advances in Technology

Adv. Technol. 2025, 5(1), 11-26

Full Paper

Development of a Framework for Evaluating Farm Sustainability in Sri Lanka

S.H.I.S Gunasiri[a], Pradeep Gajanayake*[,a], Sajani H. Kolambage[b], D.J Jayasanka[a], and Ranjith Dissanayake[c]

[a] Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Pitipana, Homagama, Sri Lanka

[b] Faculty of graduate studies, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka

[c] Green Building Council of Sri Lanka, No. 120/10 Vidya Mawatha, Colombo 07, Sri Lanka

Corresponding Author: pradeepgajanayake@sjp.ac.lk ; Tel: +94771522444

Received: 08 October 2023; Revised: 11 January 2025; Accepted: 19 January 2025; Published: 16 March 2025

Abstract

Indicator-based sustainability monitoring tools are frequently employed worldwide for sustainability assessments, including agriculture and farm systems. However, that were developed especially for Western agricultural systems. Existing international sustainability frameworks developed especially for Western agricultural systems do not address Sri Lanka's unique environmental, economic, and social aspects. This study aims to bridge this gap by developing a comprehensive rating system framework that integrates sustainability principles for local farms, including horticulture, plantation, and organic farms. Literature review and stakeholder perspectives are the beginning of the study to establish primary criteria for the framework. Through a stakeholder survey, these criteria are then validated for suitability in the Sri Lankan context. Sub-criteria are defined for each approved criterion. Sub-criteria include national and international industry standards, government legislation, and relevant benchmarks applicable to Sri Lanka. The framework is validated further through interviews with technical committees and the points for each criterion are determined using the Analytical Hierarchy Process (AHP) mathematical decision-making method. A pilot study tests the practicability of the study. The final rating system contains six main criteria with relevant sub-criteria: Management, Integrated Cultivation Management, Water Efficiency, Energy Efficiency, Waste Management, and Social Responsibilities and Awareness. According to the AHP results, the weightage of the criteria is as follows: Integrated Cultivation Management (23%), Water Efficiency (19%), Management (17%), Waste Management (16%), Energy Efficiency (15%), and Social Responsibilities and Awareness (10%). The pilot study on an organic farm in Piliyandalaachieves 65 points out of a possible 100. This verified sustainability framework served as a tool to enhance or establish sustainable practices within Sri Lanka's agriculture farm sector.

Keywords: Sustainable agriculture; Green rating tool; Rating tool development; Analytical Hierarchy Process

Introduction

Agriculture plays a critical role in global sustainability by contributing to environmental stewardship, social equity, and economic stability [1]. Agriculture activities are particular; farms are significant sectors in terms of natural resources consumption of the environmentally impactful in terms of natural resource

consumption and environmental degradation [2]. For instance, agriculture farms contribute 10%–12% of total anthropogenic greenhouse gas (GHG) emissions and 56% of the non-CO_2 GHG emissions, mainly due to nitrous oxide emissions from soils and methane emissions from cattle Globally [3]. Apart from being a significant contributor to GHG and energy consumption [4], agriculture is the primary water consumer in most developing countries with high negative environmental and economic impact. systems. Focusing on sustainable agriculture and farming systems is more essential than ever. Sustainable farming achieves social, economicenvironmental, and ecological goals simultaneously. Instead of factory-based, environmentally sound agriculture is based on nature [5]. Over the past decade, the Sustainable agriculture concept has been widely recognised, with Significant efforts toward developing various assessment frameworks [6]. These frameworks offer structured approaches and tools to evaluate and guide agricultural practices, ensuring they promote transparency, accountability, and continuous improvement in sustainability practices within a proper framework [7].

In the world, tools available to evaluate sustainable farming and agricultural processes. The Friend of Earth Standard in Milan is one such system for certifying sustainable farming products. It encompasses 13 criteria, primarily focused on ecosystem preservation, agricultural production systems, emissions control, power management, and social responsibility. The Linking Environment And Farming (LEAF) Marque, an environmental assurance system, recognizes products from more sustainable farming practices. It is based on LEAF's Integrated Farm Management (IFM) principles. The Rainforest Alliance Sustainable Agriculture Standard aims to create a more sustainable world by utilizing social and market forces to safeguard nature and enhance the livelihoods of farmers and forest communities. The Framework for Regenerative Organic Certification (ROC) is based on three key criteria: Soil Health and land Management, Animal Welfare, and Social Fairness, each with specific sub-criteria.

Sri Lankan agriculture also aligns with these global trends in sustainable agriculture. Adopting this trend is essential to effectively integrating and promoting our local agricultural practices on the global stage. However, there is currently an unavailable comprehensive framework or assessment rating system incorporated in the sustainable agriculture context within local conditions. While Good Agricultural Practices (GAP) are established within the Sri Lankan framework, it primarily serve as guidelines offering recommendations for farmers to enhance their agricultural practices, while minimizing environmental impact, ensuring food safety, and improving product quality. However, the GAP farm evaluation process is limited to assessing whether these recommendations are followed, without measuring the extent or quality of compliance [8]. This lack of a mechanism to evaluate the farm system means the requirement of the rating system. A system that integrates a rating mechanism could provide how well farmers achieve these recommendations or the level of sustainability they attain and encourage continuous improvement by rewarding higher levels of achievement [9].

In addition to that, GAP significantly prioritizes the environmental dimension, over the social and economic dimensions in their guideline [10]. While this focus is crucial, it does not fully address the broader needs of agriculture sustainability in developing countries like Sri Lanka, where agriculture serves as the primary livelihood for 25.75% of the employment [11]. Therefore, to achieve sustainability, social and

economic factors should be equally considered. The social dimension directly promotes equitable access to resources, fair wages, safe working conditions, and community development, fostering a stable and motivated farmer workforce [12]. Additionally, with the country facing economic challenges such as inflation, it is vital to consider the economic viability of farming practices, ensuring that they remain affordable and profitable for the agriculture farm system. When developing the framework for Sri Lanka, the country must address and integrate all three pillars of sustainability—environmental, social, and economic—to create a balanced approach.

Due to lack of localisation, existing rating systems for assessing agricultural sustainability in other Western countries, cannot be directly incorporated into the Sri Lankan context. Frameworks developed in Western countries often reflect those regions' unique agricultural systems, technologies, and socio-economic contexts. However, when considering their application in Sri Lanka, the localized framework must address significant differences in farming practices, environmental conditions, and socio-economic challenges. Sri Lankan agriculture predominantly relies on smallholder farms, traditional methods, and region-specific crops [13] , which differ from the industrialized and highly resource-intensive farm systems. Applying those rating systems directly to local farms generates various challenges including inaccurate assessments and recommendations that do not reflect the true sustainability of local practices, and many of these tools require extensive data inputs and complex methodologies [14]. Western countries have progressively developed and refined agricultural sustainability rating tools over the years, enabling gradual improvements in farm sustainability. These tools have evolved through continuous application, feedback, and updates, driving significant advancements in sustainable practices. In contrast, Sri Lanka has yet to take its first step toward implementing sustainability practices in the agricultural sector. Given this gap, starting through a basic rating system for local needs is essential. Such a system would serve as an entry point, enabling farmers and stakeholders to adopt foundational sustainable practices. Over time, as familiarity and capacity grow, this framework can be expanded to address more complex sustainability goals. Therefore, this current study aims to address these gaps and develop a comprehensive rating system to assess the sustainability of agriculture farms in Sri Lanka, including horticulture, plantation, and organic farm systems.

Materials and Methods

The methodology for developing a sustainability rating system for farm operations in Sri Lanka involved reviewing existing research, guidelines, and rating systems to identify primary criteria for sustainable farming (Figure 1). These criteria were validated for local context through the survey with 34 key stakeholders, followed by developingdeveloping indicators for both criteria and sub-criteria. A common model was established, and its reliability was assessed by a technical committee, leading to point allocations for each criterion. After conducting a pilot study, the tool was finalized and endorsed through an expert committee meeting under the Green Building Council of Sri Lanka (GBCSL).

Assessment of Existing Guidelines and Rating Systems

The literature review focuses on seven key papers related to agriculture sustainability from 2010 to 2022. The articles, papers, and document searches were carried out applying the following search terms: "Sustainable agriculture", "Green technologies in agriculture", "Sustainability frameworks", "Best practices in agriculture", "Farmer potential", and "Sustainable farms". These 7 documents were chosen for their relevance despite the limited data on sustainability frameworks in agriculture. Those documents included the SAFA, Rainforest Alliance Sustainable Agriculture Standard, LEAF Marque, ROC, Friend of the Earth, GAP, and National Sustainable Agriculture Standard LEO-4000. The goal of carrying out an assessment was to assess the relevance of selected documents in promoting sustainable agriculture practices across varied contexts and to identify common characteristics by investigating the environmental, social, and economic components of sustainability encoded in these documents.

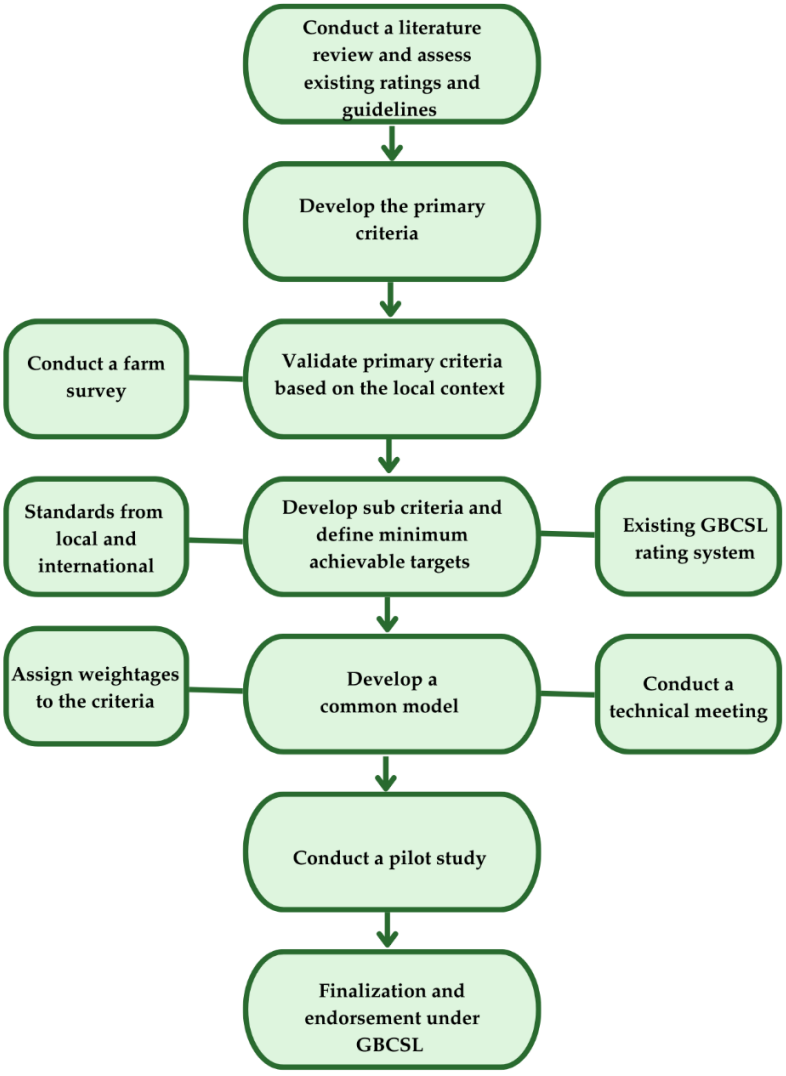

Figure 1. Research flow of the study

Develop Criteria for Rating System by Literature Survey

Key criteria and sub-criteria were extracted based on the literature assessment of existing rating systems, guidelines, and research papers. Relevance, suitability for local contexts, quality, and significance in evaluating the performance were considered in each guidance when developing criteria for the rating system. Primary criteria were developed by data obtained from existing ratings and guidelines assessment. Criteria were aligned with sustainability aspects, including environmental, economic, and social sectors.

Validate the Primary Criteria Based on the Local Context

A survey was conducted with farm top management experts to validate the primary criteria for assessing farm sustainability. Because a literature assessment was not enough to determine the criteria's relevance to Sri Lankan agriculture, which faces unique social, economic, environmental, and legal-political conditions. Thus, survey feedback from local experts helped adapt the criteria to fit local realities, ensuring practical implementation in Sri Lankan farming practices. Using purposive and homogeneous sampling, 34 individuals from top and middle management positions were selected for the survey. Data were collected through structured questionnaires, with respondents rating the importance of sustainability criteria on a hedonic scale from 1 (Not important) to 5 (Extremely important). To maintain confidentiality, all the data were collected anonymously. The responses were analyzed using SPSS to determine the most relevant criteria for farm sustainability.

Develop Indicators for Criteria, Sub-Criteria, and Common Model

Indicators for the criteria and sub-areas were developed using technical reports, industry standards, and government regulations in agriculture. Results from literature surveys, farm surveys, key criteria, and sub-criteria were obtained to create the common model.

Conduct Technical Committee Meeting

A technical committee meeting was held to evaluate the reliability and practicality of the sustainable farm assessment tool, with GBCSL professionals selected for their expertise in energy, water, waste management, and agriculture. The meeting utilized the Focus Group Discussion (FGD) method to gather detailed feedback and recommendations [15].

Point Allocation for Criteria and Sub-Criteria

An analytic Hierarchy Process (AHP) survey was conducted with fifteen experts, including agronomists, agricultural engineers, and researchers, using purposive sampling with GBCSL's assistance. There are no pre-set rules for determining the sample size in AHP surveys, hence 15 agriculture professionals were selected as samples. Structured questionnaires provided experts to rate criteria importance on a 1–9 scale (Table 1). Experienced agricultural professionals participated, and though many were unfamiliar with

AHP, the researcher explained the method to survey participants to ensure accurate feedback. Responses were analyzed using SuperDecisions 2.10 software, with the Consistency Ratio assessed for decision-making reliability [16].

Table 1. AHP scale of importance [17]

AHP scale of importance	Description
1	Equally important
2	Equally to moderately more important
3	Moderately more important
4	Moderately to strongly more important
5	Strongly more important
6	Strongly to very strongly more important
7	Very strongly more important
8	Very strongly to extremely more important
9	Extremely more important

Conduct the Pilot Study

The pilot study was conducted at an organic farm in Piliyandala, Sri Lanka. During the pilot study, farm visits were conducted, and interviews were held with the company's chairman. The assessment is a streamlined approach to evaluating the sustainability of the farm's operations.

Conduct Expert Committee Meeting and Endorsement

The final tool was presented to GBCSL for final approval and implementation.

Results and Discussion

Assessment of Literature Survey

Throughout the publications analyzed (Table 2), there was a strong emphasis on environmental sustainability in agricultural methods. SAFA, for example, emphasizes the significance of reducing environmental impact, preserving biodiversity, and supporting ecosystem health. The Rainforest Alliance Sustainable Agriculture Standard and the Friend of the Earth Standard stress natural habitat protection, soil conservation, and water management methods. These documents recommend employing sustainable land use practices, agroecological techniques, and lower chemical inputs in agricultural ecosystems to reduce environmental degradation and improve resilience. In addition to environmental complications, there was a growing recognition of the need for social sustainability factors in agricultural methods. These included a variety of concerns such as livelihood improvement, occupational health and safety, skill development, social benefits, labor standards, and labor rights. Furthermore, the publications emphasized the importance of general training programs in promoting social sustainability in agricultural communities.

This approach emphasizes the importance of addressing environmental and social factors to create more equitable agricultural systems. However, in contrast with the emphasis on environmental and social considerations, the publications evaluated only two standards, SAFA and the Rainforest Alliance Sustainable Agriculture Standard, which addressed economic sustainability. This could be because these documents prioritize agriculture sustainability, encompassing a broader range of factors beyond productivity improvement. In contrast, other standards and guidelines may primarily focus on enhancing agriculture productivity without comprehensively considering sustainability concerns. Economic aspects included various elements such as internal investment, net income, risk management, traceability systems, and sustainable investment.

Table 2. Results of literature assessment

Source	Sustainable Dimensions		
	Environment	**Social**	**Economic**
SAFA Guidelines Version 3.	GHG reduction, Air quality management, Soil management, Natural conservation, Energy management, Nutrient balance, Waste management, Animal management	Right to quality of life, Gender equality, Health and safety, Capacity development, Forced labor, Child labor	Internal investment, Net income, Risk management, Traceability system
Rainforest Alliance Sustainable Agriculture Standard, Farm Requirements Version 1.3	Riparian buffers, Wastewater management, Waste management, Energy efficiency, GHG reduction, Planting and rotation, Genetically modified organisms, Soil conservation, IMP, Agrochemical management, Post-harvest practices	Living wage, Health and safety, Work conditions, Housing and living conditions, Communities	Traceability, Sustainable investment, Sustainable differential, Production cost and living income
LEAF Marque Standard Version 16.1	Soil management and fertility, Crop health and protection, Pollution control, Animal husbandry management, Energy efficiency, Water management, Landscape and natural conservation,	Employ welfare, Training and awareness, Health and safety	
Framework for Regenerative Organic Certified	Water management, Regenerative practices, Fertilizer management, Wastewater management,	Child labor, Forced labor and hiring, Equal pay, Employment relationship, Hours	

	Waste management, Animal welfare	of work, Health and safety
Friend of the Earth Standard	Ecosystem preservation, Wildlife and flora protection, Use of hazardous substances, Agricultural production system, farming, Soil resources, Water resources, Emissions control, Waste management, Power management,	Social responsibility
Sri Lanka Good Agriculture Practices - Techno Guide	Management, Site Selection, Fertilizer Management, Soil Management, Pesticide Management, Water Management, Post Harvesting Management	
National Sustainable Agriculture Standard LEO-4000	Production System, Soil Resources, Water Resources, Air Quality, Biotic Resources, Energy Resources, Waste Management,	Health and Safety, Worker Protection, General training,

Develop Criteria for Rating System by Literature Survey

As the literature assessment results (Table 3) show, greater emphasis was placed on environmental considerations than on social and economic factors when developing the criteria. As a result, more primary criteria were defined for the environmental component than the social and economic aspects.

Table 3. Primary criteria of rating system

Main Criteria	Sub Criteria
Environmental Criteria	Natural conservation
	Soil management
	Integrated Fertilizer usage
	Integrated pesticide usage
	High-efficiency water usage
	High-efficiency energy usage
	Renewable energy usage
	Proper waste management

Economic Criteria	Management of the financial state
	Sustainable marketing strategies
Social Criteria	Employee health and safety management
	Employ welfare
	Provide job opportunities

Validate the Primary Criteria Based on the Local Context

In part of the survey, farm managers in Sri Lanka were asked to prioritize sustainability components including environmental, social, and economic concerns and rank them from 1 (High priority) to 3 (Low priority). All respondents ranked the environment as the top priority (Figure 2). For the economic category, 65% assigned it as priority level 2. Meanwhile, 35% ranked the social category as the lowest priority at level 3. Thus, the environment held the highest priority, followed by economic concerns, with social concerns being the lowest priority.

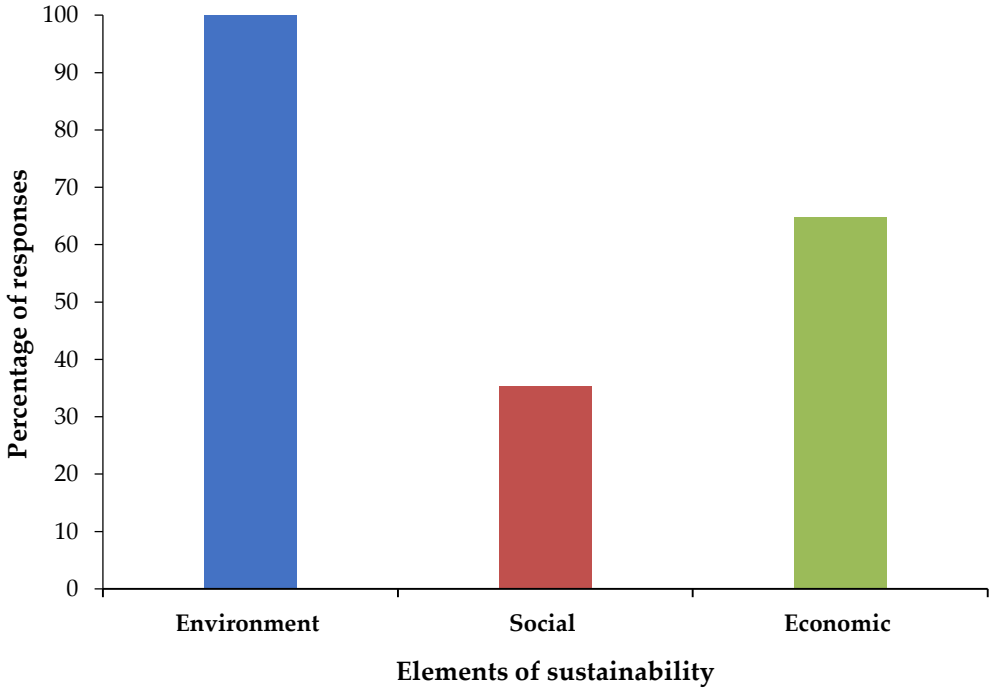

Figure 2. Percentage of respondents with prioritize the level of sustainability aspects

The research findings showed that sustainability priorities were initially environmental, social, and economic. However, the survey indicated a shift, with economic factors becoming more important than social ones, likely due to Sri Lanka's challenging economic conditions, especially inflation's impact on agriculture [18]. Consequently, when developing the rating tool, environmental factors were prioritized first, economic factors, and social aspects. In second part of the survey, respondents were given a rating for the factors appropriate to evaluating the farms' sustainability. Those criteria were constructed based on the

findings of a previous literature assignment participants rated sustainability criteria on a hedonic scale. Any criterion with an average rating above 3 ("Moderately Important") was considered acceptable for assessing local farm sustainability.

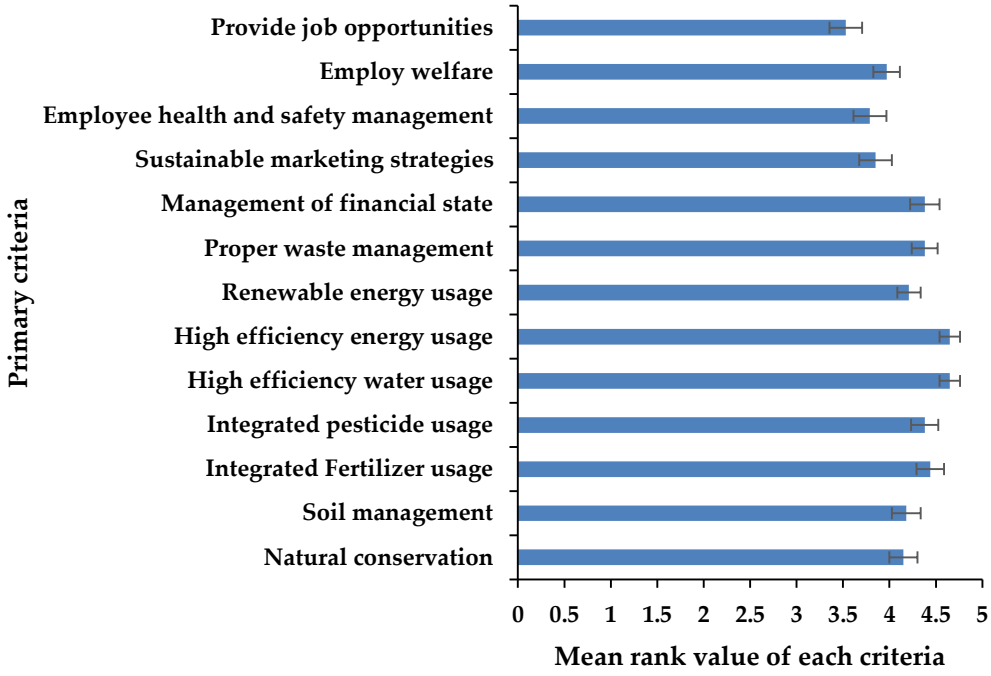

Figure 3. Ranking of Sustainability Criteria for Farm Evaluation Based on Survey Feedback

According to the results of one sample t-test (Figure 3), all the criteria are significantly different from 3, under a 0.05 significant level, since each p-value is lower than 0.05. Also, the mean value for each criterion is higher than 3. Therefore, the average value for each criterion was statistically higher than 3. Thus, all considered criteria can be accepted as locally valid criteria for further development of the farm sustainability framework. The Bar chart results revealed that environmental sustainability practices are prioritized over social and economic factors. Natural conservation, soil management, and integrated fertilizer and pesticide usage rank the highest, reflecting the growing importance of environmental preservation in line with global sustainability goals. The focus on high-efficiency water and energy usage further emphasizes the need for resource optimization. In contrast, social factors like job creation and employee welfare rank lower, suggesting they receive less attention, potentially due to a stronger emphasis on immediate environmental concerns. Employee health and safety management ranks higher among social factors, likely due to its direct impact on operational efficiency. Mid-level rankings for waste management, renewable energy usage, and financial management suggest that while these are important, they may not be considered urgent priorities compared to environmental efforts. Overall, the findings a need for a more balanced approach to strengthen social and economic sustainability alongside environmental practices.

Develop a Common Model

Indicators were developed under each verified criterion and sub-criterion in the Sri Lankan context. These indicators based on technical reports, industry standards, and government rules applicable to the agriculture sector. This common model is illustrated in Table 4, which acts as the final level of criteria development.

Table 4. Model of rating system

Sustainable Farm Rating System	
Criteria	
1.0 MANAGEMENT	
1.1	General Management
	1.1.1 Green Accredited Professional
	1.1.2 Legal Documents
	1.1.3 Awareness Session for the Farm Team
	1.1.4 Conduct on-Farm Research and Development
1.2	Natural Conservation
1.3	Green Finance Management
	1.3.1 Financial Analysis
	1.3.2 Sustainable Investment
	1.3.3 Sustainable Marketing
	1.3.3.1 Agro Tourism
	1.3.3.2 On-Farm Marketing Strategies
2.0 INTEGRATED CULTIVATION MANAGEMENT	
2.1	Land and Soil Conservation
	2.1.1 Selected Suitable Land
	2.1.2 Soil Erosion Control
2.2	Integrated Fertilizer Management
	2.2.1 Balance Usage of Organic and Chemical Fertilizers
	2.2.2 Conduct a Growing Media Test Before Applying Fertilizer
2.3	Integrated Pesticide Usage
	2.3.1 Integrated Pest Management Plan
	2.3.2 Prevent Usage of Banned Pesticide
	2.3.3 Reduce the Negative Effect of Chemical Pesticides
2.4	Maintain Storage

3.0 WATER EFFICIENCY	
3.1	Water Performance Measure
3.2	Water-Saving Strategy
3.3	Use a High-Efficiency Irrigation System
3.4	Use Safe Water for Cultivation
3.5	Innovative Wastewater Technologies
	3.5.1 On-farm Wastewater Treatment Unit
	3.5.2 Discharge Wastewater Quality
3.6	Alternative Water Usage
3.7	Technologies Used for Groundwater Recharge
4.0 ENERGY EFFICIENCY	
4.1	Energy Audit
4.2	Use of Energy-Efficient Equipment and Devices
4.3	Use of On-Site Renewable Energy
	4.3.1 Utilize Non-Solar Renewable Sources to Generate Energy
	4.3.2 Utilize Solar Energy for Power Generation
4.4	Green House Gas Reduction
	4.4.1 Implement GHG Reduction Plan
	4.4.2 Implementing Carbon Offset Initiatives
5.0 WASTE MANAGEMENT	
5.1	Implement Waste Management Policy
5.1.1	Waste Map
5.2	Proper Storage and Collection of Waste
5.3	Solid Waste Management
	5.3.1 Solid Waste Management- Organic Waste
	5.3.2 Solid Waste Management- Durable Goods
	5.3.3 Value-Added from Waste Materials
5.4	Hazardous Waste Management
6.0 SOCIAL RESPONSIBILITIES AND AWARENESS	

6.1	Employee Health and Safety
6.2	Support Local Community
6.3	Provide Job Opportunities
6.4	Employee Welfare

Assign Weightages to the Criteria

Each of the criteria of the rating tool was weighed using an AHP survey approach. AHP involved combining ratings to establish overall scores, with pairwise comparisons normalized to sum to one. A square matrix was used to allocate weights, and expert responses' geometric mean determined each criterion's relative importance (Figure 4). The validation of the AHP process was confirmed by a consistency ratio (CR) of 2.18%, well below the recommended threshold of 10% from AHP literature [19], indicating high consistency in the survey results.

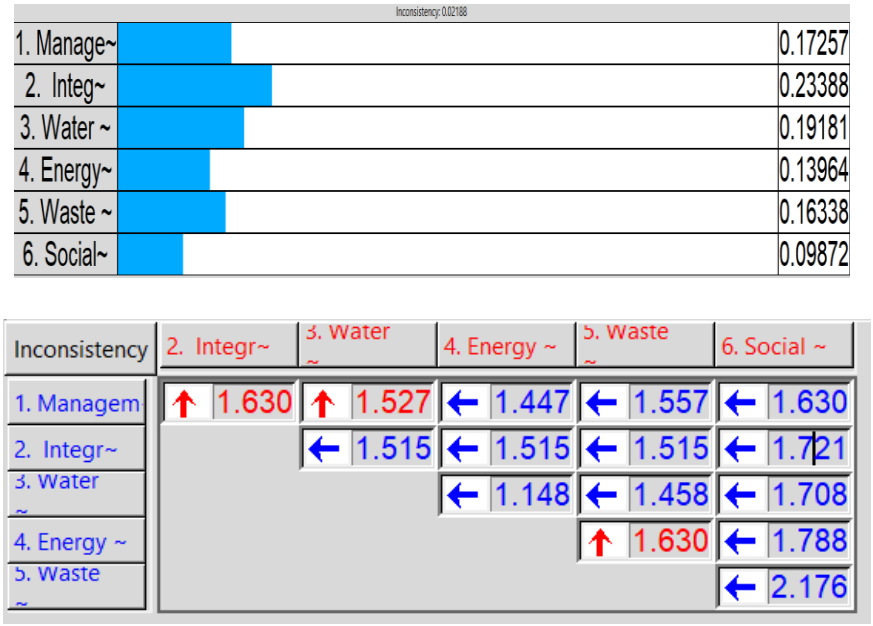

Figure 4. Pairwise comparison of the criteria - Results of SuperDecisions 2.1 software

In analyzing the criteria weights (Figure 5), Integrated Cultivation Management is prioritized as the most critical due to its comprehensive approach, including land and soil conservation, integrated fertilizer management, pest management, and overall farm resilience. Water Efficiency is ranked second, underscoring its importance due to water scarcity challenges and the need for strategies like high-efficiency irrigation and wastewater management. Management Practices are third, as they are fundamental to the success and sustainability of farm operations. Waste Management is fourth, focusing on reducing waste and pollution while maximizing resource efficiency. Energy Efficiency is ranked fifth, reflecting its comparatively lower weight. This lower priority stems from the significant initial investment required for energy-saving strategies, which can be a barrier for many farms despite their long-term benefits. Lastly,

Social and Cultural Awareness is ranked lowest, indicating its lesser focus than other criteria in the rating system.

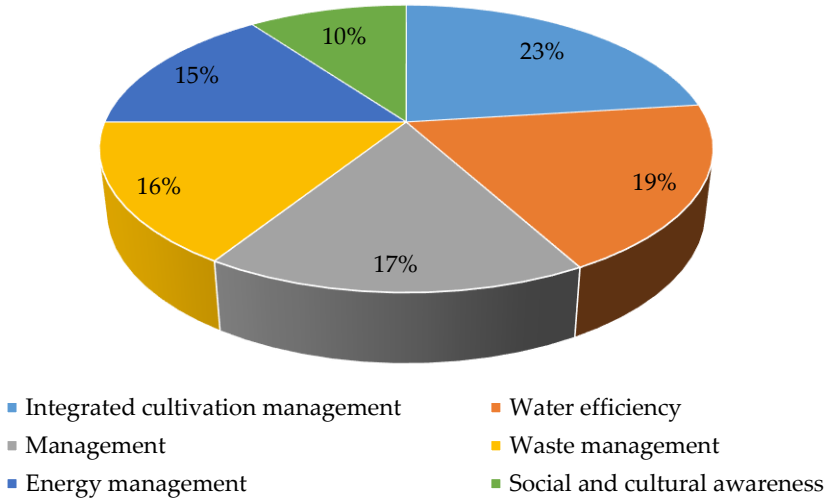

Figure 5. Weightage of each criterion according to pairwise comparison

Conduct Pilot Study

The pilot study was conducted at an organic farm in Piliyandala, Sri Lanka. Using the farm sustainability assessment tool, the organic farm scored 65 out of 100 points (Table 5), which highlights certain gaps in its sustainability practices despite being an organic operation.

Table 5. Results of the pilot study

Criteria	Available points	Claim Points
Integrated cultivation management	23	15
Water efficiency	19	10
Management	17	12
Waste management	16	12
Energy management	15	8
Social and cultural awareness	10	8

One central area of weakness was Green Finance Management, where the farm scored zero points in sustainable investment and financial analysis. This could be due to a lack of financial documentation or failure to allocate the required percentage of profits towards sustainability initiatives. Another critical area was Water Efficiency, where the farm did not implement water-saving strategies, lacked an operational wastewater treatment unit, and did not fully use alternative water sources. These deficiencies suggest inefficiencies in water conservation and recycling.

Additionally, under Energy Efficiency, the farm failed to perform an energy audit, use energy-efficient equipment, or maximize renewable energy sources like solar power, significantly reducing its score. While the farm did well in managing organic waste, it lost points in Waste Management for not reusing or recycling enough durable goods. Overall, the farm's performance reflects a need to improve financial investments in green practices, water and energy conservation measures, and comprehensive waste recycling strategies to achieve a higher sustainability rating.

Conclusion

A developed rating system to assess sustainability in Sri Lankan agricultural farms was finalized in the research. The research showed a suitable framework for evaluating Sri Lankan farms' sustainability practices. This rating tool consists main 6 main criteria, including management, integrated cultivation management, water efficiency, energy efficiency, waste management, and social and cultural awareness. This rating system can achieve 8 sustainable goals outer 17 sustainable developing goals, including SDG 02, SDG 03, SDG 6, SDG 7, SDG 8 SDG 12, SDG 13, and SDG 15. Farms interested in converting their conventional farm systems to sustainable systems can be converted under these measurements. To further improve this study, future rating system should be developed to assess animal farms. Conducting multiple pilot studies will enhance the system's reliability and validity. The content of the rating system should be regularly updated to reflect new research and industry practices, and continuous feedback from users should be gathered to improve the system over time.

Conflicts of Interest

The authors certify that they have no afflictions in any organization in the subject matter or materials discussed in this manuscript.

References

[1] Meul, M., Passel, S., Nevens, F., Dessein, J., Rogge, E., Mulier, A., and Hauwermeiren, A., MOTIFS: a monitoring tool for integrated farm sustainability. Agronomy for Sustainable Development, **2008**. 28*(2)*, 321-332. 10.1051/agro:2008001.

[2] Cruz, A., *Flipping the issue: Agriculture contributes to climate change?*, in *World Agroforestry Centre (ICRAF) and CCAFS Southeast Asia*. 2016: Wageningen University & Research Lumen building, Droevendaalsesteeg 3a, 6708 PB Wageningen, The Netherlands.

[3] Smith, P., Martino, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., McCarl, B., Ogle, S., Mara, F., Rice, C., Scholes, B., and Sirotenko, O., *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. **2007**, Cambridge, United Kingdom; New York, NY, USA: Cambridge University Press.

[4] Kohli, R., Singh, D.H., Batish, D., and Jose, S., *Ecological interactions in agroforestry: An overview*, in *Ecological Basis of Agroforestry*. **2007**. pp. 3-14.

[5] R. Malini, J. Ebanisha, and M. Lakshmi, "Sustainable agriculture is a stimulator to stretch out sustainable development goals," London Journal of Social Sciences, pp. 96–107, Sep. **2023**, doi: 10.31039/ljss.2023.6.109.

[6] Musumba, M., Grabowski, P., Palm, C., and Snapp, S., Guide for the Sustainable Intensification Assessment Framework. SSRN Electronic Journal, **2017**. 10.2139/ssrn.3906994.

[7] Bachev, H., A Framework for Assessing Sustainability of Farming Enterprises. Journal of Applied Economic Sciences (JAES), **2016**. XI*(39)*, 24-26.

[8] Bamunuarachchi, B.A.D.S., Hitihamu, H.M.S.J.M., and Lurdu, M.D.S., *Good Agricultural Practices (GAP) in Sri Lanka: status, challenges and policy interventions*, in *Research report / Hector Kobbekaduwa Agrarian Research and Training Institute*. **2019**: Colombo, Sri Lanka.

[9] Kharel, M., Dahal, B.M., and Raut, N., Good agriculture practices for safe food and sustainable agriculture in Nepal: A review. Journal of Agriculture and Food Research, **2022**. 10*(100447)*, 100447. 10.1016/j.jafr.2022.100447.

[10] Mohd Suib, N.A.b., Salleh, N.H.M., Shukor, M.S., Chamhuri, N., Shahimi, S., Salleh, K.M., and Hashim, K., The Influence of Good Agricultural Practice (GAP) on the Productivity and Well-Being of Malaysian Sustainable Palm Oil (MSPO)-Certified Independent Smallholders in Malaysia. Agriculture, **2023**. 13*(5)*, 990. 10.3390/agriculture13050990.

[11] N. Tirivayi, M. Knowles, and B. Davis, "The interaction between social protection and agriculture: A review of evidence," Global Food Security, vol. 10, pp. 52–62, Sep. **2016**, doi: 10.1016/j.gfs.2016.08.004.

[12] Tirivayi, N., Knowles, M., and Davis, B., The interaction between social protection and agriculture: A review of evidence. Global Food Security, **2016**. 10, 52-62. 10.1016/j.gfs.2016.08.004.

[13] Gunawardana, P.J. and Somaratne, W.G., Non-Plantation Agricultural Economy of Sri Lanka: Trends, Issues and Prospects. Sri Lankan Journal of Agricultural Economics, **2011**. 3*(0)*, 15. 10.4038/sjae.v3i0.3490.

[14] Streimikis, J. and Baležentis, T., Agricultural sustainability assessment framework integrating sustainable development goals and interlinked priorities of environmental, climate and agriculture policies. Sustainable Development, **2020**. 28*(6)*, 1702-1712. 10.1002/sd.2118.

[15] Khan, M.A., Wang, C.C., and Lee, C.L. *A Framework for Developing Green Building Rating Tools Based on Pakistan's Local Context*. Buildings, **2021.** 11, DOI: 10.3390/buildings11050202.

[16] Ali, H.H. and Al Nsairat, S.F., Developing a green building assessment tool for developing countries – Case of Jordan. Building and Environment, **2009**. 44*(5)*, 1053-1064. https://doi.org/10.1016/j.buildenv.2008.07.015.

[17] Khalil, N., Kamaruzzaman, S.N., and Baharum, M.R., Ranking the indicators of building performance and the users' risk via Analytical Hierarchy Process (AHP): Case of Malaysia. Ecological Indicators, **2016**. 71, 567-576. 10.1016/j.ecolind.2016.07.032.

[18] I. Abeysekera, "The Influence of Fiscal, Monetary, and Public Policies on Sustainable Development in Sri Lanka," Sustainability, vol. 16, no. 2, Art. no. 2, Jan. **2024**, doi: 10.3390/su16020580.

[19] Taherdoost, H., Decision Making Using the Analytic Hierarchy Process (AHP); A Step by Step Approach. International Journal of Economics and Management Systems, **2017**.