The Accounting Role to Implement the Sustainable Development Goals (SDGs) at Saudi Agricultural Companies

KHALED HAMDEN ALSHAMMARI
Department of Accounting,
College of Business, Jouf University,
SAUDI ARABIA

Abstract: - This study examines how Sustainable Development Goals (SDGs) that are institutionally implemented in Saudi agricultural companies. It emphasizes specific measurable and accountable aspects of the accounting, governance and sustainability. It is based on qualitative content analysis. It reviews 146 company and benchmark documents which covering 21 Saudi agricultural- companies from 2019 to 2025. There is evidence for all 17 SDGs. It deep dives into five contextually relevant goals SDGs 2, 6, 12, 13 and 15. There's a clear coding system to differentiate disclosure evidence from implementation evidence and from actual sustainability performance. The findings reveal that there are two separate layers, with six companies having relatively integrated implementation architectures, and a larger number of companies being partially institutionalized or not well evidenced. It relates SDG implementation with accounting systems, accounting practice, performance indicators, assurance, governance, corporate reporting mechanisms.

Key-Words: - Saudi Agriculture Companies; Sustainable Development Goals; Sustainability Disclosure; Corporate Governance.

Received: September 11, 2026. Revised: October 2, 2026. Accepted: October 14, 2026. Published: November 24, 2026.

1 Introduction

Accounting systems play a key role in credible sustainable development, as they act as a bridge between the environmental and the social activities and create structured information. These systems are quantifiable, comparable, monitorable and reportable. The following areas are key points in how sustainability accounting can contribute to SDG implementation: recognition of the costs of the environment; design of the performance indicators; tracking the targets; internal control; assurance. The integration of non-financial information can be into corporate reporting and governance processes. Thus, the study will not consider accounting only a reporting language in this context. An institutional mechanism, however, assists in the process of converting sustainability commitments to actionable processes within the organization. This is more crucial for the agricultural companies in Saudi Arabia, where they are at the nexus of food security, water scarcity, climate exposure, land use, ecosystems, and resource efficiency. Food security, efficiency and sustainable resource use are among the national transformation priorities of Saudi Vision [1] and the Ministry of Environment, Water and Agriculture (MEWA) (2025a).

The approach adopted in this study is a qualitative method based on documents, which included 21 Saudi companies that operate in the agricultural sector and have 146 documents and reports covering a seven-year period (2019-2025). Evidence base includes sustainability and ESG reports, annual reports, board reports, financial statements, prospectuses, policy documents, performance-data files, official websites and institutional and benchmark materials. It broad sends the scope of SDGs to the broader 17-SDG field and then narrows the focus to five goal areas. It gives the bigger picture of SDGs the 17-SDG field, and then it gets focused on the five goal areas. These play a crucial role in Saudi agriculture. It then identifies reoccurring implementation constraints. It creates an adaptive approach to translating sustainability relevance to actionable and controllable implementation that is context dependent.

Although agriculture plays a crucial role in Saudi Arabia's food security, water management, and environmental sustainability, the extent of sustainability accounting and SDG institutionalization in Saudi agricultural companies is still not well understood. Implementing an SDG or improving the sustainability performance can't be proven by existing disclosure. In response to the four research questions as outlined, this study is divided into four sub-studies as follows: RQ1. What

are the 17 SDGs that are reflected in Saudi agricultural companies and what is the level of evidence for each company? RQ2. How is SDG 2, 6, 12, 13 and 15 manifested and institutionalised throughout the sector and how does full implementation differ from partial implementation? RQ3. What are the institutional and operational challenges to greater progress towards these five goals? RQ4. What context-sensitive framework can enhance accounting, governance, measurement and reporting systems for Saudi agricultural companies related to SDG implementation? The study purpose is to map the SDG evidence at company level and looks at the depth of implementation. It establishes common obstacles and proposes a viable plan based on the actual evidence.

The rest of paper is organized as follows. The literature review is reviewed in section 2. The methodology and coding protocol are explained in Section 3. The results are presented and discussed in Section 4. Section 5 ends with suggestions for future studies, limitations and implications of this research.

2 Literature Review

Previous studies have highlighted the ability of the sustainability accounting in agriculture to go beyond the purely financial reporting of any other sector and to integrate environmental, social and operational aspects into management and accountability frameworks. The importance of analytical and management-accounting support for sustainable agricultural development is stressed by [2], [3] which expounds on the fusion of the environmental, social and accounting dimensions. Also, linking integrated accounting methods to transparency and sustainable agricultural management [4], while [5] finds a positive correlation between green accounting and sustainable development in agricultural context. These studies provide support to the relevance of accounting to sustainability. They are not, however, able to prove that company-level SDG that are commitments become governance structures, measurable indicators, assurance and recurring reporting in the Saudi agricultural context.

Therefore, the issue is not that sustainability language is not there, it's that it's not very deep in the institutionalization. Some companies publish material topics, governance mechanisms, performance indicators and information which is subject to external review. Others stay at the sectoral relevance or at general strategic level. Previous research has explored sustainability disclosure and ESG risk in agriculture, yielding valuable insights [6], [7]. There are however three areas that need improvement. First, disclosure breadth is often seen as equivalent to implementation depth. Secondly, there has been limited research interest in the differences between good and poor implementation of accounting systems, targets, KPIs, assurance and governance. Third, the Saudi agriculture sector is an under-researched differentiated company-level implementation landscape.

This study aims at filling these gaps by separating three analytically distinct concepts. Disclosure evidence is what a company makes public and/or says. Implementation evidence are institutionalized mechanisms. The governance responsibility, policies, targets, regular KPIs, accounting or data systems, and the processes related to assurance, for instance. Sustainability performance is the actual results expressed as measured progress towards a baseline or target. Disclosure is thus not considered to be evidence of implementation, and implementation evidence is not considered to be evidence of superior sustainability performance. This separation is important in the coding protocol, and in the interpretation of the results.

Originality in relation to the author(s)' previous work: The present study is based on a unique Saudi agricultural-company corpus, a company-level SDG implementation coding matrix, a five-priority-SDG assessment and eight-dimensional implementation framework based on accounting, governance, measurement and reporting. This analysis does not use any data collected from any of the author's own previous university-based sustainability research activities at the level of the dataset, table or company. The conceptual overlap is restricted to the general SDG/sustainability research field and the empirical context, the unit of analysis, the evidence base, coding process and the analytical results are specific to this study.

2.1 Sustainability Disclosure in Agricultural Sector

Agricultural sustainability disclosure is still very patchy. [6] present information on agri-food sustainability that is often not consolidated in a single report, but rather in various reporting formats. Research in the Gulf region also suggests disclosure that varies based on the quality of governance, legitimacy concerns, the expectations of investors and the companies' capacities [8], [9]. Additionally, Saudi evidence indicates that sustainability reporting could be linked to the reputation, investment effectiveness and financial results [10], [11]. This study purpose, however, disclosure quality is

evaluated in terms of the evidentiary input, not as a direct measure of implementation and performance.

2.2 Company Engagement with the SDGs: From Alignment to Implementation

The second stream is focused on the linkages enterprises create between their activities and the SDGs. The Global Reporting Initiative and the United Nations Global Compact call on organisations to select material SDGs, integrate their inclusion in running the organisation and report on progress [12]. However, firms might mention SDGs, put up the SDG icons, or outline their sustainability initiatives without setting measurable goals, board sponsorship, regular KPIs, accounting procedures, or proof of performance. This study thus views SDG relevance, disclosure, implementation and performance as related, but different concepts.

2.3 Sustainability under Agricultural System Pressure

The third literature stream is particularly applicable to situations of water scarcity, climate exposure, and agricultural-system pressure. In these contexts, sustainability is not just a matter of reputation, but also of continuity of production, environmental sustainability and policy resilience. The national policy documents include a strategic focus on food security, water management, and sustainable governance of water resources [1], [13], with the guidance of the FAO focusing on water productivity and water efficiency in Saudi irrigation [14]. Water, land, climate and value chains are not separate issue domains, but interdependent, as revealed by research on food systems [7], [15].

3 Methodology

The qualitative content analysis in this study is used based on the principles of document analysis and content analysis as described by [16], [17] and [18]. The key point with the analytical objective is not to conclude sustainability performance from narrative disclosure but to uncover the level of SDG institutionalization in the Saudi agricultural companies by the public. The study compares governance arrangements, policies, accounting and measurement systems, targets, recurring KPIs, assurance-related evidence, and on-going corporate reporting related to SDG-related claims to determine if they support them.

There were four stages to the analysis. First, all evidence at the company level was reviewed to determine which evidence was available for the wider SDG 17 goals. Second, SDGs with relevance to Saudi agricultural activities and national policy goals were limited to those relevant to the agricultural sustainability scholarship [1], [13], [14], [6] and were SDG2, SDG6, SDG12, SDG13 and SDG15. Third, the company corpus was used to identify the recurring implementation constraints inductively. Finally, the company findings were combined with references from Saudi, regional, and international sources to formulate the eight-dimensional framework.

The documents reviewed for this evidence base were comprised of 146 documents from 2019 to 2025. The materials from the companies used were supplemented with external materials from institutions and/or benchmarks to assist with interpretation of the findings and the development of the framework and were included in the corpus. Company evidence comprised sustainability and ESG reports, annual and board reports, financial statements, prospectuses, policy documents, performance-data files and disclosures on the company's website. However, the sample analysis was limited to sustainability reports only, given that several companies did not have stand-alone sustainability reporting, so the same document strategy was applied to the sample [6].

The final company-level analytical sample included 21 Saudi agricultural-related companies in the Food & Beverages field, which comprised Almarai, SADAFCO, Savola, NADEC, Tanmiah, JADCO, ENTAJ, Arabian Mills, First Milling Company, Fourth Milling Company, JAZADCO, Saudi Fisheries, Halwani, Naqi Water, Nofoth, Eastern Development, Sinad, Tadco, Wafrah, Modern Mills and Gaco. The sample included companies that were relevant to the sectors under study and companies where sectoral evidence was available at the company-level during the study period. The companies that either did not have a defensible SDG implementation classification or did not have enough evidence to substantiate that classification were not excluded from the sample but were coded as insufficiently evidenced.

The study used mixed deductive and inductive aspects of coding. The deductive part relied on the SDG architecture and reporting guidance on SDG integration, developed by SDG architecture and reporting [12], [19]. An SDG screening of each company file, as well as materiality mapping, ESG priorities, governance responsibility, policy commitments, targets, KPIs, accounting or performance-data systems, and evidence of assurance, was conducted. The inductive aspect identified persistent trends like disclosing depth

differentials, water dependence, recognition of climate risks, value chain disintegration, disclosing policy translation.

Four level coding system was used, which was transparent. For 'actual' implementation, there must be evidence of institutionalisation, not just the alignment of narratives, but evidence of a structured governance or policy process that is supported by recurring measurable evidence, like targets, KPIs, performance data, or assurance-oriented reporting. Evidence was close, but not complete: continuity, assurance or institutional depth, 'partial-to-actual' was used. Partial (including partial/sectoral) cases needed to be credible for SDG-related action, or to have enough governance depth, quantified reporting, continuity and corroborating evidence, but were not sufficiently strategically relevant. If the available corpus was not sufficient to give a defensible implementation classification, it was classified as 'insufficient'. They are not direct ratings of underlying sustainability performance, but rather categories to reflect the evidence available to the public on implementation strength.

3.1 Coding Protocol, Decision Rules, and Analytical Consistency

The coder noted: (1) the source of the document; (2) the SDG/sustainability issue evidenced; (3) the type of evidence provided either as a narrative disclosure, evidence as part of a governance or policy, evidence as part of a target or KPI, as measured performance data or as assurance related evidence; and (4) the evidence category that resulted. If several documents were available, the highest rating was given only if supporting evidence for this were provided and the evidence was not judged based on consistency of the narrative. This matrix was then used to re-check the revised Table 1, Table 2 and Table 3 in the Appendix so that each total of aggregates could be identified from the coding provided by the companies.

To enhance the reproducibility, the revised analysis was done using a coding matrix of companies by SDGs, explicitly, and recalculating all the descriptive counts directly from Table 1 (Appendix). The evidence for each classification was rechecked against the rules stated in each classification during revision and where evidence was ambiguous, the lower-level classification was retained, and not upgraded by inference. As this is a single author study of a document, there is no inter-coder agreement coefficient reported, but transparency is provided using explicit coding rules, company-level evidence rationales, a conservative decision rule, and a traceable reconciliation of Table 1, Table 2 and Table 3 in the Appendix. A conceptual sensitivity check was also performed treating 'partial-to-actual' as a partial instead of actual did not affect identification of the 6-company integrated/actual leadership tier.

4 Results and Discussion

The framework has been developed by analytical synthesis of four evidence layers: First, the strongest cases that have been used across Saudi companies; Second, the most frequently occurring challenge patterns across the company corpus; Third, the Saudi policy priorities; and fourth, regional and international benchmark practices. To enhance interpretive credibility, source triangulation, repeated company comparisons and conservative classifications thresholds were employed. The results are reported in the same order as the analysis, mapping of goals (17 goals), assessment of goals in relation to the five priority SDGs, the diagnosis of the challenges and the resulting implementation framework.

4.1 Company Size, Organizational Readiness, and Capital Capacity

Implementation depth is focused on a limited number of companies that have better reporting systems, governance structures and organizational capacity. The integrated / actual tier has Almarai, SADAFCO, Savola, NADEC, Tanmiah and JADCO in the sample. It is important to note that this pattern is not an indication of automatic company size and improved sustainability performance. Instead, it may be easier for an organization to have the resources to maintain ESG responsibilities, accounting and data systems, stand-alone reporting, recurring KPIs, assurance processes, and cross-functional coordination. The level of disclosure and reporting sustainability issues is dependent on company characteristics including size, corporate governance development, market visibility and resources [9], [20]. Previous studies suggest that companies with higher size levels disclose more widely as they are subjected to greater legitimacy concerns and external scrutiny [8], [11]. In the present sample, the more sophisticated companies provide information on material topics, governance structures, and targets; in some instances, they also provide externally reviewed information. However, a few companies, such as ENTAJ, Nofoth, Halwani and some milling companies, demonstrate appropriate sustainability action, while reporting is more selective and not as institutionalized.

The results therefore indicate that implementation depth is more widespread for larger and better prepared companies, but they also suggest that size is not a good proxy for implementation depth. From a practical perspective, the size of the company, its organisational readiness and its capital capacity affects the extent to which sustainability implementation can shift from isolated activities to a system of accountability. The expectations of regulators should then take account of variations in organizational capabilities ensuring there is a clear benchmark for credible disclosure and implementation evidence.

4.2 Company-Level SDGs Implementation Patterns across the 17 Goals

The implementation and documentation of the 17 SDGs are not the same for Saudi agricultural companies. Rather, they are spread across a spectrum of structured, institutionally sustained sustainability systems to some level of engagement and limited or insufficient evidence. However, sustainability performance cannot be assumed from food-related activities, and needs to be backed up by governance arrangements, measurable targets, dynamic indicators and ongoing disclosure [6].

The 6 most advanced companies are Almarai, SADAFCO, Savola, NADEC, Tanmiah and JADCO. The partial-to-actual position is taken by ENTAJ, and a larger middle group consisting of Arabian Mills, First Milling Company, Fourth Milling Company, Halwani, Nofoth, JAZADCO, Naqi Water, Eastern Development and Saudi Fisheries can be seen as structurally relevant without structural institutional depth. While there are widespread references to national development priorities, a number of these are not substantiated by evidence for SDG implementation, including in Sinad, Tadco, Wafrah, Modern Mills, and Gaco.

In all the analysis, SDG 2, 6, 8, 12 and 13 are the most frequently mentioned goals. They stand out due to the fundamental challenges that are intrinsic in agricultural production systems, such as food availability, water dependency, labour availability, processing efficiency, packaging, logistics, and climate exposure [7]. What is unique about the more advanced companies is their ability to transform the relevance of the sector into governance arrangements, targets, measurement systems and performance accountability. Table 1 in the Appendix presents a small number of companies that have a wide and explicit SDG architecture, and a larger sample of those that have more limited or selective sustainability engagement, or that do not have a sustainability architecture. The higher the SDG coverage, the more often SDGs are found in stand-alone sustainability reports and the more advanced the governance is in the reviewed corpus. The pattern indicates that implementation breadth is not only linked to the exposure of a sector but also to its organizational maturity. The size of the company, the capital available, and their organization readiness also seem to influence the ability to keep stand-alone reporting, cross-functional coordination of ESG and formalized performance-management systems.

4.2.1 Company Size, Capital Strength, and Organizational Readiness

The classification does not include volume of sustainability disclosure as an outcome. Rather, it reviews the institutional framework for implementation. Almarai, SADAFCO, Savola, NADEC, Tanmiah and JADCO combine the highest level of governance with reporting that is recurring, measurable and has a degree of structured evidence of sustainability. The capacity for coordination and reporting is important for these features, but they should not be regarded as evidence that it is always better for the six companies regarding sustainability. The size and capital of a company are not in indicative of the Saudi context. Instead, they seem to have an indirect impact on how implementation is carried out, through influencing the resources available for reporting systems, sustainability coordination, data infrastructure, and assurance. Similar findings are presented by [11] and [21] who indicate that sustainability maturity rests on governance capacity, organizational systems and reporting resources. The size-capacity relationship is more pronounced in the case of Almarai, Savola, and NADEC, where the coverage of SDGs is relatively high and the governance, disclosure, and performance-management systems are relatively well developed. Meanwhile, it is revealed that the results are not just about size. JADCO is also informative because it doesn't always fit into the ‘biggest companies scale’ category, but it does make its way to the actual-implementation category in the following ways: its ESG and Sustainability Reporting for 2024, its product-stage SDG mapping and its disclosure in relation to governance. This represents a relative degree of organisation readiness. JADCO is thus able to offer a counter point: preparedness is important, as is the existence of an internal architecture that can govern sustainability systematically, and the effect of capital and size is mediated by this.

A small or medium company can be relevant to the SDGs in its activities but not fully be classified

as such if it does not have the governance systems, consistency of reporting or data infrastructure in place to account for this. However, a company that is more well-equipped could show more implementation evidence than one would expect given its size. The more defensible interpretation that is not the big companies are necessarily more sustainable, but the sustainability institutionalization will be more likely under a more ready company and stronger capitalization. Size and capital have some relevance because they facilitate better reporting, governance and assurance frameworks, but not sustainability maturity. For this reason, the size of the company and the capital are not considered independent statistical predictors in this study.

4.3 The Five Priority SDGs: Implementation Depth and Practical Meaning

The deeper analysis is on five SDGs that are particularly relevant to Saudi agricultural companies: SDGs 2, 6, 12, 13 and 15. Their prioritization is the result of the integration of three layers of analysis: structure of the company corpus, Saudi policy priorities, and FAO guidance on the topic of irrigation and food systems in the Saudi context ([1], [13], [14]. These goals all reflect the sector's fundamental sustainability challenges: food security, water reliance, responsible production, climate vulnerability and land-based ecological management. The concept of 'actual implementation' is used in the five-priority-SDG analysis and means that institutionalization in governance or policy frameworks is visible in the public realm, while targets, KPIs, measurable and recurring mechanisms, performance data, and assurance-related reporting are provided. Partial implementation' means that there is credible implementation of SDG-related action or strategic relevance in terms of governance depth, quantitative measurement, continuity or corroboration, but not achieved. Implementation is not considered as sectoral relevance. Similarly, full or partial implementation is not the same as demonstrated sustainability performance, as there would need to be evidence of performance against a base line or target.

Food production is the function that makes food the project that has the widest reach in SDG 2. SDG 6 is a clear differentiator between more mature sustainability models and emerging ones. SDGs 12 and 13 are broadly applicable at the operational level but both are poorly institutionalized. The SDG 15 is the least embedded, indicating that ecological stewardship in the land domain is more challenging than in food-security narratives or factory-centered environmental initiatives. The five-goal structure not only serves as an identification tool for the issues that are most salient to Saudi agriculture, but also as a test of capabilities. The relevance of SDG 2 is also base line in the sectors, as the main activity of the field is the production of food. SDGs 6, 12, and 13 each pose a series of questions about the possibility of measurable and recurring governance of critical resources, systems of operation, and climate-related risks by companies. SDG 15 is the most challenging of the five SDGs, as it asks for a shift from an industrial vision of efficiency towards a land-based vision of good ecological stewardship that includes soils, biodiversity, ecosystem integrity and agricultural continuity. The resulting hierarchy is therefore not only a reflection of the prevalence of the issues, but also differences in the organizational readiness.

When recalculated from the company-level coding in Table 1 (Appendix) the results are as follows. The number of companies that are actual and partial/partial-to-actual will be provided for SDG 2. Four for SDG 6 are actual and four are partial/partial to actual. There are 6 actual or 7 partial/partial-to-actual for SDG 12. Six SDG 13 are actual and two are partial/partial-actual. There are 4 actual and 2 partial SDG 15. Here 'partial-to-actual' is included with the 'partial' group in the denominator of the counts and described as such in the counts. The figures and percentages shown in Table 2 (Appendix) are reconciled. The five goals are mutually analytical dependent. A claim about food security is more informative when analyzed in conjunction with dependency on water, food production, climate vulnerability, and ecological impacts on land. The stronger implementation cases look at several of these issues in governance and measurement systems at the same time instead of focusing on each issue individually. The revised counts are shown in Table 2 and Table 3 in the Appendix and the full maturity-tier classification is shown in Table 3 (Appendix).

All 21 companies are grouped into four maturity levels with the coding rules outlined in the methodology as described in Table 3 (Appendix). Tier 1 is the six integrated/actual companies, Tier 2 is the one company ENTAJ (partial/actual), Tier 3 is the eight selective/partial companies, and Tier 4 is Saudi Fisheries and the five insufficiently evidenced companies (Sinad, Tadco, Wafrah, Modern Mills, and Gaco). The maturity levels are thus not intended to indicate a ranking of actual sustainability

performance, but rather the extent of evidence of implementation in the public sector.

4.4 The Main Challenges Constraining Effective SDG Implementation

The main hurdle for the Saudi agriculture sector is making the concept of sustainability relevant to the sector at an institutional level. Only a subset of companies have developed governance structures, target systems, measurable indicators, and regular reporting on how they are linked to food security, resource efficiency, and climate resilience, which is a feature of the activities they engage in. The challenges emerged inductively from the company corpus as discussed below.

4.4.1 The Disclosure-Implementation Gap

There are many companies that do things that line up with an SDG orientation, but don't report on that in a coherent sustainability architecture. This reduces the interpretability, comparability and policy usefulness, and could result in an aggregate sustainability contribution for the sector being greater than the published record would indicate. Similarly, [6] demonstrate that, agriculture reporting on sustainability is still disorganized and not uniform in relation to the relative importance of the sector. This is seen in ENTAJ, Nofoth, Halwani and some milling companies. Nofoth speaks about sustainability in terms of growth and development of supply chains but does not provide a full-fledged SDG architecture or a system of recurring KPIs [22]. Halwani demonstrates better internal management logic with a climate-risk recognition and the integrated management policy, but its public reporting is not as material as that of Almarai, Tanmiah and JADCO [23].

4.4.2 Water Scarcity as a Foundational Systems Constraint

Water is a major limitation in the Saudi agricultural system. The sector cannot be evaluated apart from the availability of water, water productivity and the durability of production in arid conditions. Water security, sustainable food security, and natural-resource development are among the key objectives of MEWA, and irrigation efficiency and water productivity are key to the credibility of agricultural sustainability, as stated in [1] and FAO guidance (2024). Precision irrigation, continuous monitoring of water use, water stewardship and linkage to ecosystem integrity, and measurable reductions in water use are among the water-conservation practices reported by JADCO, Tanmiah, Almarai, and SADAFCO, respectively [24], [25], [26] and [27]. In contrast, many other companies are structurally water dependent and not reporting similar intensity ratios or water-risk assessments.

4.4.3 Climate Exposure and Transition Readiness

Climate exposure needs to be seen as a continuum from risk recognition to operational mitigation, to transition-oriented governance. The majority of the corpus companies are still in the first or second stage. Renewable energy and emissions reduction, and precision agriculture are more advanced areas of disclosure. JADCO, Tanmiah and SADAFCO is more disclosure comparing to other Saudi agriculture. As Halwani does not disclose climate-related risks or action. Halwani does not disclose climate-related risks or actions in any of these areas, whereas JADCO, Tanmiah, and SADAFCO do in these areas. Climate action, regenerative agriculture, supplier transition, biodiversity and water resilience are all linked to climate action, and not just to factory-level efficiency, as seen with Danone and Nestlé globally [28], [29].

4.4.4 Fragmented Value-Chain Corporate Governance

Sustainability for agriculture is not produced in any single production unit. Value chains extend beyond the boundaries of a company and have important impacts such as water in raw materials, logistics emissions, food loss, packaging burden and sourcing. Most of the sample Saudi agricultural companies, however, have a better understanding of site-based control than value-chain coordination. The local examples offered by SADAFCO and Savola are comparatively advanced in the fields of packaging initiatives, sourcing and logistics, and food-waste management [27], [30]. Fragmented governance and lack of coordination between actors are longstanding challenges in the pathway to sustainable food-system transitions, as described by [7]. Al Dahra, Danone and Nestlé are prime examples of more value chain-level sustainability governance [28], [29], [30], [31].

4.4.5 Metrics, Comparability, and Assurance

Sustainability maturity is not possible without robust data systems to measure and report sustainability. It is hard to tell the difference between institutionalized implementation and rhetorical alignment without indicators that are comparable and methodologically transparent and without repetition. It is important to highlight that there are methodological inconsistencies, limited transparency and differences in the metric

construction across companies, which weaken cross-company comparisons [32]. This is the case in the Saudi agriculture sector: some companies provide only narrative data, and others identify financial or operational risks but don't provide reoccurring sustainability metrics. More advanced interpreters, performance metrics, and assurance-related evidence (where available) are provided by Tanmiah, Almarai, JADCO, and SADAFCO, which offer a deeper level of confidence in the interpretation [33], [34], [35].

4.4.6 Weak Translation of Policy Language into Company-Level SDG Architecture

While many Saudi businesses mention sustainability and Vision 2030 in general, they are not setting targets, indicators, governance roles, or reporting on SDG targets at the company level or on a regular basis. This forms a poor connection between the level of policy aspiration and the level of corporate accountability. In the case of JADCO, a specific linkage of activities and products to Vision 2030 and the UN SDGs is made by mapping at the production stage and using its sustainability strategy [24]. The public evidence reviewed does not reveal a robust SDG implementation architecture [33] that corresponds to the Sinad, namely alignment with key sectors and national priorities [36].

4.4.7 Context-Sensitive Benchmarking

Saudis agricultural companies should be compared with those who are subjected to similar climatic, water resources and production conditions. Water, land and production strategies are materially influenced by geographic context, including their feasibility and interpretation. Al Dahra and Agthia are especially appropriate regionally as their resource conditions are similar, and they have better documented structured sustainability efforts [31], [34]. Nestlé and Danone are helpful international examples of governance design, the materiality approach and the regenerative-agriculture approach, but need to be adapted and not blindly adopted to the Saudi environment.

4.4.8 Capability Asymmetry and Cumulative Constraint Effects

The issues listed in the items above are not seen as localized issues. In practice, they go together. The rigor of materiality assessment can be compromised by weak governance, weak materiality makes prioritization less disciplined, and weak data systems can make it impossible for companies to show implementation of stated commitments. It is not to say there is a failure to report, but rather a one-sidedness in institutional capacity between sectors. This spiral phenomenon goes a long way in accounting for the distribution of Saudi agricultural companies based on their maturity level. The more sophisticated ones integrate governance, reporting continuity, resource stewardship and performance measurement, bringing sustainability to the forefront, under control and making it more actionable. In contrast, businesses in the partial tier are often subject to multiple restrictions, such as weak data infrastructure, weak sustainability ownership and reporting capacity. This is in line with the perception that issue exposure is not the sole driver of ESG maturity, but rather organizational systems and managerial capability do matter [21]. It is important to recognize that moving from partial to full implementation relates to the incremental improvement of institutions, not to the introduction of one new initiative or disclosure item. There are no shortcuts in developing the discipline of data, in establishing policy coherence and cross-functional ownership of sustainability, and in advancing governance at the company level. Advancing governance, internal data discipline, coherence of policies and cross-functional ownership of sustainability all at once is not a short-cut. The difference in the leadership tier and the rest of the field is therefore best read as an institutional-capability gap, and not as a performance gap.

4.5 A Context-Sensitive Multi-Dimensional Framework for Strengthening SDGs Implementation

The framework of 8 dimensions is proposed based on the empirical asymmetries observed in the Saudi corpus, as well as the benchmark evidence used to interpret these asymmetries. The Saudi company evidence revealed the following areas of governance ownership, disclosure fragmentation, resilience to water, policy translation and weaknesses related to metrics. The local implementation was also identified with value-chain responsibility, climate–land integration, capability building, and assurance-based progression which was further elaborated with regional and international benchmark comparisons. This derivation is made explicit in Table 4 (Appendix), where each dimension is associated with the observed empirical gap that it addresses and the illustrative evidence anchor. The framework needs to be interpreted, then, as an implementation blueprint, not a checklist for reporting! The dimensions are interlinked, such that poor governance can lead to weak materiality, poor materiality can lead to poor prioritization, poor measurement systems can lead to poor

accountability, and poor data can lead to poor assurance and comparison. Hence, staged pathway is a more realistic alternative to simultaneous pathway. The water, climate, and value-chain practices are institutionalized at the start of the process: in the initial stage, governance ownership, materiality, and a minimum accounting/data architecture are established; the second stage, targets and recurring indicators; and a third stage, strengthening assurance, cross-value-chain governance, ecological stewardship, and explicit alignment with national policy and context-sensitive benchmarks. The framework is not meant to be a prescriptive blueprint for agriculture. Instead, it is a context specific architecture based on Saudi evidence and developed for adaption underwater-stressed conditions, food-security stressed conditions and reporting maturity conditions not being uniform. The first is corporate governance and the composition of the boards. The best local enterprises are not simply communication-led and take sustainability into their decision-making and risk management processes and accountable to their executives. The second dimension is SDG prioritisation. However, not every 17 goals is relevant to Saudi agricultural businesses, starting with an identification of goals that are structurally central to the value chain of different businesses and the operating conditions. The third dimension, water-centred operational resilience. Water is not just an environmental cost in the Saudi environment; it is the precondition for long term viability of operations. The fourth dimension is integration of climate, land and agriculture. The results show that SDGs 13 and 15 are not met with factory efficiency only, but rely on agricultural production systems, soil stewardship, Biodiversity awareness, and climate responsive sourcing. Value-chain responsibility is the fifth dimension because agricultural sustainability is created in the value chain and not just at a single location in the value chain. The sixth dimension is people, inclusion, and capability building: workforce development, safety, inclusion and community contribution are key factors in ascertaining the sustainability of STS. The 7th dimension is metrics, assurance and comparability. The absence of baseline measures, reoccurring indicators and clear measurement systems makes it challenging to govern and verify sustainability performance. Aligned policy and adaptive benchmarking is the 8th dimension. Businesses must not only support the SDGs, but also Vision 2030, the MEWA priorities and benchmark models that can be realistically applied in Saudi's environment. This context-sensitive implementation framework is summarized in Table 4 of the Appendix. The findings point to a lack of sustainability in Saudi agriculture but with unequal institutionalization. The leadership tier proves that a wide-spread SDG implementation is achievable in Saudi Arabia where governance, data systems, and strategic commitment meet. The partial tier indicates that relevance is high but not enough to justify that on its own. The next space that remains to be resolved is between relevance and accountability for implementation which is the critical area of sectoral transformation. [37], [38], [39]. The framework is reinforced by applied cases. The evidence is more useful when presented in the form of four connected clusters of benchmarks that represent four different levels of implementation architecture. In the Saudi agricultural sector, more advanced ESG ownership can be achieved without scaling to the global level as shown in the local case of Tanmiah, which serves as a good example of governance connected to implementation of sustainability and external verification [25]. Danone offers a parallel international example by demonstrating the potential of embedding sustainability into the institutional framework through the board's scrutiny and executive responsibility – not communication, discretion or a choice [28]. These cases collectively indicate that it is more important for sustainability to be recognised than for responsibility to be formally assigned, measured and reviewed. Structured sustainability architectures, connected to operational realities and national policy frameworks are the examples of materiality-based SDG prioritization for JADCO and Almarai, respectively [24], [26]. The quality of the companies is not only their number of goals mentioned, but their more disciplined approach towards choosing and managing goals that are structurally central to their value chain and operating conditions. This selectivity enhances the validity of disclosure and deepens the substance of policy alignment. For example, water, climate and land-based ecological stewardship can be managed as a whole system, rather than separate silos, as illustrated by NADEC, Al Dahra, and Nestlé [29], [31], [35], [36]. The consensus in analysis is that there must be more than a reduction of emissions by a single factory, if agriculture is to be climate resilient. This must also be backed up by sustainable farming methods, proper land use and water management and governance of ecosystems. This is not only a strategic must for Saudi companies that are in arid environments, but also an added value for their operations [40]. [41], [42], [43]. The examples of SADAFCO, Savola, and Agthia reveal that the

efforts of the value chain and people-centered sustainability go beyond the production site through packaging [27]; local sourcing [30]; reduction of food waste [34]; inclusion of workers; and community-oriented investment. The cases are relevant because they demonstrate the possibility of expanding the scope of the sustainability governance up the value chain, from suppliers to logistics partners to downstream actors, within the regional context and without the size of a global business. [44], [45], [46], [47], [48]. The practical lesson that emerges across the four benchmark clusters is that the path between partial and actual implementation is clear, but success will require the ability to establish the necessary cross-functional ownership, data capability, systems and governance disciplines within the company to sustain the changes [49], [50], [51].

5 Conclusion and Practical Implications

This study analyzed the role of Saudi agricultural companies in the SDGs in relation to accounting, measurement, reporting and governance processes. The evidence suggests that sustainable companies are not so simple to distinguish from the unsustainable ones, but that there is a more complex and uneven institutionalization of the field. The implementation architectures are comparatively integrated for six companies but are partially institutionalized or less well evidenced for a wider range of companies. The five-priority-goal analysis also shows that disclosure presence is not a proxy for implementation or sustainability performance. The main empirical question concerns how much sustainability relevance is expressed as governance responsibility, targets, KPIs, data system, regular reporting and assurance practices.

The study is both practical and conceptual in nature as it offers classification of companies at the level of the company and an eight-dimensional framework, which connects sustainability with governance, materiality, water-related resilience, climate and land integration, value-chain responsibility, people and capability development, metrics and assurance, and policy alignment. The framework is not a certification system for best sustainability performance but a diagnostic tool to understand institutional preparedness and reporting-accountability issues. The accounting contribution is rooted in the ability to illustrate how the rules of measurement, the data systems, the performance indicators, the internal accountability, assurance and the accounting/or Reporting process for the company can help to move from broad alignment to SDGs to evidence the implementation of them.

This also helps to explain why companies in the same industry might seem to be the same on the narrative level but have very different institutional accountability. Managers rely on credibility more than ever on the depth of the governance, reliable accounting and data systems, transparency in measurement processes, recurring KPIs, and continuity of reporting. Policymakers: The results highlight the need for the reporting expectations to be more transparent and for improving organizational capacity for measurable progress in the sector.

The following is a list of limitations of this study. It is based on evidence that is publicly available and can be variable in depth and quality between companies. A company can then engage in sustainability actions that are not "recorded" in the public documents. The classification reflects the strength of the available implementation evidence and should not be viewed as a measure of the underlying sustainability performance. Furthermore, the single author coding design does not include an inter-coder reliability statistic although the revised study increases the reproducibility of the coding process by establishing explicit coding rules, a matrix of SDG to the company, conservative classification, and full reconciliation of the descriptive counts.

Further inquiry could be conducted that would integrate document analysis with interviews, internal performance information or longitudinal performance outcomes to determine if there is a correlation between implementation architecture and sustainability performance. Formal agreement statistics also could be computed using multi-coder studies. More studies could be conducted to investigate the impact of mandatory or standard sustainability reporting on comparability, assurance, and SDG accountability in the Saudi market.

Acknowledgements:
We gratefully acknowledge the funding from Jouf University, Saudi Arabia.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) utilized artificial intelligence (AI) technologies solely for the purpose of linguistic refinement and grammatical correction. Following the application

of these tools, the author(s) comprehensively reviewed, verified, and edited the resulting text. The author(s) maintain full accountability and responsibility for the accuracy, integrity, and final content of the publication.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

Khaled Hamden Alshammari: Conceptualization; methodology; investigation; formal analysis; data curation; writing original draft; writing review and editing. The revised manuscript is presented as a single-author study, consistent with the title page.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

This work was funded by the Deanship of Graduate Studies and Scientific Research at Jouf University under grant No. (DGSSR-2023-NF-03-027)

Conflict of Interest

The author declares no conflict of interest relevant to the content of this article.

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APPENDIX

Table 1. Company-level SDG implementation patterns across the 17 Goals

Company	SDGs evidenced in corpus	Evidence level	Evidence basis / coding rationale
Almarai	2, 3, 5, 6, 7, 8, 12, 13, 15, 17	Actual	Recurring sustainability reporting, governance-linked materiality, water as a core material issue, and recurring performance data support the Actual classification ([26], 2024c).
SADAFCO	2, 3, 5, 6, 8, 9, 12, 13, 16, 17	Actual	Recurring sustainability reporting, measurable water-use evidence, and value-chain initiatives relating to packaging, logistics, and food waste support the Actual classification ([27].
Savola	2, 3, 4, 5, 8, 10, 12, 13, 16, 17	Actual	Recurring sustainability reporting, broad SDG coverage, and value-chain sustainability evidence, including food-waste and sourcing-related initiatives, support the Actual classification ([30].
NADEC	2, 3, 6, 8, 9, 12, 13, 15, 16	Actual	Sustainability/ESG reporting with broad SDG coverage and evidence linking climate, land, and agricultural management supports the Actual classification ([36], 2024).
Tanmiah	2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15	Actual	Recurring sustainability reporting, governance-linked ESG ownership, water stewardship, measurable indicators, and external-verification evidence support the Actual classification ([25].
JADCO	2, 3, 8, 9, 12, 13, 15	Actual	The 2024 ESG and Sustainability Report provides product-stage SDG mapping, Vision 2030/UN SDG alignment, precision-irrigation and monitoring evidence, and governance-linked disclosure, supporting the Actual classification ([24].
ENTAJ	2, 6, 8, 9, 12, 13	Partial-to-actual	Annual-report and prospectus evidence shows substantial SDG-related activity and emerging institutionalization, but continuity, assurance, and governance depth remain below the Actual threshold ([37], 2024b).
Arabian Mills	2, 8, 9, 12	Partial	Prospectus and related public evidence indicate relevant activity across food production, employment, industry, and responsible production, but recurring quantified sustainability measurement and governance depth remain incomplete ([38].
First Milling Company	2, 8, 9, 12	Partial	The reviewed company-level public corpus indicates credible SDG-related activity in food production, employment, industry, and responsible production, but recurring quantified measurement and integrated governance evidence remain incomplete.
Fourth Milling Company	2, 8, 9, 12	Partial	The reviewed company-level public corpus indicates credible SDG-related activity in food production, employment, industry, and responsible production, but recurring quantified measurement and integrated governance evidence remain incomplete.
JAZADCO	2, 6, 14, 15	Partial	The reviewed public evidence indicates credible links to food production, water, marine resources, and land-related sustainability issues, but recurring quantified measurement and integrated governance evidence remain incomplete.
Saudi Fisheries	2, 14	Partial/sectoral	Sectoral relevance to food systems and marine resources is clear, but the reviewed corpus provides insufficient recurring governance, KPI, and assurance evidence for classification above Partial/sectoral.
Halwani	2, 12, 13	Partial	Financial-statement climate-risk recognition and an integrated management policy provide credible implementation evidence, but public sustainability reporting and recurring quantified indicators remain less developed ([23]; [39].
Naqi Water	6, 12	Partial	The reviewed public evidence supports links to water and responsible production, but recurring quantified sustainability metrics, governance depth, and continuity remain incomplete.
Nofoth	2, 8, 12	Partial	The 2024 annual report refers to sustainability in the context of growth and supply-chain development, but a mature SDG architecture and recurring KPI system are not evidenced ([22].

Company	SDGs evidenced in corpus	Evidence level	Evidence basis / coding rationale
Eastern Development	2, 6, 15	Partial	The reviewed public evidence indicates credible links to food production, water, and land-related sustainability issues, but recurring quantified reporting and integrated governance evidence remain incomplete.
Sinad	-	Insufficient	The reviewed financial statements and corporate disclosures refer to strategic and national-priority sectors, but do not provide sufficient company-specific SDG governance, targets, KPIs, or recurring sustainability evidence for a defensible implementation classification [33]; [40].
Tadco	-	Insufficient	The reviewed public corpus does not provide sufficient company-specific evidence of SDG governance, targets, recurring KPIs, or assurance to support a defensible implementation classification.
Wafrah	-	Insufficient	The reviewed public corpus does not provide sufficient company-specific evidence of SDG governance, targets, recurring KPIs, or assurance to support a defensible implementation classification.
Modern Mills	-	Insufficient	The reviewed public corpus does not provide sufficient company-specific evidence of SDG governance, targets, recurring KPIs, or assurance to support a defensible implementation classification.
Gaco	-	Insufficient	The reviewed public corpus does not provide sufficient company-specific evidence of SDG governance, targets, recurring KPIs, or assurance to support a defensible implementation classification.

Source and coding note: company sustainability reports, ESG disclosures, annual reports, financial statements, prospectuses, policy files, and official websites. The evidence level reflects the strength of publicly available implementation evidence under the coding protocol; it does not constitute a direct rating of sustainability performance.
Source: Created by the author based on company reports and disclosures [26], [41], [27], [30], [35], [25], [24], and other company documents listed in the references.

Table 2. Reconciled results for the five priority SDGs (n = 21). Counting rule: 'partial-to-actual' is grouped with partial for descriptive aggregation; percentages use the full 21-company sample as denominator.

SDG	Actual, n (% of 21)	Partial / partial-to-actual, n (% of 21)	Interpretation
SDG 2	6 (28.6%)	9 (42.9%)	Widest reach; food-security relevance is broad, but institutional depth varies.
SDG 6	4 (19.0%)	4 (19.0%)	Water governance differentiates stronger from weaker implementation evidence.
SDG 12	6 (28.6%)	7 (33.3%)	Broad operational relevance with uneven institutionalization.
SDG 13	6 (28.6%)	2 (9.5%)	Actual implementation evidence is concentrated in the leadership tier.
SDG 15	4 (19.0%)	2 (9.5%)	Ecological stewardship is the least widely institutionalized priority goal.

Source: Created by the author based on the company-level coding and calculations reported in Table 1.

Table 3. Implementation Maturity Tiers Across the Saudi Agriculture Field (all 21 companies classified)

Tier	Core profile	Typical evidence pattern	Representative companies
Tier 1: Integrated / Actual	Broad SDG coverage with governance, recurring KPIs, and structured reporting	Institutionalized governance/policy plus recurring measurable evidence; assurance where available	Almarai, SADAFCO, Savola, NADEC, Tanmiah, JADCO
Tier 2: Emerging / Partial-to-Actual	Strong relevance with growing institutionalization but incomplete depth	Strong implementation evidence, but continuity, assurance, or institutional depth remains incomplete	ENTAJ
Tier 3: Partial / Selective	Clear sustainability relevance but uneven governance and reporting architecture	Selective disclosure, fragmented metrics, or issue-specific rather than integrated systems	Arabian Mills, First Milling, Fourth Milling, Halwani, Nofoth, JAZADCO, Naqi Water, Eastern Development
Tier 4: Sectoral / Insufficient	Sectoral relevance or broad strategic language with limited institutional evidence	Weak, episodic, sectoral, or insufficient company-specific evidence for stronger classification	Saudi Fisheries, Sinad, Tadco, Wafrah, Modern Mills, Gaco

Source: Created by the author based on the 21-company classification and coding protocol reported in Table 1.

Table 4. Context-sensitive SDG implementation framework for Saudi agriculture companies, with empirical derivation and illustrative evidence anchors

Dimension	Core question	Empirical gap / mechanism	Illustrative evidence anchors
Corporate Governance and board ownership	Is sustainability governed at board and executive levels?	Variation in governance ownership and risk oversight; stronger cases connect accountability to recurring reporting.	Almarai, Tanmiah; benchmark: Danone
Materiality and SDG prioritization	Are SDGs prioritized based on sectoral relevance and context?	Uneven translation from broad SDG relevance to explicit materiality and prioritized goals.	JADCO, Almarai
Water-centered resilience	Is water managed as a strategic constraint?	Water is structurally material, but quantified intensity, monitoring, and risk evidence are uneven.	JADCO, SADAFCO; benchmark: Nestlé
Climate-land-agriculture integration	Are climate and land managed as a connected system?	Climate evidence is more common than integrated land/ecosystem stewardship, particularly for SDG 15.	NADEC; benchmarks: Al Dahra, Danone
Value-chain responsibility	Does sustainability extend beyond the production site?	Most evidence is site-centered; stronger cases extend responsibility to sourcing, packaging, logistics, and waste.	SADAFCO, Savola; benchmark: Agthia
People and capability building	Are labor, inclusion, safety, and community embedded?	Implementation capacity depends on workforce, inclusion, safety, and organizational capability.	Savola; benchmark: Agthia
Metrics, assurance, comparability	Are data systems robust and decision-useful?	Large variation in KPI continuity, baselines, methodology, and assurance limits comparability.	Tanmiah, Almarai, JADCO, SADAFCO
Policy alignment and adaptive benchmarking	Are company priorities aligned with KSA policy and contextual benchmarks?	Broad Vision 2030 alignment is common, but company-level translation into measurable SDG architecture is uneven.	JADCO; benchmark: Al Dahra

Source: Created by the author based on the study findings and illustrative company and benchmark evidence [24], [26], [27], [25], [28], [31], and [34].