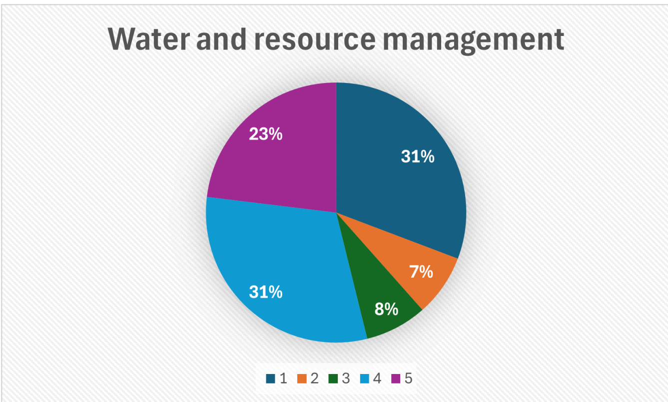
Figure A6: Distribution of project scores for the Economic model indicator.



Source: Own elaboration based on the information of the analysed projects. This figure is also discussed in the main text as Figure 4.

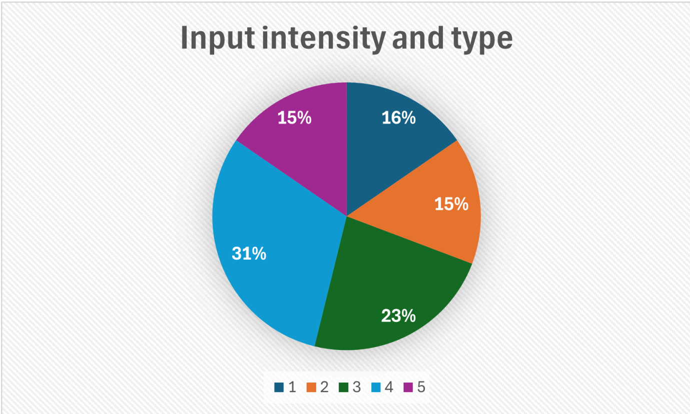
Resource Management

Figure A7: Distribution of project scores for the Water and resource management indicator.



Source: Own elaboration based on the information of the analysed projects. This figure is also discussed in the main text as Figure 2.

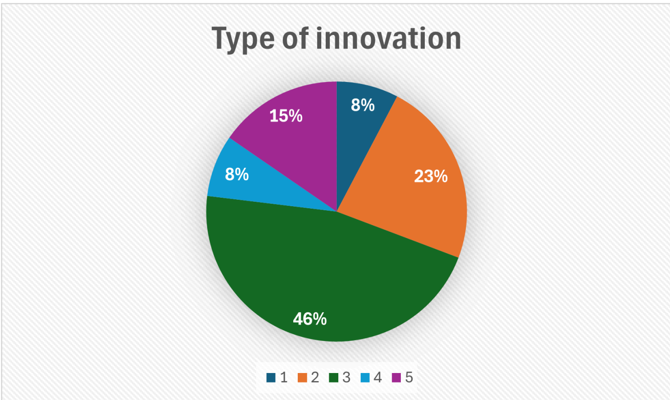
Figure A8: Distribution of project scores for the Input intensity and type indicator



Source: Own elaboration based on the information of the analysed projects.

Innovation and Productivity

Figure A9: Distribution of project scores for the Type of innovation indicator.



Source: Own elaboration based on the information of the analysed projects.

Figure A10: Distribution of project scores for the Productivity strategies indicator.

Source: Own elaboration based on the information of the analysed projects.

Annex V - List of the analysed projects

- Accenting the "culture" in agriculture. https://www.fao.org/in-action/accenting-the-culture-in-agriculture
- Action Against Desertification. https://www.fao.org/in-action/action-against-desertification/en/
- Adapting irrigation to climate change (AICCA). https://www.fao.org/in-action/aicca
- Analysis and Mapping of Impacts under Climate Change for Adaptation and Food Security (AMICAF). https://www.fao.org/in-action/amicaf/en/
- Building capacity related to Multilateral Environmental Agreements in African, Caribbean and Pacific countries (ACP MEAs 3). https://www.fao.org/in-action/building-capacity-environmental-agreements/en/
- Contract Farming Resource Centre. https://www.fao.org/in-action/contract-farming
- E-Agriculture Strategy Guide. https://www.fao.org/in-action/e-agriculture-strategy-guide/en/
- Improved Pesticides and Chemicals Management in the Former Soviet Union. https://www.fao.org/in-action/pesticides-fsu/en/
- Global Partnership Initiative for Plant Breeding Capacity Building. https://www.fao.org/in-action/plant-breeding

- Strengthening Agro-climatic Monitoring and Information System (SAMIS). https://www.fao.org/in-action/samis
- Transboundary Agro-Ecosystem Management for the Kagera River Basin. https://www.fao.org/in-action/kagera/en/
- KORE - Knowledge Sharing Platform on Resilience. https://www.fao.org/in-action/kore/en/
- Sustainable and circular bioeconomy for food systems transformation. https://www.fao.org/in-action/sustainable-and-circular-bioeconomy/en/