

Review

# Sustainable Development of Agricultural Holdings: A Theoretical Review of Concepts and Approaches

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**Abstract:** Sustainable development has become a central paradigm in contemporary policy and scientific discourse, particularly in sectors that strongly depend on natural resources, such as agriculture. However, the concept remains theoretically complex and operationally challenging due to its multidimensional and systemic nature. This paper provides a comprehensive theoretical review of the evolution of sustainability, its institutionalization through international and European policy frameworks, and the development of indicator systems for measuring sustainable development, with a specific focus on agricultural holdings. Special attention is given to the role of sustainability indicators in translating abstract principles into measurable performance metrics, including global and European frameworks such as SAFA, AEI, CMEF, and the Farm Sustainability Data Network (FSDN). Building on this foundation, the paper conceptualizes agricultural holdings as socio-ecological systems in which environmental, economic, and social dimensions are interdependent. It is argued that farm-level sustainability cannot be assessed through isolated indicators, but requires an integrated, systemic perspective that reflects interactions among resource use, economic viability, and social well-being. The review concludes that sustainability in agriculture is not a static goal but a dynamic process of adaptation, innovation, and governance. By linking theory, indicators, and policy frameworks, this paper provides a coherent conceptual basis for future empirical research and for the development of integrated sustainability assessment models that can support evidence-based agricultural and rural development policies.

**Keywords:** *Sustainability; sustainable agriculture; rural development; indicators; farm.*

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## 1. Introduction

The concepts of sustainability and sustainable development have occupied a central position in scientific and professional discourse for several decades, particularly in fields concerned with natural resource management, economic development, and environmental protection. Despite the widespread use of the term sustainable development, there is still no single, universally accepted definition, reflecting both the complexity of the phenomenon and the diversity of theoretical perspectives through which it is interpreted [1,2].

The most frequently cited and influential definition originates from the report of the World Commission on Environment and Development (WCED), commonly known as the Brundtland Report. It defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [3]. This definition marked a turning point in the global understanding of sustainability and laid the foundation for numerous international strategies and policy frameworks in the fields of environmental governance, economic growth, and social development.

Among the earliest scholars to articulate the core logic of sustainability was Repetto [4], who emphasized that the essence of the concept lies in the conviction that present-day decisions and patterns of resource use must not diminish the capacity of future generations to preserve or improve their quality of life. In a similar vein, Harris [1] argues that the pathway of sustainable development can be understood as one in which the overall stock of essential resources is maintained or enhanced over time, highlighting the importance of intergenerational preservation of capital—natural, economic, and social.

Within this conceptual framework, sustainable development is increasingly perceived as a dynamic and adaptive process, rather than a fixed end state. It involves the continuous balancing of societal activities with the biophysical limits imposed by ecosystems. Contemporary literature largely agrees that sustainability emerges from the interaction of three interdependent dimensions: environmental, economic, and social, none of which can be addressed in isolation [5,6]. The environmental dimension focuses on the conservation of natural resources and ecosystem functions; the economic dimension concerns long-term viability, efficiency, and resilience; while the social dimension encompasses quality of life, equity, community participation, and social cohesion.

This tripartite model is grounded in the understanding that development processes must simultaneously satisfy economic needs, ensure the responsible use of resources, and contribute to social well-being. Consequently, sustainable development is increasingly conceptualized as a long-term societal transition, characterized by continuous institutional change, innovation in governance structures, and the emergence of new resource management models aimed at preserving welfare in the long run [7,8].

The relevance of the sustainability concept becomes particularly pronounced in the context of agriculture, due to the sector's multifunctional role—economic, ecological, and social—as well as its direct dependence on natural resources and the specific characteristics of agricultural production systems. Agricultural systems function simultaneously as users and stewards of natural capital, making the sustainable development of farming one of the most critical challenges for contemporary agricultural policy and rural development strategies [9-11]. Climate change, biodiversity loss, soil degradation, and socio-economic pressures further intensify the need for integrated sustainability approaches at the farm and territorial levels.

In this regard, agricultural holdings should not be viewed merely as production units, but rather as complex socio-ecological systems embedded within broader economic, environmental, and institutional contexts. Understanding sustainability at the farm level therefore requires a comprehensive theoretical framework capable of capturing the interactions between resource use, economic performance, and social functions. This paper aims to contribute to such understanding by providing a structured theoretical review of key sustainability concepts and approaches relevant to the sustainable development of agricultural holdings.

## **2. The Conceptual and Institutional Evolution of Sustainability**

The concept of sustainability has evolved through several distinct phases, reflecting changing understandings of the relationships between society, the economy, and the natural environment. Its earliest roots can be traced back to the eighteenth century, particularly within forestry science, where the principle of sustained yield was introduced. This idea required that timber harvesting should not exceed the natural regeneration capacity of forests, thereby ensuring long-term resource availability [12]. Although initially technical and narrowly defined, this principle laid the foundation for the modern notion of rational management of natural capital.

In the second half of the twentieth century, sustainability entered global scientific and political discourse, particularly following the publication of *The Limits to Growth* by the Club of Rome [13]. This landmark report demonstrated that unchecked economic expansion, intensive resource extraction, and rapid population growth could lead to profound ecological and social crises. Despite significant criticism, the report fundamentally reshaped development thinking by introducing the idea that economic growth is constrained by ecological and biophysical limits.

The global consolidation of sustainability as a development paradigm occurred in 1987 with the release of the report by the World Commission on Environment and Development, widely known as the Brundtland Report [3]. By emphasizing intergenerational equity and linking environmental protection with economic and social development, this report shifted sustainability from an environmental concern into a central element of international economic and political agendas.

During the 1990s, sustainability became firmly embedded in international policy frameworks, particularly after the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. The adoption of Agenda 21 marked a turning point by promoting the integration of environmental, economic, and social objectives into national development strategies [14]. In this period, the now widely accepted three-pillar model of sustainability—environmental, economic, and social—was formally articulated and popularized [15].

At the beginning of the twenty-first century, sustainability debates were further enriched by the distinction between weak and strong sustainability. While weak sustainability allows the substitution of natural capital with human-made capital, strong sustainability assumes that certain ecological assets are irreplaceable and must therefore be strictly preserved [16]. This theoretical divide continues to influence policy design, sustainability indicators, and resource governance frameworks.

As for the institutionalization of sustainability, over the past decades, sustainable development has become a cornerstone of international governance and development strategies. Following the Brundtland Report, sustainability principles were progressively embedded into the work programs of international organizations and national policy agendas worldwide [3]. The 1992 Rio Conference represented one of the most significant steps in institutionalizing sustainability globally through the adoption of Agenda 21, a comprehensive action plan based on sustainable resource management and participatory decision-making [14].

The adoption of the Millennium Development Goals (MDGs) in 2000 further supported the operationalization of sustainability, particularly in relation to poverty reduction, education, and public health. However, the MDGs proved insufficient in addressing environmental integrity and economic sustainability. This limitation led to the formulation of the SDGs in 2015, which represent the most comprehensive contemporary framework for sustainable development, encompassing 17 goals and 169 targets across economic, social, and environmental domains [17]. These goals established a comprehensive global framework for measuring and advancing sustainability across economic, social, and environmental dimensions. The SDGs significantly enhanced the operationalization of sustainability by incorporating themes such as poverty eradication, gender equality, sustainable consumption and production, climate action, and biodiversity conservation into a unified development agenda [17]. For the first time, agriculture, climate change, biodiversity, and social inclusion were integrated into a single global development paradigm.

Within the European Union, sustainability gained strong political momentum through the adoption of the European Green Deal in 2019. This strategic framework aims to transform the EU into a climate-neutral economy by 2050, emphasizing sustainable food systems, biodiversity protection, circular economy principles, and greenhouse gas emission reduction [18]. Agriculture plays a central role in this transition through the Farm to Fork Strategy and the EU Biodiversity Strategy, which promote reduced pesticide use, expansion of organic farming, and the development of more resilient food systems [19].

Reforms of the Common Agricultural Policy (CAP) for the 2023–2027 programming period have further strengthened sustainability integration. New instruments such as eco-schemes, enhanced conditionality, stronger climate and environmental requirements, and the introduction of social conditionality—which links farm payments to labor rights compliance—demonstrate that sustainability is no longer optional but a structural component of EU agricultural policy [20]. A particularly important development is the EU's transition from the traditional Farm Accountancy Data Network (FADN) to the Farm Sustainability Data Network (FSDN). This new system enables the systematic collection of economic, social, and environmental data at the farm level, thereby significantly deepening the empirical operationalization of sustainability [21]. Together, these global and European policy initiatives demonstrate that sustainability has evolved from a theoretical and

normative concept into a practical, institutionalized framework supported by regulatory instruments, monitoring systems, and performance indicators. Sustainable development now occupies a central role in shaping natural resource governance, agricultural policy, and rural development strategies, making it the key analytical lens for assessing the sustainability of agricultural holdings as fundamental units of the agri-food system.

Today, sustainability is widely understood as a dynamic, multi-dimensional, and systemic process that requires policy coherence, stakeholder participation, and long-term strategic planning. It is no longer confined to environmental protection but has become a central framework for interpreting economic, institutional, and social transformations—especially in resource-intensive sectors such as agriculture.

**Table 1.** Key milestones in the evolution of the sustainability concept.

Period/Year	Key Event/Author	Main Contribution to the Concept of Sustainability
18th century	Forestry science ( <i>sustained yield</i> )	First formal notion of rational resource use and long-term yield management [12].
1972	<i>The Limits to Growth</i> [13]	Warning about the ecological and biophysical limits of economic growth; identification of global environmental risks.
1985	Repetto [4]	Introduction of intergenerational responsibility in economic decision-making.
1987	Brundtland Commission (WCED)	Most widely accepted definition of sustainable development; sustainability framed as a global development goal.
1992	UNCED – Rio Conference, Agenda 21	Global institutionalization of sustainability; promotion of integrated economic, environmental, and social approaches.
2000	Millennium Development Goals (MDGs)	Strong focus on social development; limited integration of environmental and economic dimensions.
2015	Sustainable Development Goals (SDGs)	Comprehensive global framework with 17 goals integrating agriculture, poverty reduction, climate action, and biodiversity protection.
2019	European Green Deal	Strategic framework for climate neutrality in the EU; Farm to Fork and Biodiversity strategies introduced.
2020–2023	CAP Reform 2023–2027	Introduction of eco-schemes, enhanced conditionality, and a stronger social dimension in EU agricultural policy.
2022	Introduction of FSDN	Expansion of FADN into an integrated network for monitoring economic, environmental, and social sustainability at farm level.

An examination of the historical evolution of the sustainability concept and its gradual institutionalization through international policy frameworks clearly demonstrates that sustainable development has evolved from a primarily academic and normative idea into a central principle of contemporary development strategies. Key documents and initiatives—from *The Limits to Growth* and the Brundtland Report, through Agenda 21 and the MDGs, to the SDGs, the European Green Deal, and the reformed Common Agricultural Policy—have shaped the current understanding of sustainability as an integrated, systemic, and long-term process. This evolutionary trajectory has enabled not only the theoretical consolidation of the concept but also its practical implementation through regulatory mechanisms, indicator systems, support programs, and institutional reforms in the fields of natural resource governance and agriculture. Consequently, contemporary analyses of the sustainability of agricultural holdings cannot be conducted in isolation but must be embedded

within these global and European strategic processes that define new development pathways for agriculture and rural areas.

### 3. Indicators of Sustainable Development

Indicators of sustainable development represent a fundamental instrument for the operationalization of sustainability and for monitoring its performance in practice. Given that sustainability encompasses a wide range of interrelated economic, environmental, and social dimensions, indicators function as simplified yet informative representations of system performance, enabling evidence-based decision-making grounded in relevant, reliable, and measurable data [22,23]. According to the OECD [24], indicators are defined as “quantitative or qualitative parameters that provide information about the state, changes, or trends within a given system and its surrounding environment.”

Bossel [25] emphasizes that sustainability indicators must satisfy two essential conditions:

- (1) they must provide vital information on the current state of the system or its subsystems, and
- (2) they must reveal how the system contributes to broader processes and interconnected subsystems.

In other words, indicators should not merely assess isolated components but must allow an understanding of system interactions and overall stability – a requirement that is particularly relevant for agriculture, which is inherently multifunctional and closely linked to ecosystems, markets, and social structures.

Sustainability indicators can be classified according to various criteria. One of the most frequently used typologies distinguishes between input, output, outcome, and impact indicators [26]. Input indicators refer to resources entering the system, such as fertilizer use or labor inputs. Output indicators measure immediate results, including yields or farm income. Outcome indicators reflect changes in system performance, for example, improvements in resource-use efficiency or reductions in land degradation. Impact indicators describe long-term effects on ecosystems, communities, or the broader economy. This framework enables the monitoring of both short-term performance and long-term sustainability trends.

The quality and usefulness of indicators depend on their validity, reliability, consistency, and data availability. Moldan et al. [22] stress that indicators must be understandable not only to scientists but also to policymakers and local stakeholders, as excessive complexity can undermine practical applicability. Therefore, the selection of indicators requires a careful balance between scientific rigor and communicative clarity.

A major challenge in practice is the lack of harmonized indicator systems and the diversity of interpretative frameworks within which they are applied [27]. This diversity complicates cross-country, regional, and sectoral comparisons. The European Union has acknowledged this limitation and developed several coordinated indicator systems, including the EU Sustainable Development Indicators, Agri-Environmental Indicators (AEI), and the Common Monitoring and Evaluation Framework (CMEF) under the Common Agricultural Policy (CAP). These systems provide structured tools for monitoring environmental pressures, economic performance, and social dimensions of agriculture.

In agriculture, sustainability indicators are particularly important for capturing complex processes such as soil degradation, climate impacts, labor availability, resource productivity, and farm economic stability. Tilman et al. [10] argue that only through systematic measurement of these dimensions is it possible to identify key risks and anticipate future sectoral trends. In practice, indicators are used for:

- (1) diagnosing farm performance,
- (2) evaluating agricultural and rural development policies,
- (3) assessing the impacts of technological and agroecological practices, and
- (4) supporting decision-making at both farm and policy levels.

The European Commission [21] has introduced a new approach through the transformation of the traditional Farm Accountancy Data Network (FADN) into the Farm Sustainability Data Network

(FSDN), which incorporates expanded environmental and social indicators. This shift confirms that conventional economic indicators alone are no longer sufficient to capture the full spectrum of farm performance. Sustainability is thus reframed as a multidimensional concept that includes quality of life, responsible resource management, and the resilience of rural communities.

Several international indicator frameworks have been developed to assess agricultural sustainability. One of the most prominent is the Agri-Environmental Indicators (AEI) system of the European Commission, which covers areas such as soil quality, erosion, agrochemical use, pressure on water resources, greenhouse gas emissions, and biodiversity status [28]. These indicators help evaluate the environmental footprint of agriculture and identify practices that either degrade or enhance natural resources.

Within the CAP, sustainability indicators are further operationalized through the Common Monitoring and Evaluation Framework (CMEF), which integrates economic, environmental, and social dimensions. The CMEF includes indicators related to productivity, competitiveness, diversification, social cohesion, resource management, and climate performance [29]. This framework enables the assessment of the extent to which agricultural policies contribute to sustainable development objectives, particularly with regard to climate neutrality and rural resilience.

At the global level, the FAO Sustainability Assessment of Food and Agriculture Systems (SAFA) framework offers a holistic approach to sustainability measurement, encompassing four dimensions: good governance, economic resilience, environmental integrity, and social well-being [26]. SAFA is applicable to farms, enterprises, and value chains, and is widely used for comparative assessments of diverse agricultural systems.

Sustainability indicators in agriculture cover a broad spectrum of domains, most commonly grouped into three major categories (table 2):

**Table 2.** Core sustainability indicator domains at farm level.

Dimension	Key Indicator Areas	Policy Relevance
Environmental	Soil quality, erosion, agrochemical use, water management, biodiversity, GHG emissions, waste & manure	Climate action, biodiversity protection, resource efficiency
Economic	Productivity, profitability, liquidity, risk, investments, diversification	Farm resilience, food security, competitiveness
Social	Demographics, quality of life, labor rights, succession, gender, youth, social inclusion	Rural vitality, social justice, generational renewal

Environmental indicators:

- soil quality and fertility;
- soil erosion and land degradation;
- fertilizer and pesticide use;
- water resource management;
- biodiversity and landscape structure;
- greenhouse gas (GHG) emissions;
- management of agricultural waste and manure.

These indicators capture how farming practices affect natural resources and ecosystem functions. Tilman et al. [10] particularly emphasize the importance of monitoring eutrophication, nitrogen losses, and soil degradation due to their long-term impacts on productivity and ecological stability.

Economic indicators

- productivity and technical efficiency;
- farm profitability and income levels;
- indebtedness and liquidity;
- income risks and volatility;

- investment activity;
- production diversification and market integration.

Economic indicators enable the assessment of farm stability and resilience. The OECD [24] stresses that economic sustainability represents a prerequisite for implementing environmental and social standards, especially in countries with limited investment capacity.

Social indicators

- farm demographics (age, gender, education);
- farmers' quality of life;
- labor conditions and workers' rights;
- intergenerational knowledge transfer and farm succession;
- gender equality;
- youth participation in agriculture;
- social inclusion and rural community stability.

Janker and Mann [2] argue that the social dimension is the most complex and frequently neglected aspect of sustainability, as many relevant variables are difficult to quantify or are not systematically captured by conventional statistical systems.

Although sustainability indicators are indispensable tools for monitoring development trajectories, their practical application faces several limitations. A major challenge is data fragmentation, as economic, environmental, and social indicators are often stored in separate databases and managed by different institutions, which hinders integrated analysis [30, 31]. A second challenge concerns the lack of standardization and international harmonization, which complicates cross-country and regional comparisons [32]. A third limitation is the restricted availability of farm-level data, which prevents detailed assessments of the real sustainability performance of agricultural systems.

In response to these challenges, the European Commission has introduced the Farm Sustainability Data Network (FSDN) as an expanded farm-level data system, designed to incorporate environmental and social indicators that were previously absent from the FADN structure [21]. This initiative establishes a foundation for complementary monitoring across all sustainability dimensions and supports integrated policy design and evaluation.

#### 4. Sustainability in Agricultural Production Systems

Agricultural production is one of the domains in which the concept of sustainability is manifested in the most complex and direct manner. Agriculture simultaneously depends on natural resources and shapes their condition, while also constituting the economic backbone and social fabric of many rural areas. Owing to this multifunctional role, the sustainability of agriculture has become one of the most pressing challenges of contemporary development—particularly in countries dominated by family farms.

Sustainable agriculture is commonly defined as a production system that ensures the long-term preservation of soil productivity and natural resources, the economic viability and competitiveness of farms, and the social development of rural communities [9]. Diazabakana et al. [33] emphasize that sustainable agriculture must simultaneously fulfill three core functions — productive (economic), environmental, and social — and that failure in any of these dimensions inevitably undermines the stability of the system as a whole.

*Environmental Dimension of Sustainability in Agriculture* - The environmental dimension is especially prominent in agriculture, as the sector relies on resources such as soil, water, and biodiversity, all of which have limited regenerative capacities. Environmental sustainability involves maintaining soil fertility, preventing erosion, reducing water pollution, conserving biodiversity, and lowering greenhouse gas emissions [10]. Contemporary approaches—including agroecology, conservation agriculture, and regenerative farming—stress the importance of increasing soil organic matter, improving land management, reducing external inputs, and safeguarding ecosystem functions.

In the context of climate change, environmental sustainability increasingly includes the concept of resilience, referring to the capacity of farms and agroecosystems to adapt to extreme weather events, droughts, floods, and shifting resource availability [34,35,36]. This dimension of sustainability is now directly influencing farm-level economic decisions and requires new models of adaptive resource management.

*Economic Dimension of Sustainability in Agriculture* - Economic sustainability refers to the ability of farms to remain financially stable, productive, and competitive while providing an adequate standard of living for producers. Its key components include profitability, productivity, diversification, risk reduction, access to markets, and the capacity for continuous investment [24]. A stable economic base enables farmers to adopt technological innovations and implement practices that support environmental protection and social well-being.

In developing and transition economies economic sustainability often represents the primary constraint. Limited access to capital, low investment levels, land fragmentation, and income volatility restrict the adoption of environmentally and socially oriented practices. Ryan et al. [37] note that farms must first reach a certain level of economic resilience before they can actively implement more complex sustainable production models.

*Social Dimension of Sustainability in Agriculture* - Social sustainability in agriculture encompasses farmers' well-being, fair labor conditions, equal access to resources, gender equality, intergenerational knowledge transfer, youth engagement in farming, and improvements in quality of life [2]. Over the last decade, this dimension has gained increasing importance in European policies, particularly through the introduction of social conditionality within the CAP and the promotion of safe and equitable working conditions in the agricultural sector [20].

In countries facing demographic challenges social sustainability is closely linked to rural depopulation, population aging, and the declining number of farms. These trends directly threaten the long-term sustainability of the agri-food system by reducing labor availability, weakening innovation capacity, and eroding social cohesion in rural communities.

Contemporary research increasingly emphasizes that agricultural sustainability cannot be achieved by addressing individual dimensions in isolation. Instead, it requires an integrative, systemic approach that recognizes the interdependence between ecological constraints, economic pressures, and social needs [26,38]. For example, environmentally harmful practices may temporarily increase economic returns, yet they ultimately degrade soil fertility and reduce long-term system resilience. Similarly, economic stress can erode social standards and accelerate rural depopulation, thereby undermining sustainability from within. Sustainable agriculture should therefore be understood as a process of continuous adaptation, innovation, and risk management, rather than the application of fixed technical solutions. In this context, public policies play a crucial role—particularly those related to incentives, resource-use regulation, and the strengthening of Agricultural Knowledge and Innovation Systems (AKIS) [36,39].

#### 4.1. Concept of Sustainable Farm

At the core of this systemic perspective lies the agricultural holding (farm) as the basic production unit of the agrarian sector and the primary analytical level at which economic, environmental, and social dimensions converge. The concept of the sustainable farm is thus central to understanding sustainable agriculture as a whole. A sustainable holding can be defined as one that effectively manages natural resources, achieves economic stability, and contributes to social well-being within rural communities, while ensuring the long-term viability of production [9; 11].

The concept of agricultural multifunctionality is a key theoretical pillar underpinning farm sustainability. According to the OECD [24], agriculture performs not only a productive function, but also delivers a wide range of public goods, including landscape preservation, biodiversity conservation, social cohesion, and rural employment. Consequently, a sustainable farm is not merely an economic entity, but also a generator of broader social and ecological value [40,41].

This perspective implies that farms must align their production processes with resource conservation and community needs. It requires integrated land and ecosystem management,

reduced pressure on natural resources, and active contributions to rural livelihoods and quality of life.

From a theoretical standpoint, a sustainable farm is defined through three mutually reinforcing dimensions:

1. **Economic sustainability** - An economically sustainable holding ensures stable income, financial resilience, investment capacity, and long-term competitiveness. Core elements include productivity, production diversification, cost-efficient management, and the ability to adapt to market changes [24]. Economic viability is a precondition for the adoption of innovative, agroecological, and socially responsible practices.

2. **Environmental sustainability** - An environmentally sustainable holding uses land, water, energy, and biological resources in a rational manner, safeguarding their quality and availability for future generations. This includes maintaining soil fertility, controlling erosion, conserving biodiversity, reducing agrochemical inputs, and lowering greenhouse gas emissions [10]. Drawing on resilience theory, farms are viewed as systems capable of absorbing external shocks—such as climate change, price volatility, and biological risks—while retaining their functional integrity [35].

3. **Social sustainability** - A socially sustainable holding enhances the quality of life of farmers and rural communities, ensures fair labor conditions, promotes equal access to resources, and supports intergenerational knowledge transfer. This dimension also includes gender equality, youth engagement in agriculture, household stability, and rural demographic vitality [2]. It is particularly critical in regions experiencing population aging, migration, and rural depopulation.

The theoretical concept of sustainable farms is grounded in a systems approach, where the holding is understood as a complex socio-ecological system (Table 3). Changes in one dimension directly affect the others: environmental degradation reduces economic productivity, economic instability limits investments in resource protection, and social factors—such as education, age structure, and migration—shape farms’ adaptive capacity [11].

At this level, sustainability is best understood as a dynamic process of ongoing adjustment and optimization, rather than a static condition. Farm sustainability depends on the ability to manage risks, innovations, and resources in ways that secure long-term system functionality.

Finally, the sustainable farm concept highlights the importance of public policies in shaping farmers’ behavior. CAP reforms, eco-schemes, agri-environmental measures, incentives for young farmers, and social conditionality create an institutional environment that influences farm-level decisions and practice choices [20]. Institutional support is therefore a key prerequisite for translating sustainability from theory into practical implementation.

**Table 3.** Sustainability of farm.

Dimension	What it Includes	Why it Matters	Example Indicators
<b>Environmental</b>	Soil, water, biodiversity, emissions, resource use	Protects natural capital and ecosystem functions	Soil fertility, erosion rate, fertilizer use, GHG emissions
<b>Economic</b>	Income, productivity, investments, diversification, risk	Ensures farm viability and resilience	Farm income, productivity, liquidity, diversification index
<b>Social</b>	Quality of life, labor conditions, gender, youth, succession	Supports rural communities and social stability	Age structure, labor rights, youth participation, life satisfaction
<b>External context</b>	Climate change, markets, policies, institutions	Shapes farm decisions and constraints	Climate risk, price volatility, policy participation
<b>Outcomes</b>	Resilience, viability, ecosystem health, rural vitality	Reflect long-term sustainability performance	Composite sustainability indices, FSDN/SAFA scores

## 5. Conclusions

This theoretical review has demonstrated that sustainability has evolved from a normative and sector-specific concept into a comprehensive, multidimensional framework that shapes contemporary development strategies and agricultural policies at both global and European levels. Through its progressive institutionalization—reflected in key international agreements, indicator systems, and policy reforms—sustainable development has become an operational paradigm rather than an abstract ideal.

Within agriculture, sustainability emerges as a particularly complex and critical challenge due to the sector's multifunctional role, its dependence on natural resources, and its strong embeddedness in rural socio-economic structures. The review has shown that sustainable agricultural development cannot be understood through isolated environmental, economic, or social lenses. Instead, it requires an integrated, systemic perspective that captures the interactions among these dimensions at the level of the agricultural holding. By positioning the farm as a socio-ecological system, this paper highlights the central role of agricultural holdings as key units for assessing and advancing sustainability. The transition from traditional performance measures to integrated indicator frameworks—such as FSDN, SAFA, and CAP monitoring systems—confirms that sustainability is increasingly being translated into measurable and policy-relevant constructs.

Finally, the analysis underscores that sustainability is not a fixed state, but a continuous process of adaptation, learning, and institutional change. Future research should therefore focus on developing context-sensitive assessment models, improving data integration across sustainability dimensions, and strengthening the link between sustainability measurement and evidence-based policymaking. In this way, sustainability can move beyond a guiding principle to become a practical pathway for the long-term resilience and transformation of agricultural systems.

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