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Perspective Paper

Sustainability Assessment of Organic Farming Practices: A Comparison of Key Tools

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Abstract

Sustainable agricultural production is essential for an adequate food supply to feed the global population. One facet of efforts in making the agricultural sector more sustainable is the dramatic increase in organic farming (OF). With its current popularity, people across the globe are increasingly interested in the sustainable performance of organic production. However, accurate and timely information is scarce and there is a lacuna of knowledge among organic farmers about Sustainability Assessment (SA). Many promising SA measurement tools have been developed for the organic farming sector. However, improved procedures and a broader common knowledge are still necessary. In response, this paper provides a comprehensive comparison and scientific underpinning of the prominent tools for assessing farm sustainability to provide support for monitoring sustainable development in OF practices. This comparison can contribute to the adoption of suitable SA tools, and, thereby, the achievement of the United Nations (UN) Sustainable Development goals by 2030.

Keywords: Farm Assessment Tools, Organic Farming, Sustainability Assessment, Sustainable Development, Sustainable Organic Farming

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Introduction

Sustainable development (SD) has become the motto for global financing organizations, a key word in policymakers' vocabulary, the topic of conferences, symposia, and research publications, as well as the staging ground for universal development action (Lele, 1991; Pretty 2018).

Literature pertaining to sustainable development and the Triple Bottom Line (TBL) approach prioritizes balancing the social, environmental, and economic benefits as a prime goal (Rowlands 1999; Sargani et al., 2020). Stückelberger (1999) argues that two additional aspects: "human dignity" and "nonhuman environment" should be added to the conceptual frame of sustainability. Hence, environmental preservation, economic efficiency, and social cohesion are widely regarded as the three key factors of sustainable development. In today's era of a growing consciousness about the health of the human race in particular and the planet in general, there is a continuing demand for and discussion about sustainability in all production systems, and the agriculture sector is not immune to such discussions. As a result, operations at the farm level also necessitates the use of the sustainability conceptual framework. Sustainable agriculture, according to the Sustainable Agriculture Initiative (SAI, 2003), employs lucrative, viable, and efficient agricultural techniques while also conserving and enhancing the natural environment, world ecology, and the socioeconomic conditions of local people. Organic farming (OF) is considered one obvious facet of sustainable agriculture (Food and Agriculture Organization [FAO], 2020). Therefore, it is imperative to assess the sustainability of organic farming practices. Concerns about the long-term sustainability of contemporary agriculture have resulted in the development of a wide range of SA methodologies and tools that take into consideration social, environmental, and economic factors. These assessments address certain themes (e.g., biodiversity and ecology, climatic change, labor, and well-being) by using appropriate indicators (Singh et al., 2009; Binder et al., 2010; Schader et al., 2014). These methodologies and tools make use of a precisely articulated normative framework and an assessment structure.

With the implementation of the UN Agenda 2030, SA is becoming a significant concern throughout the world. In today's era of high-level management dedication to the doctrine of sustainable development, SA is gaining prominence as a decision-making tool for anticipating the long-term consequences of proposed actions (policy proposals, strategies, programs, or endeavours) (Pope et al., 2004). Despite the prominence of SA of farms globally, we are lacking SA at the farm level in India and other South Asian Nations (Zulfiqar & Thapa, 2017; Sajjad and Nasreen, 2016). The reasons for this, are the scarcity of accurate and timely information and the lacuna of knowledge among organic farmers about SA.

Many significant and often promising SA projects have been undertaken in the organic farming sector. However, improved procedures and a broader common knowledge are still necessary. In this context, the objective of this perspective paper is to provide a comparative holistic view and scientific bases of prominent tools for farm SA which include: *Response-Inducing Sustainability Evaluation* (*RISE,* Häni et al., 2003; Grenz et al., 2012); *Indicateurs de Durabilité des Exploitations Agricoles [Farm Sustainability Indicators]* (*IDEA,* Zahm et al., 2008); *Sustainability Assessment of Food and Agriculture System (SAFA,* FAO, 2013*)* and *Sustainability Monitoring and Assessment RouTine* (*SMART,* Schader et al., 2014).

Review of Literature

Sustainability Assessment

Sustainability has become a philosophy and the guiding principle that all organizations and production systems aim to follow. The origins of sustainable development are generally attributed to the Brundtland Commission's Report (World Commission on Environment and Development [WCED], 1987). Prior to that, historically, SD was highlighted by *Silent Spring* (Carson, 1963), a book in response to the environmental impact of pesticides, and the report *Limits to Growth* (Meadows et al., 1972) in response to the significant public concern over indiscriminate resource usage. The WCED (1987) defines sustainable development as development that fulfils current requirements without jeopardizing future generations' ability to satisfy their own needs. As per the WCED (1987), the notion of sustainability as a policy concept comprises three intersecting and hierarchically ranked pillars (economic, environmental, and social). Later, the triple bottom line (TBL) sustainability model by Elkington (1997) was drawn and brought people, the planet, and profit into its ambit.

SA is the technique aimed at steering, planning and decision-making towards sustainable development (Hacking & Guthrie 2008; Bond & Morrison-Saunders 2011). The literature also makes use of other terminology, such as sustainability appraisal, integrated assessment, sustainability impact assessment, etc. The overarching objective of the growing subject of SA is sustainable development. SA is evolving as a significant decision-making mechanism across the globe, along with the development of sustainable development strategies (Bond et al., 2012). According to Hacking and Guthrie (2008), SA is ideally viewed as an umbrella concept that covers a range of impact assessment techniques. It is a strategic (broad focused and forward-looking), comprehensive (wide coverage) and integrated framework (combined/aligned) that aids in categorizing the features of an assessment and the degree to which it may promote sustainability (Hacking & Guthrie, 2008).

In general, the assessment of sustainability is associated with the establishment of indicators that can be used as measurements of the status of the social, economic, and bio-physical environment and thus utilized as the foundation for projections and forecasts when a development program is implemented (Bockstaller & Girardin, 2003; Donnelly et al., 2007). The approach can be reductionism (the breakdown of complex systems into simple terms or components) or holism (considering systems as a whole) (Bell & Morse, 2008).

The recent boom in SA is primarily due to its primary goal of sustainable development (Bond & Morrison-Saunders, 2011). Since sustainability pertains to the recognition of environmental, economic, and social factors in the context of cultural, historical, retrospective, prospective, and systemic standpoints, suitable tools and software techniques are required to ensure an extensive overview of these facets and to facilitate the engagement of stakeholders (Villeneuve et al., 2017).

The assessment criteria must promote good measures toward a better community and environmental balance, as well as a more viable, pleasurable, and sustainable future (Gibson et al., 2005; Gibson, 2006a). SA encompasses not just interdisciplinary (environmental, economic, and social) components, but cultural and value-based aspects as well (Singh et al., 2009). As a result, the best SA practices employ a holistic perspective rather than a three pillars approach, which can contribute to producing net sustainability benefits over time (Gibson et al., 2005; Gibson 2006b, 2011) through enhanced system health and resilience (Grace, 2010).

Sustainability Assessment of Organic Farming

As a result of today's food systems, ecosystems are under tremendous pressure (Gordon et al., 2017; Willett et al., 2019). In the past few years, there has been a greater focus on the complicated problem of preserving ecosystems while simultaneously sustainably feeding the growing global population. Since research has demonstrated that minimizing production pressures alone would not be adequate to fulfill sustainability goals, the paradigm has changed from ‘eco-friendly production’ to ‘food system sustainability,’ which encompasses both production and consumption side enhancements (Roos2017; Springmann et al., 2018). Sustainable farms must be ecologically responsible, commercially viable, and socially acceptable (Rasul & Thapa, 2004). According to the FAO (2020), organic farming is one obvious facet in the attempts at making agriculture and agribusiness more sustainable. The sustainability of organic farming is determined by economic feasibility, environmental preservation, and social fairness (Ahlem &Hammas 2017; Dhar et al., 2020). Organic farming rigorously conforms to sustainable agricultural production in its current context (Smith & Lampkin, 2019) and continually catalyze efforts to enhance the sustainability of the agro-food system (Jouzi et al., 2017; Muller et al., 2017), and it has been demonstrated to outperform conventional farming in terms of environmental impact (Reganold & Wachter, 2016) as well as being more economical (Venkat 2012). However, studies like Muller et al. (2017) and Smith et al. (2019) have indicated that, under the premise of continued food demand, the transition to organic farming will significantly increase the growth of agricultural land, resulting in negative impacts from deforestation (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019). Therefore, it is imperative to check the sustainability of organic farming practices to be well versed in its pros and cons concerning sustainability. Farm-level SA tools and techniques, which capture and reflect the holistic idea of agro and food chain sustainability, have been introduced for this purpose (Schader et al., 2014; Marchand et al., 2014). These include numerous sustainability metrics, as well as farm-level sustainability results at the local level.

Slow Sustainability Assessment in the Farm Sector

Generally, there has been a low use of SA tools at the farm level (Gasparatos, 2010; De Mey et al., 2011), and the situation is even more aggravated in India since it is a developing country. There are several reasons for slow SA adoption in the agricultural sector in general, and the OF sector in particular (Triste et al., 2014). Factors such as data availability, and time constraints, as well as issues such as unfamiliar vocabulary and difficulty of use impact farmers' perceptions of the usefulness and subsequent adoption of assessment tools (Gasparatos, 2010; Marchand et al., 2014), and, therefore, hinder the process of SA (Triste et al., 2014). Furthermore, developers of SA tools make value judgments and assertions about matters such as, what sustainability is, what its optimal level is, which metrics and indicators to employ, and how to quantify, evaluate, and integrate those indicators (Gasparatos, 2010). If end-users (farmers and advisors) are not actively involved in tool development, a mismatch between their value judgment and assumptions and those of developers is likely to occur. This is also a significant reason why SA tools have not been widely adopted in the farming sector (Gasparatos, 2010; De Mey et al., 2011; Triste et al., 2014). Hoogmartens et al., (2014) and Whitehead et al. (2020) pointed out that most research on SA tools emphasize the development and design stages, with little consideration devoted to how the tool may be successfully applied and adopted. To have a robust implementation process, subtle factors influencing the adoption of the SA tool, including management support, end-user competence, and the uniqueness of the tool's tasks, need to be managed. Whitehead et al. (2020) indicated that more attention must be paid to the variables that promote or impede the use of sustainability tools in order to make sure that pragmatic results are reached via the assessment process. Furthermore, the majority of research and literary sources on SA is aimed at improving the consistency, substance, and precision with which evaluations are conceptualized and their content created (De Olde et al., 2018). In contrast to this emphasis on assessment content, the practical farm-based application of SA outcomes is sometimes ignored (Whitehead et al., 2020), which is also a cause of the problem.

This paper aims to elucidate a comparative assessment of different SA tools introduced for monitoring sustainable development in OF practices. Thereby we intend to provide a holistic view of prominent tools for assessing farm sustainability and present a comprehensive comparison of these key SA tools to place organic farming in the context of sustainable development as a strategy for decision-making.

Comparative Analysis of SA Tools

The SA Tools

SA tools are various analytical procedures and software programs that attempt to comprehend a system and portray the data and facts in a way that can facilitate decision-making (Gasparatos, 2010).

Generally, in the farm sector, SA tools provide a means for implementing sustainability evaluation frameworks on farms. They serve as a linkage between abstractions of sustainable development and the ability to execute significant improvements to farming systems (Whitehead et al., 2020). The farm-based SA tools assist with on-farm decisions (Marchand et al., 2014) and hence have a substantial influence on farm sustainability (Le Gal et al., 2011). The most common forms of farm SA methodologies and tools for managing varied challenges of sustainability are the ones that attempt to enlighten farm stakeholders in decision-making and to deliver standardized data sets to accreditation, assurance, and certification programs.

They can assist farmers in improving their farm's sustainability performance (Schindler et al., 2015).

Over the last couple of decades, multiple assessment methodologies and tools for evaluating sustainability performance have been developed (Singh et al., 2009; Schader et al., 2014; De Olde et al., 2016). These tools have brought to light the complex nature and diversity of farming methods across various sectors and geographic regions (Van Passel & Meul, 2012; Triste et al., 2014). A majority of such tools aim to make challenging sustainability concerns more comprehensible in order to help farmers make decisions very easily (Castoldi & Bechini, 2010). In most cases, SA approaches are structured around the sustainability pillars (environmental, economic, and social) and the assessment results are often utilized to generate tangible metrics for improvements and decision-making for pertinent interest groups.

To establish sustainable farming systems, it is necessary to conduct an assessment of farm sustainability using an appropriate tool. There are already a diverse set of sustainability tools, approaches, and implementations. They vary widely in terms of level, threshold, focus, inclination, scale, metrics, demonstration and presentation, and target end-users (Van Passel & Meul, 2012). Here we are comparing the different SA tools that are robust and in tune with the dimensions pertaining to sustainable organic farming.

The approaches that address farm sustainability extensively are:

- RISE: Response-Inducing Sustainability Evaluation (Häni et al., 2003; Grenz et al., 2012)
- IDEA: Indicateurs de Durabilité des Exploitations Agricoles [Farm Sustainability Indicators]. (Zahm et al., 2008)
- SAFA: Sustainability Assessment of Food and Agriculture System (FAO, 2013)
- SMART: Sustainability Monitoring and Assessment RouTine (Schader et al., 2014)

Response-Inducing Sustainability Evaluation (RISE)

RISE is a computer-assisted approach that uses indicators to assess the sustainability dimensions of farming practices. It was developed and is supplied by the Bern University of Applied Sciences' School of Agricultural, Forest, and Food Sciences. RISE's mission is to foster expertise processes based on voluntary participation, secrecy, and capacity building in order to contribute to the long-term sustainability of agricultural production. RISE users engage in farm consulting, training and development initiatives, and raw material procurement, among other activities.

RISE allows for a comprehensive evaluation of farm-based activities. A RISE assessment involves the definition of aim and scope, selection of farmer and contact building, data gathering and analysis, farmer input discussions, feedback, and report. The assessment is based on 10 indicators that address concerns pertaining to the 3 pillars of sustainability (environmental, economic, and social) (Häni et al., 2003). Relevance to farm-level sustainability, a scientifically established computation technique, repeatability, responsiveness to farm activities, explicit and comprehensible evaluation functions, and a robust cost-benefit ratio are the criteria used during indicator development. The indicators of RISE are, soil use, animal husbandry, environmental protection and material use, water use, energy and climate, biodiversity, working conditions, quality of life, economic viability, and farm management.

There has been a transition from RISE1.0 to RISE 3.0 over time. The static collection of themes and indicators is now being superseded with a more robust and dynamic system with the shift from RISE1.0 to RISE 3.0.

RISE was developed to assess a particular farm precisely. Its goal is to offer a simplified and reliable tool for a comprehensive assessment of an individual farm's sustainability and deliver "Response Inducing" pragmatic and comprehendible indications on the modifications and improvements needed to enhance the sustainability of agricultural practices. In RISE, an interview with the farmer using a structured questionnaire is the most significant data source. The assessed data is displayed as a sustainability polygon and serves as the foundation for a feedback conversation in which the farmer and the professional RISE consultant discover the potential for enhancing farm sustainability performance together.

Indicateurs de Durabilité des Exploitations Agricoles (IDEA)

A multidisciplinary research team in France developed the IDEA technique to provide a practical approach to the concept of sustainability evaluation, in the context of farm sustainability (Vilain et al., 2003). This approach, envisioned as a farmer self-assessment grid, offers comprehensive content with operational substance for the agricultural sustainability concept (Vilain et al., 2003). IDEA is a means of putting the notion of sustainable farming into practice (Zahm et al., 2008). It is centered on 41 multi-criterion sustainability indicators that must be modified to local farm conditions before being used (Zahm et al., 2008). This technique encompasses three sustainability aspects viz., environmental, economic, and social, and is intended as a self-assessment technique for farmers as well as policymakers to encourage sustainable agricultural practices. Being a diagnostic tool, it combines agro-ecological, socio-territorial, and economic scales for carrying out a SWOT (Strength, Weakness, Opportunity, and Threat) analysis of the production system, and proposes paths for development toward higher sustainability using quantifiable indicators (Vilain et al., 2003). The IDEA technique provides a comprehensive perspective on agricultural sustainability; its 10 components are diversity, the organization of space, farming practices, the quality of products and land, employment and services, ethics and human development, economic viability, independence, transferability, and efficiency.

The IDEA method uses the following schema. First, clearly defined objectives are formulated within the framework of the sustainability principle. Second, a matrix that combines the desired objectives with the indicators is created. Third, the basic hypotheses and options for the indicators' development and calculation technique are outlined. Fourth, the content of the three scales is organized and the design of each indicator is specified. Finally, the indicators are analysed and the survey findings are validated.

The IDEA indicators are designed to describe and assess the essential aspects via the notion of a sustainable farming system. They examine the viability, livability, and reproducibility of farming practices. Viability is an economic term which refers to the efficacy as well as the security of the revenue sources of the farm system at the time of market volatility and uncertainties about financial support. Livability examines whether farming practices provide an excellent work-life balance, and the environmental reproducibility of farm-linked ecosystems may be examined via agri-environmental indicators, which reflect the environmental effects of agricultural activities.

Sustainability Assessment of Food and Agriculture System (SAFA)

SAFA (Sustainability Assessment of Food and Agriculture System) is a comprehensive worldwide methodology for analysing food and farm value chain sustainability. It is an open-source, free, user-friendly assessment tool developed and implemented by the FAO for sustainability evaluation of enterprises via guidelines and indicators. According to FAO (2013), SAFA offers a global standard for evaluating the trade-off and synergy across four sustainability aspects (environmental, economic, social, and governance). It was developed so that businesses, whether corporate entities or micro-enterprises, engaged in the making, preparation, dissemination, and marketing of commodities have a solid knowledge of the component elements of sustainability and, as a result, can better address their strengths and weaknesses to advance toward sustainability. SAFA aspires to harmonize and unify sustainability strategies within the food and agricultural value chains while also advancing standard procedures by offering a clear and comprehensive framework for measuring sustainability (FAO, 2013).

The key benefits of SAFA constitutes the following. Comprehensiveness: the SAFA evaluation is a comprehensive methodology that includes all aspects of sustainability. Transparency: Using a traffic light system and representation, very high precision and clarity of outcomes, it helps to prioritize intervention. Complementary: It can be used to supplement surveillance and certification processes, and to connect them to current management systems. Customizability: the SAFA framework can be used by small and medium-sized businesses, big organizations, and other stakeholders involved in agriculture and food value chains; users can specify the geographic location, the scope, and indicators to be used.

The SAFA implementation follows the schema of, evaluating team formulation, mapping goal and scope establishment, identification of primary and sub-themes, contextualization and indicator customization, a first-round data collection and data gap identification, the data collection for the second time followed by analysis and, report formulation.

Sustainability Monitoring and Assessment Routine (SMART)

Sustainability Monitoring and Assessment Routine (SMART), developed by the Research Institute of Organic Agriculture- Forschungsinstitut für biologischen Landbau (FiBL), is a systematic tool that allows farmers and firms in the food industry to assess and evaluate the sustainability of dimensions associated with them in a reliable, fair, and comparative fashion (FiBL, 2014). SMART is entirely compatible with the FAO's SAFA Principles and offers an efficient and effective means of putting these guidelines into action on the ground. It is a cutting-edge tool for holistic sustainability analysis and assessment of agriculture and food enterprises. The assessment technique includes a weighting of the indicators based on their degree of impact on the different SAFA sub themes.

SMART is incredibly effective and pragmatic in its implementation, despite its scientific base and methodology of very deep analysis. As a result, when compared to alternative approaches, data gathering, and provision frequently requires less effort and resources from the respective organization. Furthermore, the individual farm or company's area of influence and responsibilities, along with the time, location, and the responsible stakeholder of sustainability effects throughout the value chain, are addressed. To offer SMART SA services, FiBL established the Sustainable Food Systems GmbH (SFS), which is a spin-off system that owns the license and uses copyrights to SMART.

Prime features of SMART are holistic (i.e., thoroughly incorporates all sustainability metrics and operational processes), comparable (i.e., employs standard evaluation techniques and is based on the FAO's globally-valid SAFA Guidelines for SA), credible (i.e., it is a scientifically-based method established by a large multinational sustainability specialist), and, efficient and field-tested (i.e., it is built on a smart software solution with intelligent, efficient, and pragmatic favourable processes). SMART primarily comprises a custom-built database that includes a complex evaluation algorithm along with a large set of indicators. With the help of these, farms and businesses' performance on the sustainability continuum can be evaluated in a reliable, fair, and comparable manner. As a result, SMART considerably outperforms previous techniques in the fields of Corporate Social Responsibility and Sustainability Reporting.

Comparative Analysis

The SA tools vary in their function and area of focus as evidenced by the tabulation of data (Table 1, Table 2, and Table 3). The settings wherein these SA tools are implemented differ based on geography, ease of use, sector, and the organization concerned. The SA tools under our study viz. RISE, IDEA, SAFA, and SMART frameworks for assessing farm sustainability comprise different types of indicator-based assessment tools (Table 1). They have been developed by different research groups with diverse degrees of involvement with stakeholders. The substance of the tools demonstrated that they differ in their definitions of what agricultural sustainability entails. They also differ in terms of organization and scope, as well as their goals and objectives (see Table 1). Furthermore, their grounding rationale and nomenclature for the concept of sustainability diverge to some extent (Zahm et al., 2008; Grenz et al., 2009). Although developing these measures is a vital step, these methods have weaknesses/criticism along with their strengths and advantages (Table 3). Evaluation of sustainability pillars varies across these tools. RISE, IDEA, and

Table 1: Comparative Tabulation of General Characteristics of the Farm Sustainability Assessment Tools

Tool	Target Group	Assessment Level/ Sector	Pillars	Origin	Issuing Organization	References
Response Inducing Sustainability Evaluation *(RISE)*	Farmers	Farm/ Universal	Environmental, Economic, Social	Switzerland	Bern University of Applied Sciences	Häni et al. (2003), Grenz et al. (2012)
Indicateurs de Durabilité des Exploitations Agricoles *(IDEA)*	Farmers, Policy-makers, Education	Farm/ Universal	Environmental, Economic, Social	France	Ministry of Agriculture and Food, France	Vilain et al. (2003), Zahm et al. (2008)
Sustainability Assessment of Food and Agriculture Systems *(SAFA)*	Food & agricultural enterprises, Government	Farm, Chain /Universal	Environmental, Economic, Social Governance	Multiple countries	Food and Agriculture Organization (FAO)	FAO (2013)
Sustainability Monitoring and Assessment RouTine *(SMART)*	Farmers, Food companies	Farm/ Universal	Environmental, Economic, Social	Switzerland	FiBL- Research Institute of Organic Agriculture	Schader et al. (2014)

SMART tools look at the environmental, economic, and social aspects of sustainability, while SAFA tool brings the governance pillar into the ambit of the measures. Some methods are expert-driven (top-down), while others are expert, and stakeholder driven (top-down and bottom-up; bottom-up) (Table 2).

Assessments approaches like SAFA, are for universal and worldwide applicability, while others are for specific contexts (e.g., IDEA is for the French context). Because local agricultural priorities and practices impact SA frameworks, these methods for assessing agricultural sustainability can vary and are always developing (FAO, 2013). Further, the RISE tool and the IDEA technique are specifically developed for agricultural assessments, although SAFA and SMART, which are based on SAFA criteria, have a broader reach. SAFA encompasses agricultural value chains, forestry, fisheries, and relevant supply networks.

South Asian nations lag behind developed nations in carrying out SA of agricultural practices. The literature identifies varied reasons for this. Sajjad and Nasreen (2016), found the decrease in land holdings as a reason for diminishing agricultural SA. Zulfiqar and Thapa, (2017) suggested that local level agricultural extension structures along with effective agricultural strategies are lacking. The complexity of these tools also adds to their low acceptance. Whitehead et al. (2020) discovered that managerial support, end-user competence, and the specificity of the tool's functions are vital factors in the adoption of these sustainability tools. Furthermore, Zulfiqar and Thapa (2017) suggested a revised mechanism of information distribution and farm level training can prove beneficial in the adoption of these SA tools.

The above analysis (see Table 1 above and, Table 2 and 3 below) can provide some guidance for South Asian nations for adopting different tools for different purposes. The selection and implementation of a SA tool depend upon the themes to be evaluated and indicators to be tested in a particular case. It can vary depending upon the geographical location, farm size and ownership, and the scale of measurement of indicators under study. From the tabulation of data (Table 1, 2, 3) it is evident that SAFA being one of the universal and dynamic SA tools is fit for all regions and geographical conditions. In comparison to other tools, the SAFA tool has the flexibility to delete subthemes, and is best suited for governance along with the three pillars of economic, environmental, and social. RISE's strength is its adaptability, which allows it to be used in advisory work and education (Grenz et al., 2012).

Table 2: Comparative Tabulation of Conceptual Aspects of Farm Sustainability Assessment Tools

Tool	Sustainability Base and Concept	Approach	Scoring and Aggregation Method	Function of Tool
RISE	Sustainable development (WCED 1987); Agriculture's sustainable development is non-destructive to the environment, technically adequate, economically feasible, and socially desirable (FAO, 1989)	Top-down Approach, Stakeholder involvement	RISE comprises 10 themes and 50 sub-themes. The sub-theme scores range from 0 to 100 and are cantered on an aggregation of factors. The Software Tool computes the ratings and scores by utilizing an on-farm interview, farm account data, and referrals to local and core databases.	A comprehensive investigation on the long-term sustainability of agro output at the farm level, to generate discussions.
IDEA	Sustainable development (WCED 1987); Sustainable agriculture is farming that is environmentally sound, commercially viable, socially just, and ethical (Francis et al., 1990).	Top-down approach	IDEA comprises 10 themes and 42 sub-themes. This tool is established upon farm-based survey interviews. A specific data point can be acquired for each indicator. Furthermore, to limit the possibility of compensating for poor outcomes, IDEA has established a maximum value for each theme and sub-theme.	Provide a tool for assessing and informing people of agricultural sustainability.
SAFA	Sustainable development (WCED 1987; Elkington, 1997) Agriculture's sustainable development is non-destructive to the environment, technically adequate, economically feasible, and socially desirable (FAO, 1989)	Top-down approach	SAFA comprises 21 themes, 58 sub-themes, and 116 indicators. Each indicator's score is assigned a scale value of 1 – 5. SAFA suggests strategies to measure the indicator. Indicator scores are summed up at the sub-theme and theme levels. SAFA weighs performance, practice, and target-based metrics differently.	Provide comprehensive analysis and review of agro and food systems in four areas of sustainability.
SMART	Sustainable development (WCED 1987; Elkington, 1997) Agriculture's sustainable development is non-destructive to the environment, technically adequate, economically feasible, and socially desirable (FAO, 1989)	Top-down approach	The SMART-Farm Tool simulates the farm performance concerning SAFA themes (21), sub-themes (58), and indicators (116). SMART contributes to the implementation of SAFA Guidelines by developing open and equitable reporting mechanisms for the food industry (Jawtusch et al., 2013)	Addresses social issues and ecological concerns from a societal point of view, while governance issues and economic concerns are addressed from a farm enterprise one.

Table 3: Comparative Tabulation of Farm Sustainability Tool

Tool	Purpose	Nature	Strengths	Weaknesses
RISE	A tool that makes assessing sustainability at the farm level simple.	System-Oriented	It can quantify the level of agricultural system sustainability. It is applicable worldwide. (Talukder et al., 2017) Both quantitative and qualitative data (Alaoui et al., 2022)	Only 12 indicators are used. The interplay of the indicators is not measured. (Talukder et al., 2017) High number of input data. It requires a specialist. (Alaoui et al., 2022)
IDEA	The IDEA approach puts the sustainability principles of agriculture into practice. Farmers and policymakers can use this method to analyze and encourage sustainable agriculture	Technical/ Site-specific	It can be connected to the French Farm Accounting Data Network, providing an intriguing opportunity to examine the levels of sustainability of various farming systems. (Talukder et al., 2017; Alaoui et al., 2022)	The indicators used in this method must be tailored to local farming. Based on a French Context. (Alaoui et al., 2022)
SAFA	It is a standard and umbrella approach for assessing the sustainability of food and agriculture systems that takes a comprehensive approach. It builds on existing transparency-enhancing techniques. It evaluates performance rather than system upgrades.	Guidelines: ongoing	It promotes a sustainable management system that speeds up the process of producing, processing, and distributing food and agricultural goods. It's a template that can be used anywhere. It is credible, due to institutional independence. (Talukder et al., 2017) Both qualitative and quantitative data can be used. (Alaoui et al., 2022)	It is still under development and has only been used in a few trials. Not all indicators are accepted by all global farming systems. (Talukder et al., 2017) Complex framework. Requires sustainability expert. (Alaoui et al., 2022)
SMART	The SMART-Farm Tool simulates SAFA. It is based upon open and equitable reporting mechanisms for the food industry	Guidelines: ongoing (Based on SAFA)	It promotes a sustainable management system, based upon SAFA guidelines. Uses semi-quantitative data (Alaoui et al., 2022)	Very time-demanding and limited to scientists. (Alaoui et al., 2022)

RISE is ideal in the context of extension, development, or quality management programs. IDEA is a diagnostic tool that combines agro-ecological, socio-territorial, and economic scales to carry out a SWOT (Strength, Weakness, Opportunity, and Threat) analysis of the production system. SMART enables a robust evaluation of agricultural sustainability and offers datasets that enable inter-farm evaluations which are easily disseminated to various stakeholders.

Apart from the tools elucidated, a few prominent tools in farm-based SA, which can be used in the case of OF as well, are Monitoring Tool for Integrated Farm Sustainability (MOTIFS, Meul et al., 2008) and SALCAsustain (Roesch et al., 2017). However, SALCAsustain is a highly advanced and sophisticated tool and is better suited for the European setting. It is generally implemented to answer research queries and analysis of various farm management strategies (Roesch et al., 2017).

SA necessitates a comprehensive understanding of the demands of the various tiers and end-users concerned, as well as the important sustainability issues from a broad viewpoint. It is also necessary to confirm the integrity and appropriateness of various assessment tools before implementing them in a particular setting. Therefore, to get the best assessment outcomes, the most appropriate tool should be used for each level (stage) and the customer (end-user).

Conclusion

With growing health concerns, the notion of sustainability is gaining impetus in all sectors and production systems; the agricultural sector isn’t immune. With the global emphasis on sustainable production methods, organic farming is gaining traction as a viable substitute for conventional agriculture. Organic farming, being one of the fastest expanding sustainable agricultural markets during the previous two decades (Diekman & Polacek 2013), increasingly calls for SA. It is gaining prominence as a facilitator in decision-making by providing support for anticipating the long-term consequences of proposed sustainable actions and in measuring their actual performance. SA is essentially a methodological structure and integration of theme-based indicators into standardized software protocol. The performance of organic production needs a check and balance vis-à-vis sustainability dimensions at the local, national and global levels. This assessment is the process of analysing the ecological, economic and social aspects of sustainability, along with the sustainable performance evaluation of all the activities involved in the farm value chain. SA tools help with on-farm decisions and hence have a substantial influence on-farm sustainability.

Although many significant and often promising SA tools have been adopted in the farm sector, improved procedures and a broader common knowledge are still necessary. This perspective paper tried to elucidate the SA tools introduced to monitor sustainable development in OF practices. It provided a comprehensive comparison of key tools related to organic farming SA in the sustainable development contextual frame. The tools included RISE – Response-Inducing Sustainability Evaluation; IDEA – Indicateurs de Durabilité des Exploitations Agricoles [Farm Sustainability Indicators]; SAFA – Sustainability Assessment of Food and SMART – Agriculture System and Sustainability Monitoring and Assessment RouTine. Furthermore, the paper provided a comparative view of the scientific bases of these prominent tools for assessing farm sustainability.

The objective of the paper was to summarize the key ideas that arise from the comparison of the different existing monitoring instruments in order to perform SA. Nonetheless, in addition to assessment, our insights arising from the comparative analysis of these SA tools based on the analysis of relevant literature will be a boon for all the stakeholders involved. Because it will also help to get a clear picture for the adoption of specific sustainability tools for different purposes. The free availability of these tools, in conjunction with the SAFA guidelines at the elementary farm level, can contribute to the adoption of SA tools and the achievement of the UN SDGs by 2030.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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