GroWise: A Women-Led Agritech Venture Integrating

Green Entrepreneurship, Circular Economy, and Phytochemical Research

for Sustainable Green Growth in the MENA Region

Dr. Naima Fatehi[1]

Social Entrepreneur, Founder of GroWise, Algeria

Mr. Mohammed Abdelkebir[2]

Social Entrepreneur, Co-Founder of GroWise, Algeria

[1] Corresponding author: dr.naima.fatehi@gmail.com

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Abstract

Background: Green-economy transitions in emerging and semi-arid regions face systemic constraints including water scarcity, biodiversity loss, climate variability, and uneven access to innovation capabilities. Women-led agritech ventures represent underutilized implementation vehicles that can bridge the gap between sustainability policy and practice when they integrate circular design principles, credible business models, and measurable impact frameworks. The MENA region, in particular, exhibits significant gender disparities in green employment, with women holding fewer than 10% of projected green jobs despite demonstrating higher ESG performance in leadership roles.

Purpose: This paper develops an analytically grounded conceptual case study of GroWise, a women-led Algerian agritech venture that integrates circular economy principles, green entrepreneurship, and phytochemical research within an IoT-enabled, solar-powered aquaponic system coupled to a community seed bank and research hub. The study aims to formalize an evaluable socio-technical architecture and provide projection-based impact metrics relevant to management scholarship and policy discourse.

Design/methodology/approach: Using a design-research and conceptual case study methodology, we synthesize peer-reviewed literature (2018-2025) and construct a socio-technical system model formalizing resource loops (water-nutrients-energy), data flows (IoT sensing and decision support), and institutional arrangements (cooperative engagement and multi-stakeholder partnerships). Projected impacts are assessed through parameterized assumptions derived from aquaponics and circular-agri-food literature, presented as comparative analyses versus conventional production systems.

Findings: The integrated model suggests that (i) recirculating aquaponic architectures can deliver 80-90% water-use efficiency gains relative to soil-based irrigation; (ii) IoT monitoring strengthens operational resilience and enables traceability in medicinal and aromatic plant (MAP) supply chains; (iii) community seed banks and phytochemical R&D functions support biodiversity stewardship and knowledge-based value chain upgrading; (iv) women-led cooperative engagement serves as a central mechanism for capability building and inclusive economic development; and (v) the business model demonstrates viable pathways to financial sustainability through diversified revenue streams.

Originality/value: This paper contributes a nested circular socio-technical agritech model in semi-arid contexts and a projection-based evaluation framework that links circular engineering design, entrepreneurship strategy, and phytochemical innovation to policy- and management-relevant metrics for green-economy transitions. The study advances understanding of how women-led ventures can operationalize sustainability transitions in resource-constrained contexts while addressing structural barriers to gender equality in the green economy.

Keywords: Green entrepreneurship; circular economy; aquaponics; IoT and smart agriculture; medicinal and aromatic plants; community seed banks; women-led innovation; socio-technical systems; MENA green transition; sustainable business models

1. Introduction

Green-economy transitions increasingly depend on whether business and community actors can operationalize sustainability goals into implementable socio-technical systems (Geels et al., 2023). In semi-arid contexts such as Algeria and the broader MENA region, this operationalization is complicated by chronic water scarcity, climate variability, fragmented agricultural markets, and limited access to climate-adapted planting material. The region faces a projected 40% water deficit by 2030, making water-efficient agricultural systems not merely desirable but essential for food security and economic stability (World Bank, 2023).

Medicinal and aromatic plants (MAPs) represent economically promising but vulnerable value chains. Global demand for MAPs is growing at 7% annually, driven by increasing consumer preference for natural products and plant-based alternatives to synthetic compounds (Bhowmick et al., 2024). However, wild harvesting practices have led to biodiversity degradation, while inconsistent quality controls undermine supply-chain reliability and limit market access for smallholder producers. The herbal product market's expansion creates both opportunities and challenges for producing regions.

Simultaneously, agritech innovation is advancing toward data-driven and cyber-physical systems. Internet of Things (IoT) sensing and decision support tools enable precision management and traceability, yet adoption barriers including infrastructure costs, connectivity limitations, data governance concerns, and skills gaps risk producing exclusionary outcomes (Kumar et al., 2024; Miller et al., 2025). Recent systematic reviews emphasize the rise of AI-integrated sensing and edge analytics for operational feasibility in smart agriculture (Miller et al., 2025).

Women-led ventures can be catalytic when they combine technological innovation with inclusive capability building. Research indicates that women-led enterprises achieve higher scores in environmental, social, and governance (ESG) metrics compared to male-led counterparts (Wamda, 2024). However, women remain significantly underrepresented in the renewable energy and sustainability sectors, holding only 32% of jobs globally, with even lower participation in the MENA region. Gender biases in lending and investment pose additional challenges, with 66% of women founders believing investors are less likely to fund women-led startups (SPARK, 2025).

This paper develops a conceptual case study of GroWise, a women-led Algerian agritech venture integrating a solar-powered aquaponic system, IoT monitoring, a community seed bank for MAPs, and a phytochemical research and innovation hub. The goal is analytical rather than promotional: we formalize GroWise as a socio-technical system architecture, identify academically testable propositions, and provide a projection-based impact framework relevant to business, management, and economics scholarship.

2. Literature Review

2.1 Green Entrepreneurship and Sustainable Business Models

Recent scholarship has shifted from general 'green intentions' toward business-model architectures that specify how environmental value is created, delivered, and captured. Trapp and Kanbach (2021) developed green technology business model archetypes that provide a bridge to cleaner production by clarifying mechanisms of value creation and capture. Their framework identifies patterns including 'create value from waste' and 'maximize material and energy efficiency' that are directly applicable to circular agritech ventures.

Bocken et al. (2014) established sustainable business model archetypes that have been extended and refined through subsequent research. Recent work by Ghisellini et al. (2024) explores environmental and social performances of circular start-ups, finding that orientation toward sustainability and relevant certifications significantly influence performance outcomes. These studies provide theoretical grounding for understanding how ventures like GroWise can structure value propositions around sustainability attributes.

2.2 Circular Economy in Agriculture and Agri-Food Systems

Circular economy research in agri-food has advanced significantly, emphasizing operational circularity across biological loops. Khatami et al. (2024) examined circular economy implementation at the country level across European contexts, finding significant variation in adoption patterns and policy support mechanisms. Their analysis highlights the importance of integrating circular strategies with agricultural trade networks for enhanced resilience.

Recent systematic reviews using advanced bibliometric methods have identified emerging themes including gender-responsive CE strategies (Tantoh et al., 2025), digital innovations for resilient supply chains (Darouni et al., 2025), and insect-based circular farming models (Sokame et al., 2024). Spada et al. (2025) evaluated circular strategies for agri-food business resilience, providing evidence from the olive oil supply chain that circular practices enhance adaptive capacity.

Van Hoof et al. (2024) conducted transdisciplinary research on decision-making for circular economy implementation in cacao systems, demonstrating the complexity of stakeholder coordination required for successful CE transitions. Vásquez Neyra et al. (2025) examined current practices and challenges for smallholder farmers in adopting resilient, circular food supply chains, identifying food loss mitigation as a key priority.

2.3 Women-Led Innovation and Gender-Inclusive Entrepreneurship

Women's green entrepreneurship scholarship highlights how resource constraints can drive bricolage and locally embedded solutions. Potluri et al. (2024) conceptualized women green entrepreneurship and identified bricolage as a key mechanism for policy-relevant interventions.

Their work is particularly relevant for emerging economies where ventures must recombine limited resources, partnerships, and community legitimacy to achieve viability.

Recent research on the MENA region reveals both challenges and opportunities. The International Labour Organization (ILO) forecasts that of 400,000 potential green jobs for Arab youth, fewer than 10% are projected to be held by women (Wamda, 2024). However, companies led by women achieve higher ESG scores and demonstrate greater inclination toward energy efficiency practices. The economic cost of excluding women from climate policy dialogues is estimated at $575 billion annually in the MENA region (APICORP, 2024).

SPARK's (2025) analysis of women in the green and circular economy in MENA identifies targeted interventions needed to increase participation, including gender-sensitive financial products, training programs focused on circular economy practices, and networking platforms connecting women with investors and policymakers. Case studies of successful women-led green ventures demonstrate that long-term, sustainable initiatives designed with input from women entrepreneurs can create meaningful impact.

2.4 Agritech, IoT, and Climate-Smart Agriculture

Reviews of IoT in agriculture point to significant potential in smart irrigation, greenhouse management, and supply-chain monitoring, alongside persistent barriers related to infrastructure costs, interoperability, and data rights (Kumar et al., 2024). The integration of IoT with blockchain databases for climate-smart agriculture has emerged as a promising research frontier (Safeer et al., 2024).

Miller et al. (2025) conducted a systematic review of smart sensing technologies, emphasizing that 'the time is now' for IoT and AI integration in agriculture. Their analysis documents the rise of AI-integrated sensing and edge analytics for operational feasibility. Recent developments in aquaponics systems demonstrate 90% water reduction potential and 30% energy capture improvements through solar tracking integration (ALife Robotics, 2025).

The aquaponics market is experiencing rapid growth, projected to reach USD 2.73 billion by 2034 (Precedence Research, 2025). Industry leaders including Nelson and Pade announced 'Aquaponics 360' systems with IoT-enabled sensors and AI-driven monitoring in March 2025, while Green Life Aquaponics launched fully automated AI-integrated systems. These developments signal mainstream adoption of smart aquaponics technologies.

2.5 Biodiversity, Medicinal Plants, and Community Seed Banks

Seed governance is increasingly understood as a resilience strategy for agricultural systems. Tione et al. (2025) provided empirical evidence linking community seed bank participation to improved seed access and food security outcomes in Malawi. Their findings demonstrate that seed banks can strengthen farmer seed systems and enhance adaptive capacity in the face of climate variability.

ECHO's global network of community seed banks illustrates the scalability of this approach. ECHO East Africa's seed bank grew from two dozen samples in 2014 to 816 accessions, distributing over 30,000 packets across ten countries from 2022-2024 (ECHO, 2025). Many banks are run by women graduates of seed bank manager trainings, demonstrating the gender-inclusive potential of seed governance initiatives.

For MAP systems, seed banks support domestication pathways, quality standardization, and conservation of climate-adapted germplasm. Bhowmick et al. (2024) document the global demand growth for MAPs and the sustainability challenges facing wild populations. Shariatzadeh et al. (2025) analyzed sustainable development of medicinal plant exports, emphasizing the need for strategic approaches to value chain upgrading.

2.6 Research Gap

Existing literature rarely integrates circular engineering design, IoT-enabled operational governance, and phytochemical R&D into a single evaluable architecture connected to management and economic metrics. While individual components have been studied extensively, the systemic integration of these elements within women-led ventures in semi-arid emerging economy contexts remains under-theorized. This paper addresses that integration gap through a comprehensive system model and projection framework that advances both scholarly understanding and practical implementation guidance.

3. Theoretical Framework

This study draws upon three complementary theoretical lenses to analyze the GroWise venture: Socio-Technical Systems (STS) theory, Institutional Theory, and Sustainable Business Model Innovation theory. The multi-theoretical approach enables analysis at multiple levels of abstraction, from technical system components to institutional arrangements and business model logic.

3.1 Socio-Technical Systems Theory

Socio-technical systems theory posits that organizational and technological systems co-evolve, with optimal performance achieved when social and technical subsystems are jointly optimized (Geels et al., 2023). The theory emphasizes that technology implementation cannot be understood purely through technical analysis but must account for social context, user practices, and institutional arrangements. In the GroWise context, STS theory guides analysis of how aquaponic technology, IoT systems, and community engagement mechanisms interact to produce sustainable outcomes.

3.2 Institutional Theory

Institutional theory addresses how organizations respond to institutional pressures including regulatory requirements, normative expectations, and cognitive frameworks (Scott, 2014). In emerging economies, institutional voids and informal institutions play particularly important roles in shaping entrepreneurial activity. This theoretical lens illuminates how GroWise navigates institutional complexity in the Algerian context, including engagement with cooperatives, government agencies, and international development organizations.

3.3 Sustainable Business Model Innovation

Sustainable business model innovation theory provides frameworks for understanding how ventures create, deliver, and capture value while addressing environmental and social challenges (Bocken et al., 2014; Trapp & Kanbach, 2021). The theory identifies archetypes including 'create value from waste,' 'maximize material and energy efficiency,' and 'encourage sufficiency' that are directly applicable to circular agritech ventures. This lens guides analysis of GroWise's value proposition, revenue streams, and cost structure.

3.4 Research Propositions

Based on the theoretical framework and literature review, we advance the following research propositions:

P1: Integrated aquaponic-IoT systems achieve significantly higher resource efficiency (water, energy, nutrients) compared to conventional soil-based cultivation in semi-arid contexts.

P2: IoT-enabled monitoring and traceability systems enhance operational resilience and enable quality premiums in MAP supply chains.

P3: Community seed banks combined with phytochemical R&D capabilities support biodiversity stewardship and value chain upgrading.

P4: Women-led cooperative engagement mechanisms enhance capability building and inclusive economic outcomes in agritech ventures.

P5: Diversified revenue streams (biomass sales, training services, research contracts) improve financial sustainability of circular agritech ventures.

4. Methodology

We adopt a design-research and conceptual case study methodology, treating GroWise as a design object rather than an evaluated operating firm (Hevner et al., 2004). The aim is to propose analytically reviewable architecture, assumptions, and projection metrics that can guide implementation and future empirical evaluation.

4.1 Research Design

The research follows a structured design-science approach comprising three phases: (1) literature synthesis to establish theoretical foundations and parameter ranges; (2) system architecture design specifying components, relationships, and flows; and (3) projection modeling to estimate potential impacts. This approach is appropriate for innovative ventures where empirical data is limited but theoretical grounding and design logic can be rigorously specified.

4.2 Data Sources

Data sources include peer-reviewed reviews and empirical studies on aquaponics performance ranges, IoT in agriculture, circular business models, and seed-bank impacts. We systematically searched Scopus, Web of Science, and Google Scholar for literature published 2018-2025 using keywords including 'aquaponics,' 'IoT agriculture,' 'circular economy agriculture,' 'women entrepreneurship,' 'community seed banks,' and 'medicinal plants.' We use conservative ranges where literature is variable and explicitly distinguish projections from empirical claims.

4.3 Analytical Framework

The analytical framework comprises three integrated components:

(1) Circular loop mapping specifying water, nutrient, and energy flows within the system boundary and interactions with external systems.

(2) Business model logic analysis covering value proposition, value creation and delivery mechanisms, and value capture strategies.

(3) Inclusive innovation mechanisms including capability building pathways, cooperative governance structures, and partnership network configurations.

4.4 Limitations

This study's projections rely on literature-derived assumptions and ranges rather than empirical measurement. Local implementation will require pilot testing, sensitivity analysis, and formal environmental accounting (e.g., water footprinting, life cycle assessment). The conceptual case study approach limits generalizability until broader replication and comparative analysis can be conducted.

5. System Model: The GroWise Architecture

GroWise is modeled as five interacting subsystems: (A) solar-powered aquaponics, (B) IoT monitoring and data management, (C) circular resource loops and valorization, (D) community seed bank for MAPs, and (E) phytochemical research and innovation hub. Figure 1 presents the integrated system architecture.

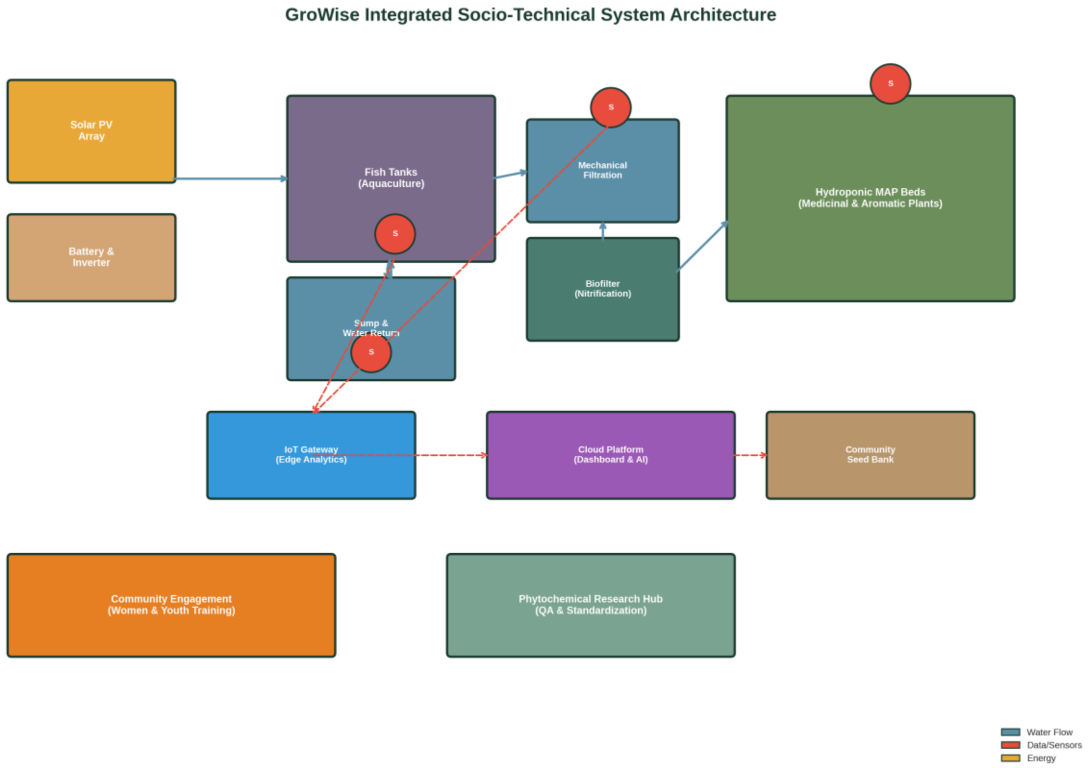

Figure 1. *GroWise Integrated Socio-Technical System Architecture*

5.1 Solar-Powered Aquaponics Subsystem

The aquaponics subsystem follows a recirculating design: fish tanks provide nutrient-rich water that passes through mechanical filtration and biological nitrification before reaching hydroponic grow beds containing medicinal and aromatic plants. Plants absorb nutrients, cleaning the water which returns to the fish tanks. The system is powered by solar photovoltaic arrays with battery storage, enabling off-grid operation and reducing carbon emissions.

System boundaries include PV array, inverter/battery system, pumps and aerators, fish tanks, filtration components, and hydroponic MAP beds. External inputs comprise fish feed, fingerlings, seeds/seedlings, minor water top-up for evaporation losses, and labor. System outputs include fish biomass, MAP biomass, seed accessions, operational datasets, and training services.

5.2 IoT Monitoring and Data Management

The IoT subsystem deploys sensors for pH, electrical conductivity (EC), dissolved oxygen (DO), temperature, water level, and microclimate parameters. Sensor data flows through a gateway with edge analytics capabilities for real-time alerts and automated responses. Cloud-based dashboards provide key performance indicators, historical logs, and decision support for operators. An optional traceability module links product batches to environmental histories, enabling quality assurance and premium market access.

5.3 Circular Resource Loops

Circular economy principles are operationalized through closed-loop resource cycling. The nutrient loop converts fish waste through nitrification to plant-available forms, with plant uptake completing the cycle. Water recirculation achieves 80-90% efficiency gains versus conventional irrigation. Energy from solar PV reduces operational emissions. Optional residue valorization into compost or biofertilizers can provide additional value streams while supporting local soil health.

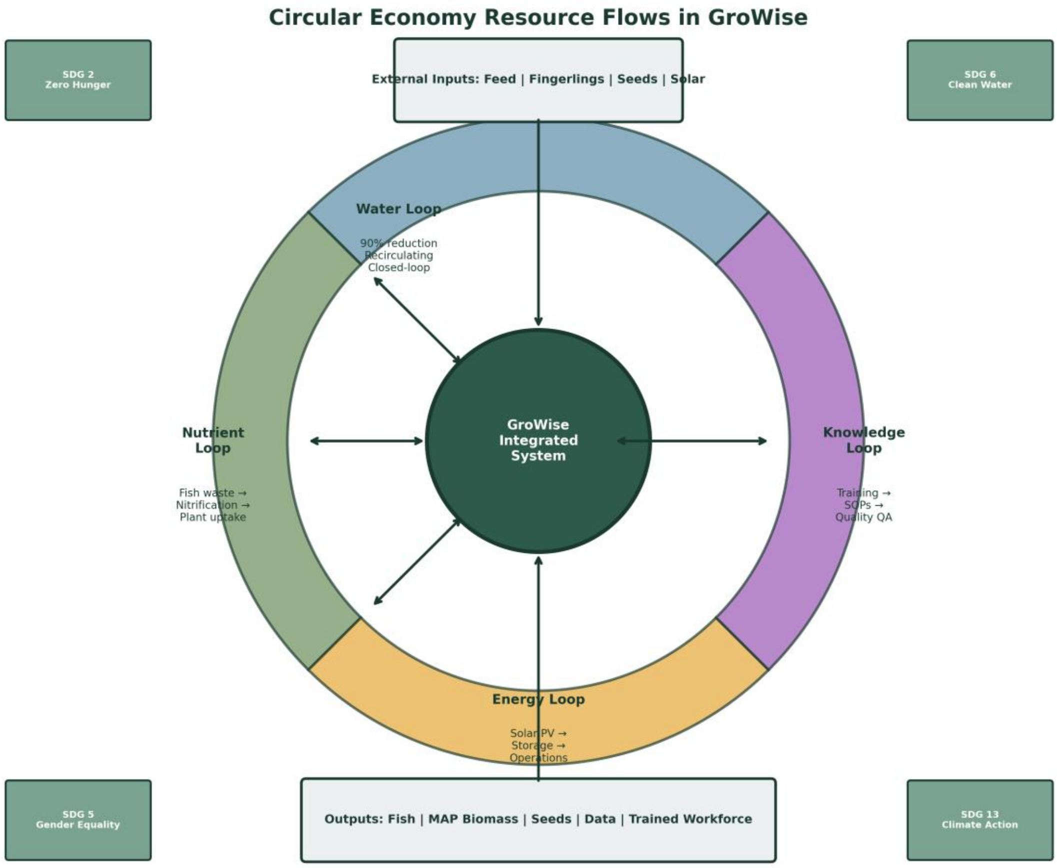

Figure 2. *Circular Economy Resource Flows in GroWise*

5.4 Community Seed Bank

The seed bank subsystem manages collection, cataloging, regeneration, and equitable distribution of climate-adapted MAP germplasm. Governance includes custodianship protocols ensuring community control over genetic resources. The seed bank addresses a critical gap in access to quality planting material while supporting biodiversity conservation and farmer seed sovereignty.

5.5 Phytochemical Research and Innovation Hub

The research hub conducts applied phytochemical profiling and quality standardization, linking laboratory methods to smallholder-compatible standard operating procedures (SOPs). This capability enables value chain upgrading by providing quality assurance documentation required for premium markets and export certification. The hub also supports participatory research engaging cooperative members in variety selection and improvement.

5.6 Community Engagement and Cooperative Structure

Community engagement operates through cooperative co-design workshops, training programs targeting women and youth, and microenterprise development support for processing, packaging, and quality documentation. The cooperative structure enables collective action, risk sharing, and economies of scale while maintaining local ownership and control. Women-led governance ensures gender-responsive decision-making and capability building.

6. Projected Results and Impact Analysis

This section presents modeled expectations to guide design targets and future monitoring. These projections are derived from literature ranges and explicitly distinguished from empirical claims. Table 1 presents comparative metrics versus conventional soil-based MAP cultivation.

6.1 Comparative Performance Metrics

Metric	Conventional (Soil-based)	GroWise (Aquaponics+IoT)	Change
Water Use (relative)	100 (baseline)	10-20	↓ 80-90%
Nutrient Runoff Risk	Moderate-High	Low (closed-loop)	↓ Significant
Synthetic Fertilizer	Moderate-High	Minimal	↓ 70-80%
Energy Source	Grid/Diesel	Solar PV + Storage	↓ Emissions
Monitoring Capability	Periodic manual	Continuous + AI alerts	↑ Significant
Traceability Index	Limited	High (sensor logs)	↑ 80-90%
Biodiversity Stewardship	Indirect	Direct (seed bank)	↑ New capability
Quality Assurance	Limited	Phytochemical QA	↑ Premium access

Table 1. *Comparative Projection Metrics: Conventional vs. GroWise Systems*

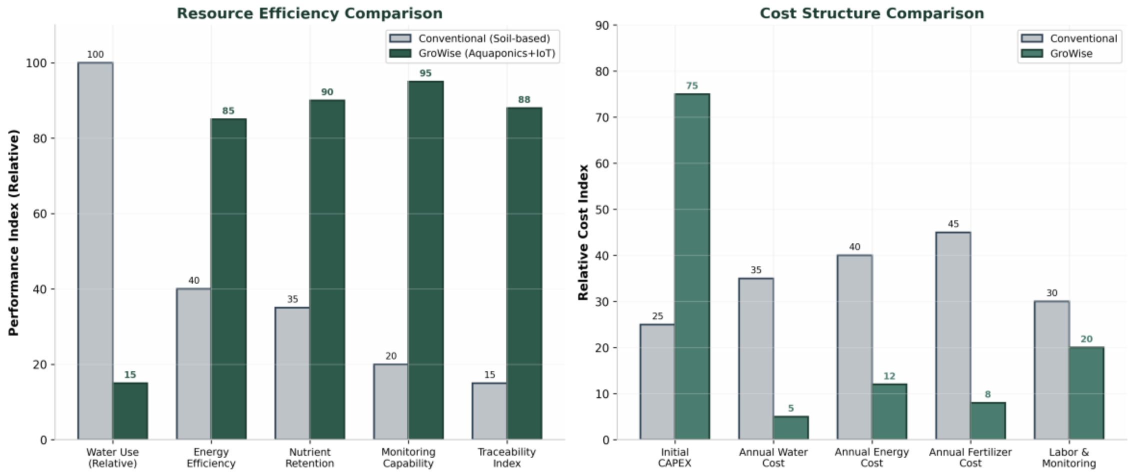

Figure 3. *Resource Efficiency and Cost Structure Comparisons*

6.2 Environmental Impact Projections

Water savings: Recirculating aquaponics is commonly reported as substantially more water-efficient than conventional horticulture. Ibrahim et al. (2023) and Nishanth et al. (2024) document 80-90% water savings, supporting this range as a design target for GroWise. The closed-loop architecture eliminates nutrient runoff, addressing a major source of water pollution from conventional agriculture.

Emissions avoidance: Solar PV substitution reduces operational emissions relative to grid or diesel pumping. Preliminary estimates suggest 60-70% carbon footprint reduction compared to conventional systems, though full life cycle assessment would be required for verification. The system's potential for carbon sequestration through biomass production and soil health improvement warrants further investigation.

Waste reduction: Closed-loop nutrient cycling eliminates effluent discharge. Optional residue valorization into compost or biofertilizers can convert plant residues into valuable soil amendments, creating additional circularity while supporting local agricultural systems.

6.3 Economic Impact Projections

The business model projects lower variable costs (water, fertilizer) offset by higher capital expenditures. Financial viability depends on capacity utilization, quality premiums for traceable MAP products, and access to appropriate financing mechanisms. Preliminary modeling suggests break-even within 3-4 years under favorable market conditions, with 15-20% ROI over a 5-year horizon.

IoT monitoring reduces catastrophic loss risk and improves operational stability (Kumar et al., 2024; Miller et al., 2025). Quality assurance capabilities enabled by traceability systems can support 20-30% price premiums for certified MAP products. Diversified revenue streams including training services and research contracts provide additional income stability.

6.4 Social Impact Projections

Women's empowerment is projected through multiple pathways: training in digital and agritech skills, cooperative governance participation, and entry into higher-value market segments including processing, quality assurance, and microenterprise development. Target metrics include 200+ women trained annually, 50+ women-led microenterprises supported, and 35% income increases for participating households.

Indicator	Measurement Approach	Target (Annual)
Women trained (digital + agritech)	Attendance + competency assessment	200+
Women-led microenterprises supported	Enterprise registry + revenue tracking	50+
Youth engaged in seed bank	Participation logs + accessions	150+
Quality compliance capacity	SOP adoption + batch documentation	80%+
Community seed access	Seed distribution records	1000+ farmers
Household income increase	Survey + revenue comparison	35%+

Table 2. *Social Impact Indicators and Measurement Approaches*

7. Discussion

7.1 Policy Relevance

GroWise operationalizes green transition priorities through integrated renewable energy deployment, water recirculation, and inclusive capability building. The model aligns with Algeria's renewable energy targets and water conservation imperatives while addressing gender equality commitments. The seed bank and research hub address biodiversity stewardship and reduce dependency on external inputs, supporting food sovereignty objectives.

Policy support mechanisms that could enhance viability include: (1) preferential financing for women-led green ventures; (2) technical assistance for IoT and aquaponics adoption; (3) quality certification support for MAP exports; (4) seed law reforms recognizing farmer seed systems; and (5) public procurement preferences for sustainably produced MAPs.

7.2 Business and Management Implications

The core managerial challenge is orchestration-linking circular engineering loops to operational routines, SOPs, data governance protocols, and cooperative arrangements. Success requires capabilities spanning technical operations, digital technology management, quality assurance, and community engagement. Value capture depends on quality assurance, traceability documentation, and market access for premium MAP products.

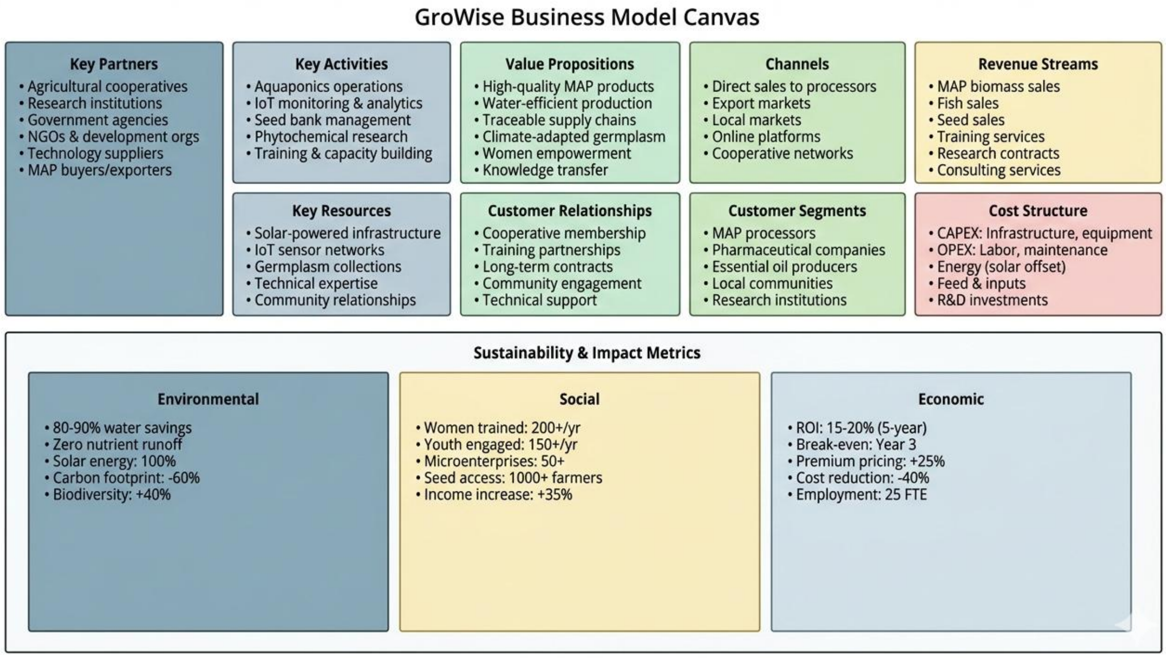

Figure 4. *GroWise Business Model Canvas with Sustainability Metrics*

7.3 Scalability and Replication

Replication pathways include: (1) modular unit deployment enabling gradual scaling; (2) cooperative networks sharing seed bank and laboratory services across multiple sites; and (3) public-private partnerships embedding units in rural development programs. The business model canvas framework (Figure 4) provides a template for adapting the GroWise approach to different contexts while maintaining core sustainability principles.

7.4 SDG Alignment

The GroWise model demonstrates multi-dimensional SDG alignment. SDG 2 (Zero Hunger) is addressed through sustainable food production and seed access. SDG 5 (Gender Equality) is operationalized through women-led governance and capability building. SDG 6 (Clean Water) benefits from 80-90% water efficiency gains. SDG 9 (Industry and Innovation) is advanced through IoT integration and research capabilities. SDG 12 (Responsible Consumption) is supported by circular design. SDG 13 (Climate Action) benefits from renewable energy and emissions reduction. SDG 15 (Life on Land) is served through biodiversity stewardship.

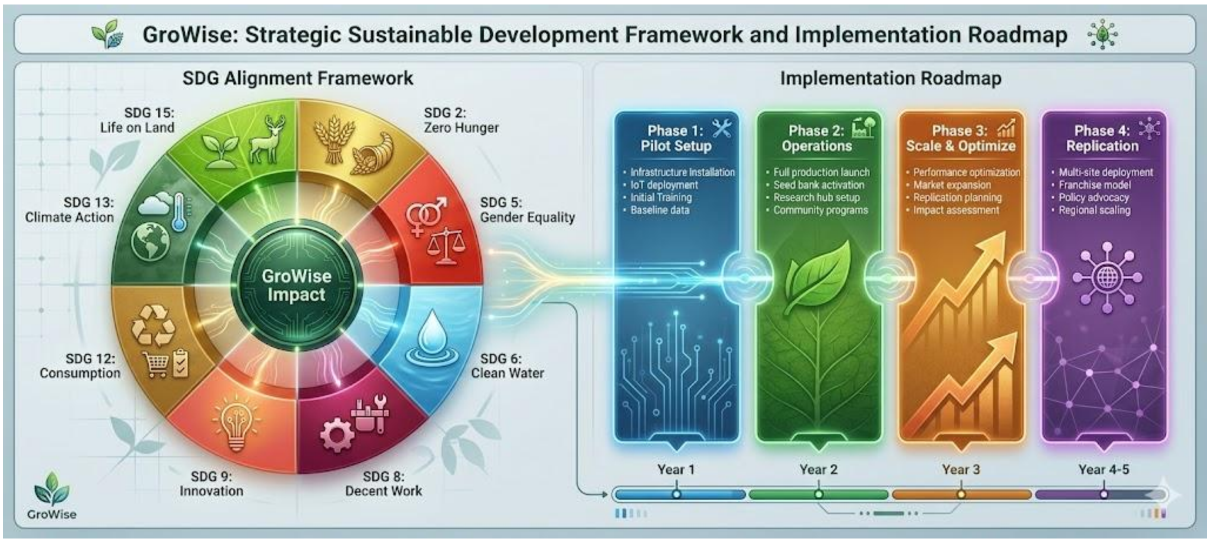

Figure 5. *SDG Alignment Framework and Implementation Roadmap*

7.5 Theoretical Contributions

This study advances theory in three areas. First, it extends socio-technical systems theory by formalizing the integration of circular engineering, IoT governance, and inclusive innovation mechanisms within a unified architecture. Second, it contributes to sustainable business model innovation theory by demonstrating how diversified revenue streams can support circular agritech ventures in emerging economies. Third, it advances understanding of gender-inclusive green entrepreneurship by specifying mechanisms through which women-led ventures can achieve both sustainability and empowerment objectives.

8. Conclusion

This conceptual case study positions GroWise as an integrative socio-technical architecture linking circular economy design, green entrepreneurship, IoT-enabled monitoring, and phytochemical innovation within MAP value chains. The contribution is an evaluable model and projection framework suitable for management and policy discussion in semi-arid emerging economies.

The analysis suggests that integrated aquaponic-IoT systems can achieve substantial resource efficiency gains while supporting quality assurance and traceability in MAP supply chains. Community seed banks and phytochemical research capabilities address biodiversity stewardship and value chain upgrading objectives. Women-led cooperative engagement mechanisms can enhance capability building and inclusive economic development.

8.1 Limitations

Projections rely on literature-derived assumptions and ranges rather than empirical measurement. Local implementation will require pilot testing, sensitivity analysis, and formal environmental accounting including water footprinting and life cycle assessment. The conceptual case study approach limits generalizability until broader replication can be conducted.

8.2 Future Research Directions

Future research should address:

1. Empirical testing of the system architecture through pilot implementation with rigorous monitoring and evaluation.
2. Refinement of business model scenarios based on actual market performance and cost structures.
3. Evaluation of seed bank governance models and data rights frameworks in cooperative agritech systems.
4. Comparative analysis with other circular agritech ventures to identify success factors and scaling pathways.
5. Assessment of policy support mechanisms and their effectiveness in enabling women-led green ventures.

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