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Greening Growth

Greening Growth

An Analysis of Agriculture Value Chains' Circularity Potential

September 2024
Baalbeck, Chouf, Hasabaya, Bekaa districts

A project implemented by Acted

Table of Contents

Acknowledgements

This report is the result of the collaborative efforts of numerous stakeholders dedicated to fostering sustainable development within Lebanon's agricultural and agri-food sectors.

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Acronyms

MSME: Micro, Small, and Medium Enterprises

GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit

MEAL: Monitoring, Evaluation, Accountability, and Learning

KII: Key Informant Interview

NGO: Non-Governmental Organization

FAO: Food and Agriculture Organization

WFP: World Food Programme

SWOT: Strength, Weakness, Opportunities, Threats

VC: Value Chain

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Executive Summary

Executive Summary

The "Greening Growth: Empowering MSMEs in the Agriculture and Agri-Food sector" project, funded by BMZ and implemented by Acted in partnership with GIZ, is aimed at bolstering the agricultural and agri-food sectors in Lebanon. This report provides an in-depth analysis of the Value Chain (VC) identification analysis, and findings, with a particular focus on the challenges and opportunities for Micro, Small and Medium Enterprises (MSMEs) in the districts of Baalbeck, Chouf, Hasbaya, and Bekaa. Predominantly the project aimed to **identify and prioritize viable value chains**; **integrate circular economy solutions within these value chains** and; **enhance market access for MSMEs**.

Context and Rationale

Lebanon's agriculture sector, heavily reliant on MSMEs, is grappling with multifaceted crises that include limited access to capital, extreme inflation, and climate risks. Dependence on imports for basic supplies and devaluation of the Lebanese currency have escalated operational costs for MSMEs. Consequently, this sector struggles with food security threats, economic sustainability, and employment instability, particularly in rural areas. The compounding challenges underscore the urgent need for an innovative approach like the circular economy to counteract traditional resource-intensive practices and transition towards sustainable growth. Embracing circular models—such as resource recycling, waste reduction, and product regeneration—holds promise for establishing a more resilient and environmentally sustainable agricultural sector. As a part of the project, Acted undertook a value chain analysis to identify circular solutions within these agri-value chains and their feasibility.

Methodology

The analysis involved a participatory, multi-step approach to understand and identify feasible circular solutions within key VCs, selected based on their economic and environmental potential. The selected VCs were: Olive, Honey, Dairy, Apple, Aromatic Plants, Wheat and Barley, Vegetables and Legumes, Figs, and Grapes and Vineyards. Stakeholder consultations, focus groups, and key informant interviews were conducted with representatives from several Ministries, Chamber of Commerce, industry experts, and MSMEs to ensure a robust assessment. The study utilized secondary data reviews of three primary reports, including the GIZ Value Chain Report 2022, Acted's Circular Agriculture Assessment 2022 and Acted's Study Report Towards Circular Economy 2020. Findings from these consultations and secondary data review informed a SWOT analysis and a matrix scoring each VC's potential, ultimately selecting priority VCs for their circular economy suitability. The methodology is detailed further in this report.

Key findings within the prioritized value chains:

1. **Olives**: Lebanon's olive industry, significant for local employment and exports, faces issues such as high production costs and limited processing facilities. Circular solutions include utilizing olive pomace for eco-friendly building materials, producing olive leaf tea, and extracting polyphenols from wastewater, aligning with global health and wellness trends.
2. **Honey**: This high-demand VC is beneficial to biodiversity but vulnerable to environmental changes. Proposed circular solutions involve beeswax-based products, such as natural candles and fruit coatings, which capitalize on the eco-conscious consumer market.
3. **Dairy**: Lebanon's dairy sector is integral to rural livelihoods but is impacted by high feed costs and inadequate infrastructure. The report suggests value-added processing of whey into products like sports drinks and yellow cheese to minimize waste and increase profitability.
4. **Apples**: Apple cultivation in Chouf and Hasbaya is challenged by climate impacts and quality control issues. Suggested circular initiatives include producing gluten-free flour from apple pomace, pectin extraction, and cider production from unsold apples, enhancing market diversity.
5. **Aromatic Plants**: Ideal for Chouf's environment, this sector benefits from minimal resource requirements and high consumer demand. Circular options include producing natural repellents and essential oil-based beauty products, meeting the expanding market for natural alternatives in personal care.
6. **Wheat and Barley**: Essential for local food security but hindered by high labor demands and climate variability. Circular economy options include using wheat straw for mushroom cultivation and sprouting barley as local livestock feed, addressing feed shortages sustainably.
7. **Grapes**: A valuable export VC in Baalbeck and Bekaa, hindered by limited storage. Opportunities identified include grape pomace use in health foods, grape seed oil extraction, and producing disinfectants from low-quality alcohol, which aligns with sustainable health and safety products.
8. **Vegetables and Legumes**: A crucial sector for local nutrition with challenges in storage and market access. Recommended solutions involve producing powdered onion and garlic using dry freezing techniques, extending shelf life and catering to consumer demand for natural spices.
9. **Figs**: Cultivated mainly in Hasbaya, figs have export potential but require careful handling. Circular approaches include integrating figs into cereal bars and snacks, capitalizing on the growing health food market.

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Introduction

Introduction

Lebanon is facing multiple challenges deriving from its long-standing structural issues, stacked up by compounding political, economic, social, humanitarian and security crises; the 13-years long Syria crisis, Beirut Port Explosions, Covid19 pandemic, unprecedented economic recession, and cross-border conflict. Lebanese Micro, Small, and Medium Entreprises (MSMEs) have been significantly impacted by these multi-layered ongoing crises, which have further exacerbated pre-existing structural challenges. The banking sector adopted heavy capital control measures and ceased lending. This shortfall in access to capital, combined with eroding fiscal reserves of small businesses, increasing prices of imports and constrained energy access resulted in a large share of businesses struggling and/or shutting down[1]. GDP per capita is expected to drop by 49% in 2024 compared to 2019. The country imports up to 80% of its food, and all its fuel. Added to the removal of the State subsidies, currency devaluation and depreciation has resulted in a year-on-year nominal food inflation of 181% as of February 2024[2].

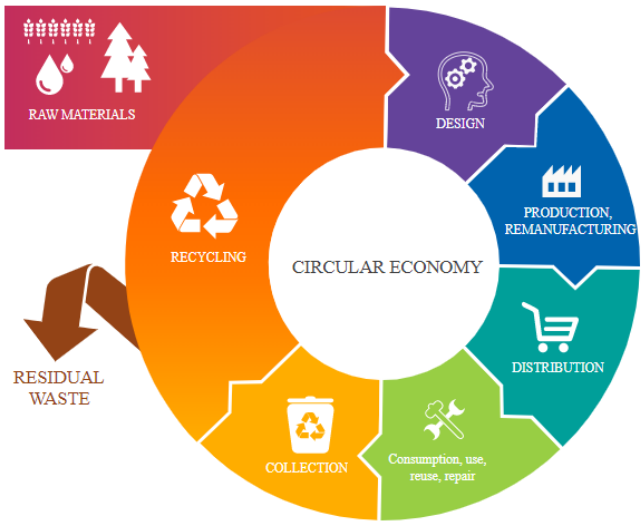
The role that MSMEs play in the agriculture sector is critical for rural development and provides essential livelihood support to these communities. Yet, looming as a potential additional crisis for the country to deal with, are the effects of climate change. If current emissions continue unabated globally, Lebanon stands to wear significant environmental, economic, and social impacts that may prove beyond its ability to cope. Human activities that adversely affect ecosystem resilience such as reduction of biodiversity, exploitation of natural resources, pollution, land use, and anthropogenic climate change are increasingly causing regime shifts in ecosystems, often to less desirable and degraded conditions. Of the 9 planetary boundaries that regulate the stability and resilience of the Earth system, it was assessed that 6 planetary boundaries were crossed as of 2023 due to human activities[3]. Consequently, the intricate balance between social, economic and environmental markets, necessary for sustainable development and alleviating poverty, has been disrupted, leading to increasing negative impacts on most sectors, including basic services. These most notably include agricultural productivity, water & sanitation, manufacturing, transportation, and energy.

In the wake of the current crises Lebanon is facing, market factors create a unique opportunity for green economic recovery. Embracing circular economy practices can reduce the environmental footprint and enhance the competitiveness of MSMEs through the adoption of sustainable consumption and production patterns (e.g. materials reuse, energy efficiency, innovation in product design and waste management), thereby offering opportunities for the private sector in Lebanon. Circularity represents a fundamental shift

[1] According to the Beirut Traders Association, 35% of Lebanese merchants had shut their stores or store branches by January 2022.
[2] International Monetary Fund, Haver Analytics, Trading Economics, and World Bank real time price estimates.
[3] https://www.stockholmresilience.org/research/research-news/2023-09-13-all-planetary-boundaries-mapped-out-for-the-first-time-six-of-nine-crossed.html

away from the traditional linear model of production and consumption, which is characterized by "take-make-dispose," towards a more regenerative and resource-efficient approach. Resources are kept in use for as long as possible, extracting maximum value from them while in use, and then recovering and regenerating products and materials at the end of their service life. This model emphasizes a closed-loop system, reducing waste and encouraging the continual use of resources. However, current initiatives largely remain scattered, small-scale, focusing on recycling & waste management only, and/or mono-sectoral, while the socio-economic and climate crises call for a holistic change of perspective and action.

Acted aims to ensure that ecosystems and natural resources are regenerated, consumed and protected in a more sustainable manner so that populations can responsibly benefit from them to meet their needs while conserving the ecosystems for future generations. Circular Economy presents a systemic approach for enhancing economic development while mitigating the impact on the planet's limited critical resources. Since 2017, Acted Lebanon has thus been striving to promote and influence environmental sustainability and circular economy initiatives.



The "Greening Growth: Empowering MSMEs in the Agriculture and Agri-Food sector" project, funded by BMZ and implemented by Acted in partnership with GIZ, as part of the ACE Program, is aimed at bolstering the agricultural and agri-food sectors in Lebanon (2023-2025). Through one of the components of the project, 15 Micro Enterprise and 25 Small and Medium Enterprises (MSMEs) will be supported to transition to circular economy approaches, by means of tailored resource management and updated business plans, along with in-kind and/or technical assistance.

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Methodology and Objectives

To inform the support to be provided to MSMEs for their circular transition, Acted conducted an in-depth analysis of agriculture Value Chains circularity potential in the Baalbeck, Chouf, Hasbaya, and Bekaa districts. More specifically, it sought to select relevant VCs, analyze their strengths and weaknesses, as well as identify concrete circular solutions and determine their feasibility and viability.

Acted employed a multi-step, participatory approach involving secondary data review, consultation workshops, focus group discussions, and key informant interviews. The process was led jointly by the Acted program team and Monitoring, Evaluation, Accountability and Learning (MEAL) unit in May-July 2024. Data was collected through KOBO-code questionnaires whenever possible and relevant.

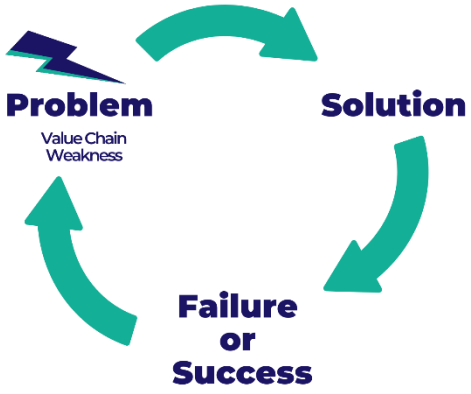
Available reports were broadly reviewed, with a focus on the following three:

- GIZ Value Chain Report 2022: a comprehensive study looking at the resilience of smallholder farmers, MSMEs and local communities in Lebanon. It emphasizes the importance of the agricultural sector in reducing poverty, generating employment, and combating rural exodus. The project focuses on six VCs namely, Apples, Dairy, Wheat & Barley, Honey, Chicken (Broiler & Layers), and Legumes. The study involves mapping and analysing these VCs to understand their current state, identify gaps and challenges, and propose interventions to improve productivity, quality, and marketability. The analysis takes into account social, ecological, economic, and gender aspects, aiming to create a sustainable and competitive agricultural sector that meets local and international market standards.
- Towards Circular Economy in Lebanon, June 2020, Acted: the first nationwide assessment on the potential of circular economy in Lebanon. Through 241 Key Informant Interviews (KIIs), it sought to identify the main actors working in Circular Economy, their types of activities, the resources they use and the outputs they produce, as well as the limitations they face for growth/expansion. It also looks at the needed policy frameworks/incentives to improve the circularity of a Value Chain, and the employment opportunities in a Circular Economy.
- Circular Agriculture Assessment, 2022, Acted, arcenciel, LOST: a nationwide assessment to understand how to promote the transition from resource intensive and environmentally harmful agricultural practices towards more sustainable practices which can also improve farmer revenues and reduce waste, taking into account the current ongoing crisis in Lebanon.

A first round of four consultations workshops gathering key stakeholders allowed to pre-identify value chains per district, including representatives from local communities, representatives from the ministries of agriculture and industry, Chamber of Commerce, MSMEs, and relevant sectors, were invited to participate. Both eligibility and prioritization

criteria were used, by means of a matrix scoring their sustainability and economic potential (e.g. spread, suitability to the environment, resource requirements, employment rates, and market acceptance). This was complemented by a strengths, weaknesses, opportunities and threats (SWOT) analysis, so as to prioritize the VCs presenting the highest potential and the least risks.

The second round of consultation workshops explored Circular Opportunities within the Pre-Identified Value Chains, bringing together key stakeholders, including industry experts, Agriculture Experts and Circular Economy Experts. Starting from the identified weaknesses, participants brainstormed to identify potential circular solutions per VC, assess their actionability and understand their potential for failure/success. The ideation process was framed by the following objectives: enhancing product competitiveness, boosting the economy, creating jobs, generating income, promoting inclusivity and social equity, ensuring financial sustainability, and protecting environmental resources.



The third consultative workshop sought to determine the feasibility and viability of the identified circular solutions (two-three per VC), engaging diverse stakeholders to assess their feasibility and viability while addressing potential barriers to implementation. Criteria used included: expertise requirements, legal / regulatory barriers, market demand, cost implications, financial sustainability, potential for job creation and community benefits, environmental sustainability, change management. To this effect, participants included circular and value chain technical specialists, policymakers, and business consultants.

To coordinate the project with other initiatives, pinpoint barriers and challenges faced, identify gaps and avoid duplicates, Acted mapped ongoing circular economy projects targeting MSMEs. This involved communication with the Food Security and Agriculture and Livelihood sectors, the EcoSwitch Coalition, and other GIZ partners. Utilizing the

collected data, Acted created a GIS map to visualize geographic patterns, gaps, and areas needing additional support.

Acted then undertook nationwide Key Informant Interviews (KII) with representatives from the Ministry of Agriculture, the Ministry of Trade, the Lebanon Chamber of Commerce, private sector actors, and specialized national and international NGOs. The objective was to better understand the available support and barriers faced by MSMEs in market access when applying circular practices in Lebanon. A second round of KIIs delved deeper into the market demand trends, potential markets, and necessary support mechanisms for specific circular economy products.

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General Findings

General Findings

National ministerial plans

The Ministry of Economy & Trade and the Ministry of Industry have identified priority value chains that hold high potential for growth and creation of employment opportunities, almost all of which bear circular potential. For agriculture and agro-food, the listed ones are agritech, aquaculture, post-harvest infrastructure, wine production, olive oil, dried food and nuts, chocolate and other sweet products and dairy products, freekeh, honey, etc.

In its National Agriculture Strategy (2020-2025), the Ministry of Agriculture further recommends supporting value chains which are characterised by high domestic consumption, and/or widespread production base (i.e. with high impacts on livelihoods of rural and agricultural dwellers) such as cucumbers, tomatoes, leafy vegetables, table grapes, avocadoes, cherries, citrus, apple, potatoes, and olive oil. Acted supports enhancements in circularity of entire value chains, in line with the strategy of the Ministry of Agriculture (NAS Pillar 3).

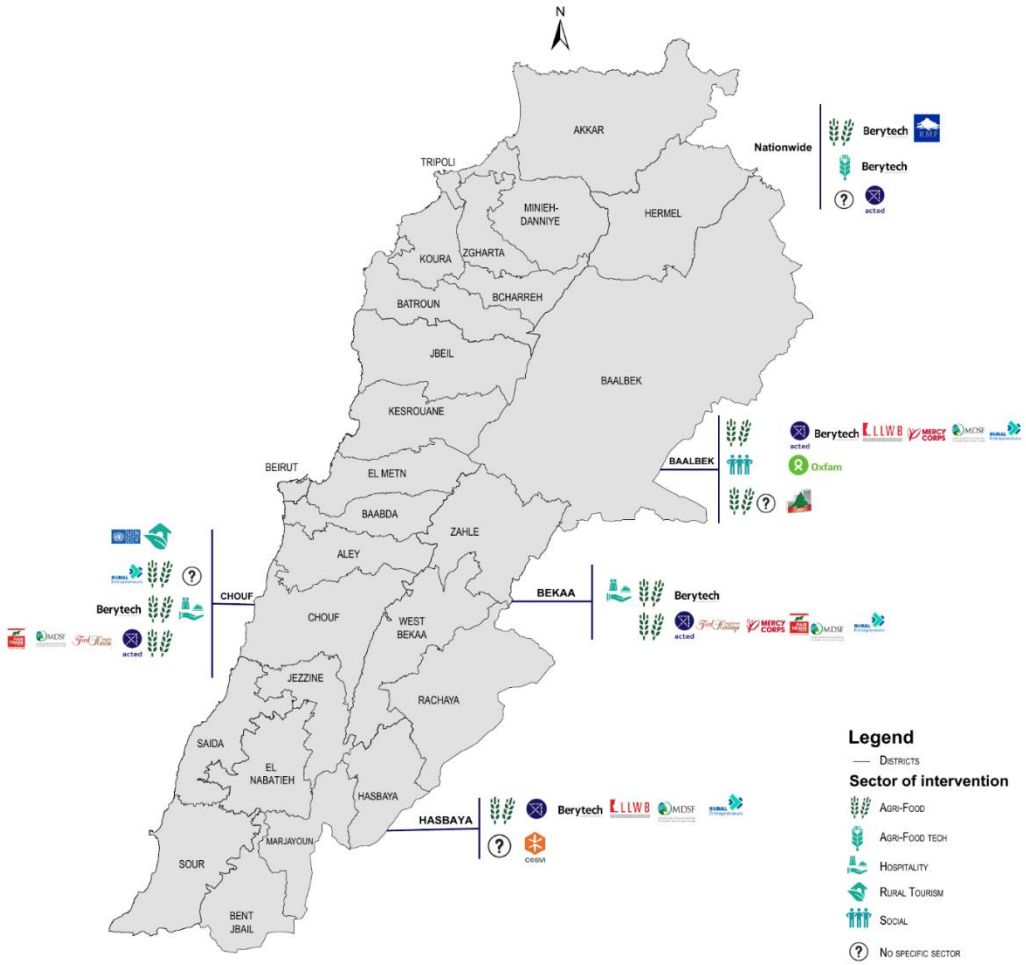
Regulations in the agriculture sector

- **Inputs:** regulations mainly cover the import/export of fertilizers, pesticides, and chemicals. There are standards for local agricultural practices, but they are not as stringent as those for export.
- **Seeds:** regulations on seed variety, germination rate, viability, and storage conditions. However, there is a lack of strict regulations on seed distribution.
- **Livestock Feed:** Standards for mass agriculture and quality control for animal feed, but no specific regulations for local production.
- **Water:** Regulations for water contamination levels in farms and food processing facilities, but irrigation regulations at the farm level are mostly non-existent.
- **Renewable Energy:** No regulatory frameworks for renewable energy production in farms, and the cost of renewable energy systems is a significant barrier for small and medium-sized farmers.
- **Agricultural Waste:** Regulations for commercial compost, including the composition and use of compost from agricultural waste.
- **Machinery:** Standards for the repair of agricultural machinery and food processing machinery, particularly concerning hygiene and food safety.
- **Safety and quality:** Acted's 2020 Circular Economy Assessment indicated that agri-business in Lebanon mainly focus on standards related to safety and quality (such as ISO 9001) while there are no incentives to adopt environmental standards such as ISO 14001. Firstly, there are no national regulations that make it

mandatory. Moreover, as these standards do not influence customer purchase, including in the export markets, other financial incentives must be provided to industries such as tax benefits for establishing improved environmental management systems.

Ongoing MSME support projects in circular economy

The below map, derived from Acted's consultations and aiming at deduplication, highlights various districts where actors are actively engaged with ongoing projects, including in specific Baalbek, Chouf, Hasbaya, Bekkaa. Each district is marked with specific icons representing sectors of intervention, illustrating the breadth and diversity of various actors' initiatives across the country, which include Agri-Food, Agri-Food Tech, Hospitality, Social, and Rural Tourism.



International organizations such as the FAO and WFP play a crucial role in supporting sustainability from a food security perspective. Utilizing waste reduces food production costs, which has a positive impact on food security. However, there is no prioritization for local products by these organizations. International frameworks and standards are more focused on imports, further complicating the situation for MSMEs trying to penetrate these markets.

Support from the government and public entities for MSMEs in accessing market opportunities for circular economy products is notably lacking. The local authorities are not currently ready to support sustainable initiatives, with no significant efforts being made to promote circular economy practices. The absence of government initiatives and the discontinuation of programs like IDAL's export plus program[1] leaves MSMEs to rely primarily on private initiatives.

Currently, there are no existing support programs or future strategies from the ministry to promote market access for circular economy products. Increasing market linkages through events and forums in schools or villages was suggested by a key informant. Involving big suppliers to promote local production and working with the Ministry of Economy to establish standards for circular economy products are also important steps, according to an interviewed expert.

Appetite and challenges for MSMEs in circular agriculture VCs

Acted's 2020 Circular Economy assessment identified the agriculture sector as key to establish a robust circular economy in Lebanon.

In its 2022 Circular Agriculture Assessment, Acted reached the following conclusions with regards to farmers' readiness to resort to circular agriculture practices:

- **Seed Use, Perception, and Supply:** Farmers rely heavily on imported seeds/seedlings, and due to economic crises, many have resorted to saving seeds from their plants. There is a negative perception of the quality and productivity of locally saved seeds.
- **Input Use, Perception, and Supply**: Farmers predominantly use store-bought fertilizers and animal-based organic fertilizers. There is a significant lack of skills and knowledge on composting practices, and farmers are less able to afford inputs due to economic conditions. There is a negative perception of natural inputs compared to agrochemical inputs.

[1] IDAL's Program: The Agri Plus Program was put in place in 2012 (approved by the government in September 2011) to replace the Export Plus Program and to support exporters in the marketing of their agricultural products in regional and international markets. link: http://www.investinlebanon.gov.lb/en/export/financial_support/agri_plus_program_

- **Livestock Feed Supply:** Imported animal feed is less affordable, and there is a negative perception of locally produced feed in terms of quality. However, farmers would be willing to use locally produced feed if it were cheaper.
- **Water Use and Supply:** Farmers' primary water source is wells/bore wells, which are also reported as the most contaminated. Farmers are open to using treated greywater or wastewater if it is cost-effective, despite negative perceptions.
- **Land Management:** Common practices include tilling, border planting, and terracing, with trainings mostly provided by NGOs. Farmers are aware of the profitability of polyculture but face financial constraints.
- **Post-Harvest:** Farmers face challenges in selling harvested products, often due to market saturation or lack of proper storage. Post-harvest losses reduce their ability to purchase inputs for the next season.
- **Machinery Repair:** The cost of spare parts and services are significant constraints. Farmers generally trust local repairmen, but procurement of spare parts is challenging.
- **Governance & Representation:** Farmers mostly get technical information from NGOs and suppliers, with less than 50% receiving support from extension centres.

Market trends show a growing demand for circular economy products, driven largely by international markets, particularly among the Lebanese diaspora who are inclined to support products made in Lebanon. Labelling products with their Lebanese origin could enhance their appeal abroad. Domestically, there is a growing awareness and willingness among consumers to purchase local and environmentally friendly products. However, MSMEs often lack the production capacity to scale these products for international markets.

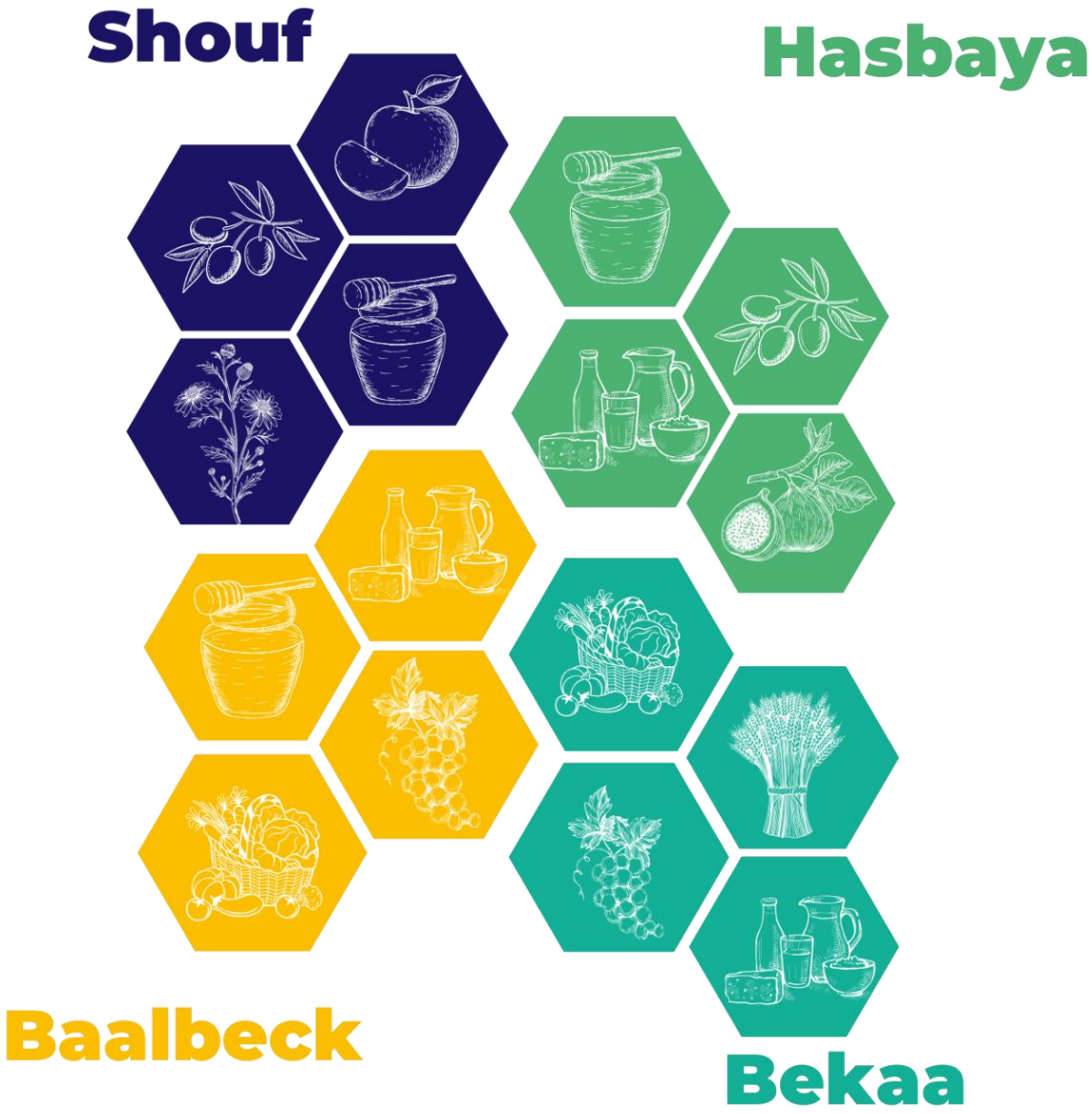
MSMEs also face multiple challenges in implementing circular economy practices and accessing markets:

1. **Lack of Government Support:** The lack of governmental support is a significant barrier. There is an absence of sustainable initiatives and a lack of continuity in INGO projects. Outdated regulatory frameworks and standards do not support micro-enterprises and do not encourage local production or include greening standards.
2. **Limited Resources and Knowledge**: MSMEs often lack the necessary materials, know-how, and production quantities. There is a need for more piloting practices and increased consumer awareness.
3. **Market Access Barriers:** Price competitiveness is a major hurdle, as well as the lack of incentives for circular economy practices. There are no laws prohibiting the

production of such products, but the absence of incentives and support hampers MSMEs' efforts.

Selected Value Chains

Based on the desk review and extensive consultations led, the following VCs have been selected for the project:



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Analysis of Value Chains' Circular Potential

Olive

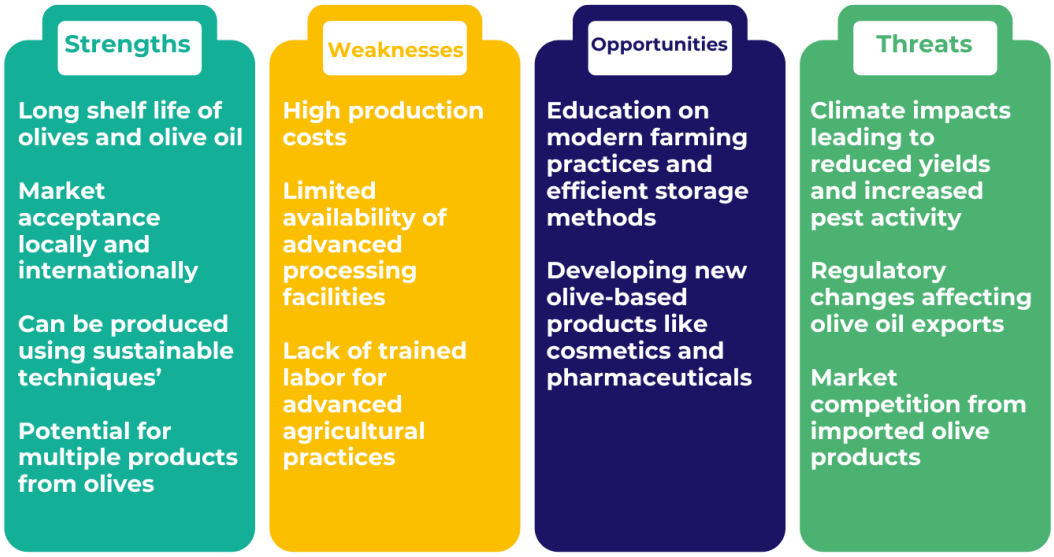
Introduction

Olive cultivation is highly suitable in Chouf and Hasbaya, adapting well to various soil types and requiring minimal resources. Employing more than 25% of the workforce in these areas, the olive sector produces a range of products such as olives, olive oil, and soap. Regulatory measures ensure the quality and safety of olive products, and the sector's historical significance and market acceptance make it a robust value chain.

Secondary Data Review

The olive value chain in Lebanon is crucial for the agricultural economy, with olive cultivation covering over 23% of the country's agricultural land. Olive production is concentrated in regions such as the North and South of Lebanon and contributes significantly to rural livelihoods. However, the sector faces several obstacles, including land fragmentation, high production costs, traditional farming practices, and a lack of modern milling and storage facilities. Issues like poor quality control, inadequate waste management from olive oil mills, and competition from imported olive oil further impact the industry. Opportunities exist from an agriculture point of view and not from a circular economy perspective that enhance production efficiency through modern agricultural techniques, investments in advanced milling equipment, and cooperative-driven initiatives for shared services and market linkages. Strengthening cooperatives' capacities can provide crucial support to small farmers, improve quality, and expand access to both local and international markets

Value Chain Swot Analysis



Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Brick Production from Olive Pomace and Pruning

Proposition solution: Eco-friendly construction materials. Eco-friendly bricks made from olive pomace and pruning waste cater to the growing demand for sustainable construction materials. These bricks can be marketed as a green alternative to traditional building materials.

Process associated with the proposed solution: Drying, grinding, mixing, briquette press.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Knowledge in materials science and brick production.
- **Machinery Needed:** Dryers, grinders, briquette presses.
- **Conclusion:** Technically feasible.

Market Access: Construction and building materials markets, particularly those focused on sustainable building practices.

Barriers: Market demand needs to be stimulated through awareness campaigns. Ensuring quality and consistency of the bricks is essential to gain consumer trust.

Support Needed: Market awareness initiatives, partnerships with construction companies, and quality assurance programs.

Solution 2 - Olive Leaf Tea Production

Proposition Solution: Olive leaf tea caters to the increasing demand for health and wellness products. Olive leaf tea can be marketed as a natural alternative with various health benefits.

Process associated with the proposed solution: Preparation, drying, grinding, packaging.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Knowledge in tea production and quality control.
- **Machinery Needed:** Dryers, grinders, packaging machines.
- **Conclusion:** Technically Feasible with market opportunities.

Market Access: Health and wellness markets, specialty tea shops, and health food stores.

Opportunities: Olive leaf tea appeals to consumers seeking natural health products. The growing wellness trend supports the market for herbal teas with health benefits.

Barriers: Ensuring a consistent supply of high-quality olive leaves and educating consumers about the benefits of olive leaf tea.

Support Needed: Market research, promotional activities, and partnerships with health food and wellness retailers.

Solution 3 - Irrigation Use of Olive Mill Wastewater

Proposition Solution: Olive mill wastewater can be treated and reused for irrigation purposes or repurposed in building and construction, offering both cost-effective irrigation and environmental benefits.

Process associated with the proposed solution: Preparation (screening and settling), filtration, reuse or reuse in building and construction.

Feasibility and Viability:

- **Risks:** Environmental impact and water quality.
- **Expertise Required:** Environmental science knowledge, water treatment.
- **Machinery Needed:** Filtration systems, settling tanks.
- **Conclusion:** Technically Feasible with environmental benefits.

Market Access: Agriculture sector, particularly in water-scarce regions, and sustainable construction practices.

Opportunities: Treated wastewater can be a cost-effective solution for irrigation in arid regions, and its reuse in construction aligns with sustainability trends.

Barriers: Addressing concerns related to water quality and environmental regulations for wastewater use in irrigation.

Support Needed: Environmental assessments, regulatory compliance assistance, and partnerships with agricultural stakeholders and construction companies.

Solution 4 - Polyphenol Extraction from Olive Mill Wastewater

Proposition Solution: Olive mill wastewater can be utilized to extract polyphenols, which are in high demand in the health and beauty sectors due to their antioxidant properties.

Process associated with the proposed solution: Preparation, extraction (solid-liquid or liquid-liquid extraction).

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Chemical processing knowledge, quality control.
- **Machinery Needed:** Extraction units, filtration systems.
- **Conclusion:** Technically feasible with market opportunities.

Market Access: Health and beauty industries, focusing on antioxidant products and natural health supplements.

Opportunities: Polyphenols are valued for their antioxidant and anti-aging properties, making them appealing to consumers seeking natural health and beauty products.

Barriers: Ensuring the extraction process yields high-quality polyphenols consistently and educating the market about their benefits.

Support Needed: Research and development in extraction techniques, quality assurance measures, and collaborations with health and beauty brands.

Solution 5 - Soap Making from Remaining Low-Quality Oil

Proposition Solution: Low-quality oil can be repurposed to create natural and eco-friendly soaps, catering to the rising demand for sustainable personal care products.

Process associated with the proposed solution: Mixing lye solution (NaOH) with oil, blending, adding fragrance (essential oil), molding, curing, cutting, and curing.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Soap making knowledge, quality control.
- **Machinery Needed:** Mixing tanks, molds, curing racks.
- **Conclusion:** Technically feasible with market opportunities.

Market Access: Natural and eco-friendly personal care product markets, specialty stores, and health-focused retailers.

Opportunities: The growing trend towards eco-friendly and natural skincare products supports the demand for handmade soaps.

Barriers: Ensuring a consistent quality of soaps and educating consumers on the benefits of using natural and eco-friendly products.

Support Needed: Market awareness campaigns, quality assurance programs, and collaborations with specialty stores and eco-friendly product retailers.

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Honey

Introduction

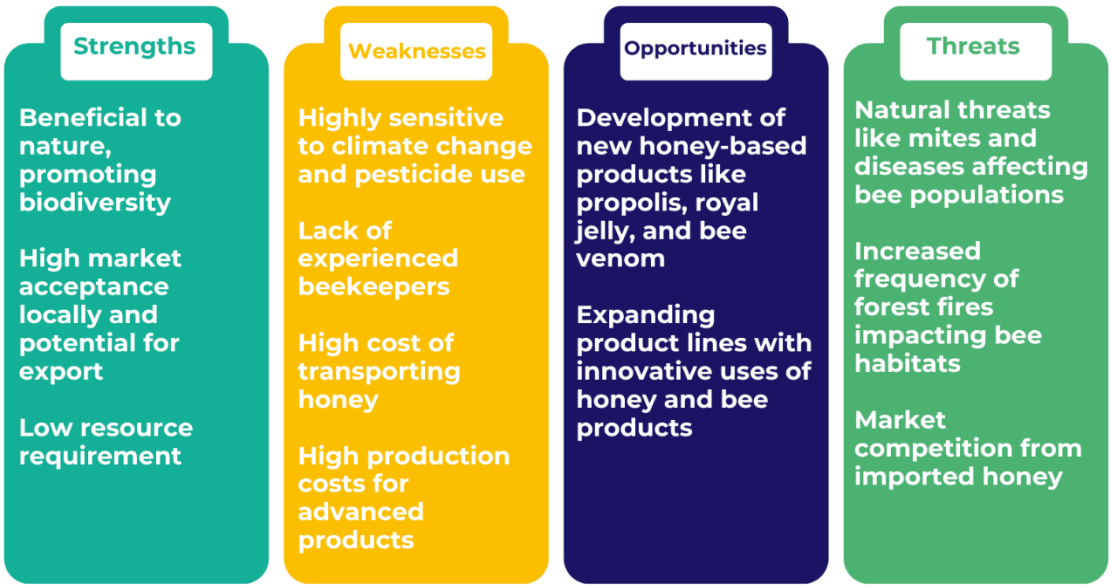
The beekeeping industry is well-established in Baalbeck, Chouf, and Hasbaya, benefiting from each region's unique and diverse flora. Honey production in these areas does not depend heavily on specific environmental conditions but is sensitive to climatic changes. Employing a significant portion of the workforce—ranging from 5% to over 25%—the honey sector supports environmental sustainability through pollination and offers a variety of marketable products, including honey, beeswax, and royal jelly. These regions enjoy a strong market presence both domestically and internationally, with honey and its derivatives having significant export potential.

Secondary Data Review

Honey production in Lebanon is a traditional activity with significant cultural and economic importance. Beekeeping is practiced across various regions, including Mount Lebanon and Beqaa. The honey sector, however, faces several challenges. Diseases affecting bees, such as varroa mites, pose a significant threat to bee populations and honey production. Beekeepers often lack access to modern techniques and equipment, which limits productivity and quality. Market competition, both local and international, also affects the profitability of the sector.

There are numerous opportunities to strengthen the honey value chain. Training beekeepers in modern beekeeping practices can improve hive management and increase honey yields. Investing in better processing facilities can enhance the quality of honey, making it more competitive in the market. Expanding market opportunities, both domestically and internationally, can help beekeepers achieve better prices for their products. Additionally, promoting the nutritional and health benefits of honey can increase demand and create new market niches. Support for forming cooperatives can also help beekeepers pool resources and access better markets.

Value Chain Swot Analysis



Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Candle Production from Beeswax

Proposed Solution: Beeswax can be used to create natural candles, appealing to consumers seeking eco-friendly and health-conscious alternatives to chemical-based candles. This also opens opportunities for niche markets like scented and insect-repellent candles.

Process associated with the proposed solution: Preparation, melting, molding, setting.

Feasibility and Viability:

- **Risks:** Import substitution, lower use of chemical candles.
- **Expertise Required:** Basic candle-making knowledge.
- **Machinery Needed:** Melting pots, molds, packaging machines.

- **Conclusion:** Technically feasible and beneficial with strong market potential.

Market Access: Natural product markets, specialty candle shops, eco-friendly retailers, and niche segments such as insect-repellent and scented candle markets.

Opportunities: Increasing demand for natural candles aligns with consumer trends favoring sustainable and health-conscious products.

Barriers: Competing with cheaper, chemical-based candles and ensuring consistent product quality.

Support Needed: Market awareness campaigns, collaborations with eco-friendly retailers, and development of niche product lines (e.g., insect-repellent candles).

Solution 2 - Beeswax Coating: Natural Preservation for Fruits (e.g., Apples)

Proposed Solution: Beeswax can be used to coat fruits like apples, providing a natural and eco-friendly method of preservation that reduces the need for artificial preservatives and excessive packaging.

Process associated with the proposed solution: Harvesting beeswax, melting it down, dipping or spraying fruits (e.g., apples) with the melted beeswax, allowing it to dry and harden as a protective coating.

Feasibility and Viability:

- **Risks:** Potential cost of beeswax, ensuring uniform coating, consumer acceptance of waxy texture on fruits.
- **Expertise Required:** Knowledge of wax application techniques and food preservation, quality control to ensure coating effectiveness.
- **Machinery Needed:** Melting tanks, spraying/dipping equipment, drying racks.
- **Conclusion:** Technically feasible with strong market opportunities in organic and eco-friendly food preservation sectors.

Market Access: Specialty stores, health and wellness markets, and eco-friendly product retailers.

Opportunities: Growing demand for natural, organic preservation methods in the food industry. Reduces the need for artificial preservatives and packaging.

Barriers: Market awareness and consumer education on the benefits of beeswax coatings for fruits, as well as the cost implications.

Support Needed: Marketing campaigns, cost management strategies, and partnerships with specialty retailers and eco-friendly food producers.

Solution 3 - Collection of Valuable Products like Bee Bread, Pollen, and Propolis

Proposed Solution: Bee products such as bee bread, pollen, and propolis are in high demand due to their health benefits. These natural supplements cater to the growing wellness and health food markets.

Process associated with the proposed solution: Training beekeepers, collection processes.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Beekeeping knowledge, product collection and preservation techniques.
- **Machinery Needed:** Collection tools, drying equipment, packaging machines.
- **Conclusion:** Technically feasible with significant market opportunities.

Market Access: Health food stores, wellness markets, and specialty retailers.

Opportunities: High demand for natural health products such as bee bread, pollen, and propolis. These products cater to consumers seeking natural supplements.

Barriers: Ensuring consistent quality and supply, as well as raising market awareness.

Support Needed: Quality assurance programs, educational marketing campaigns, and collaborations with health food retailers.

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Greening Growth

Dairy

Introduction

The dairy industry is well-established in the regions of Baalbeck, Chouf, Bekaa, and Hasbaya, where dairy farming is widespread and adapted to local environmental conditions. Employing a significant portion of the workforce—ranging from 5% to over 25%—the sector produces a variety of traditional dairy products, such as Labneh, Kashk, cheese, yogurt, and cream. These products are in high demand both locally and in broader markets, contributing to the regions' economic sustainability. A robust regulatory framework across all regions ensures product quality, safety, and traceability, supporting the industry's growth and market acceptance.

Secondary Data Review

The dairy value chain in Lebanon is a vital component of rural livelihoods, providing a primary source of income for many families. Dairy farming is predominantly concentrated in regions like West Beqaa and Zahle, where smallholder farmers dominate the sector. Despite its significance, the dairy industry faces numerous challenges that threaten its sustainability.

High production costs, largely due to expensive feed and veterinary services, strain the profitability of small farmers. Inadequate infrastructure, including poor road networks and a lack of refrigeration facilities, exacerbates the difficulties farmers face in preserving and transporting their products. Limited market access further restricts farmers' ability to sell their products at fair prices, undermining their income stability.

In this context, there is substantial market potential for valorized waste products from the dairy industry. Dairy processing facilities that produce cheese often generate whey as a waste product, which is frequently discarded. This practice, especially the dumping of whey in water bodies like the Litani River, poses significant environmental risks, as whey can alter the pH of water and destabilize ecosystems. ACTED's key informant interviews (KIIs) revealed that globally, whey production is estimated at around 180 to 190 million tons per year, but only about 50% of this whey is processed and transformed into food and feed products. Finding ways to repurpose whey is essential, as treating whey-contaminated water is costly.

However, opportunities exist to address these challenges and capitalize on untapped potential within the dairy sector. By enhancing production efficiency through improved feed management and animal health practices, farmers can increase their productivity and milk quality. Training programs in modern dairy farming techniques could equip farmers with the skills necessary to adopt more efficient methods. Organizing farmers into cooperatives can allow them to pool resources, reduce costs, and gain better market access.

Furthermore, investing in infrastructure, such as improved road networks and refrigeration facilities, would help reduce post-production losses and maintain product quality. Strengthening market linkages, both domestically and internationally, can ensure that farmers receive fair prices for their products. Lastly, processing and transforming whey into a low-cost liquid feed for animals or incorporating it into food products suitable for human consumption offers an economical alternative that could open up new revenue streams for the sector.

Value Chain Swot Analysis

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Adding Whey Wastewater to Ayran, Cheese Spread, and Juice

Proposed Solution: Whey wastewater can be utilized to create new value-added products such as Ayran, cheese spread, and juice, promoting sustainability and reducing waste in the dairy industry.

Process associated with the proposed solution: Collection, mixing, processing.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Food processing knowledge, product development.
- **Machinery Needed:** Mixing tanks, packaging machines.
- **Conclusion:** Technically feasible with market opportunities.

Market Access: Dairy and beverage industries, health food markets, and specialty stores focused on innovative products.

Opportunities: Creates new value-added products from whey waste, aligning with sustainability and waste reduction trends in the food industry.

Barriers: Ensuring consistent quality and gaining consumer acceptance of new products containing whey wastewater.

Support Needed: Product development support, market awareness initiatives, and partnerships with dairy companies and health-focused retailers.

Solution 2 - Sports Drinks from Whey: Utilizing Whey for Hydration and Nutrition

Proposed Solution: Whey can be processed and blended with electrolytes, flavors, and natural sweeteners to create sports drinks that cater to fitness enthusiasts seeking protein-enriched beverages and natural hydration solutions.

Process associated with the proposed solution: Filtering and processing whey, blending it with electrolytes, flavors, and natural sweeteners, packaging as a sports drink.

Feasibility and Viability:

- **Risks:** Market competition from established sports drink brands, potential taste preferences, and lactose intolerance considerations.
- **Expertise Required:** Knowledge of whey processing, sports nutrition, and flavor formulation.
- **Machinery Needed:** Filtration systems, blending tanks, pasteurization units, and bottling machines.
- **Conclusion:** Technically feasible with growing demand for protein-enriched sports beverages, leveraging the health benefits of whey.

Market Access: Sports and fitness nutrition markets, health food stores, gyms, and wellness-focused retailers.

Opportunities: Increasing consumer interest in protein-enriched drinks and natural sources of electrolytes for fitness enthusiasts.

Barriers: Competing with established sports drink brands and addressing consumer taste preferences and lactose intolerance.

Support Needed: Marketing campaigns, product differentiation strategies, and partnerships with fitness centers and health retailers.

Solution 3 - Production of Yellow Cheeses to Increase Shelf Life

Proposed Solution: Producing yellow cheeses offers an opportunity to extend shelf life, reduce waste, and enhance profitability in the dairy sector.

Process associated with the proposed solution: Milk reception and standardization, pasteurization, inoculation, coagulation, curd cutting and stirring, whey draining, salting, molding and pressing, ripening/aging, packaging, and distribution.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Dairy processing knowledge, quality control.
- **Machinery Needed:** Pasteurizers, inoculation tanks, presses, packaging machines.
- **Conclusion:** Technically feasible with market opportunities.

Market Access: Cheese markets, specialty food stores, and supermarkets.

Opportunities: Longer shelf life reduces waste and increases the profitability of cheese products. Yellow cheese can cater to both local and international markets.

Barriers: Maintaining high-quality standards and building market demand for these cheeses.

Support Needed: Quality assurance, market promotion, and collaborations with cheese retailers and distributors.

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Greening Growth

Apples

Introduction

Apple cultivation is well-suited to the regions of Chouf and Hasbaya, where the climate and environment provide ideal growing conditions. In these regions, apple farming employs around 10% of the workforce, producing a variety of apple products, such as fresh apples and apple vinegar, which are widely accepted in the market. The sector's moderate resource requirements contribute to its sustainability and economic impact. Although other regions like Baalbeck and Bekaa are not eligible for apple farming, Chouf and Hasbaya have successfully developed this industry due to favorable conditions.

Secondary Data Review

The apple value chain in Lebanon is a critical component of the agricultural sector, providing significant income for many rural families. Apples are primarily grown in regions such as Aley, Matn, Chouf, and Beqaa. Despite the importance of this crop, the sector has faced numerous challenges over the past few years.

Lebanon's apple sector is suffering from a crisis due to a combination of economic, environmental, and technological factors. A significant percentage of apple produce has been discarded due to low market uptake, stemming from low-quality production, low market value, outdated agricultural practices, and illegal imports from Syria. The drop in the number of months with snowfall and a subsequent decline in meltwater—exacerbated by climate change—has stressed apple trees, leading to an increase in diseases and a decrease in the quality of fruit. Additionally, pesticide residues, particularly from chlorinated pesticides that are prone to bioaccumulation, have resulted in bans on Lebanese apple exports by Gulf countries. As a result, Lebanese apple farmers have faced a challenging market environment, with an estimated 40% of the apple produce in 2018 being wasted.

The sector's struggles are compounded by limited access to modern agricultural technology and infrastructure. Farmers have difficulties coping with market fluctuations, impacting their income stability. Moreover, Lebanon's broader economic and political instability further exacerbates these issues.

However, there are significant opportunities to revitalize the sector. Introducing modern agricultural techniques can improve both yield and quality. Expanding market access, especially to international markets, can help stabilize farmers'

incomes and reduce their dependence on volatile local markets. Infrastructure improvements, such as enhancing cold storage facilities, can minimize post-harvest losses and maintain the quality of apples. Furthermore, developing value-added products like apple-based beverages and processed foods could open new income streams and create employment opportunities.

Value Chain Swot Analysis

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Gluten-Free Flour Production from Apple Pomace

Proposed Solution: Apple pomace can be dried, ground, and processed into gluten-free flour, catering to the increasing demand for gluten-free products and providing a unique alternative in the market.

Process associated with the proposed solution: Drying, grinding or milling, packaging, storage, and distribution.

Feasibility and Viability:

- **Risks:** Climate change affecting apple season, longer winter inhibiting solar power, and port closures are significant risks that might impact the implementation slightly negatively to a considerable success.
- **Expertise Required:** Knowledge in food processing and gluten-free product development.
- **Machinery Needed:** Dryers, grinders, milling machines, packaging machines.
- **Conclusion:** Technically feasible but dependent on environmental conditions and consistent supply of apple pomace.

Market Access: Health food stores, gluten-free product sections in supermarkets, and specialty food retailers.

Opportunities: The gluten-free market is expanding rapidly as more consumers seek gluten-free options due to dietary restrictions and health trends. Apple pomace-based flour provides a unique alternative.

Barriers: Legal recognition of apple pomace-based products and raising market awareness. Consumers need to be informed about the benefits and uses of this alternative flour.

Support Needed: Advocacy for legal recognition, educational marketing campaigns, and collaborations with gluten-free product manufacturers.

Solution 2 - Pectin Extraction from Apple Pomace or Unsold Apples

Proposed Solution: Pectin can be extracted from apple pomace or unsold apples to meet the growing demand for vegan substitutes for gelatin, catering to the health-conscious and vegan consumer segments.

Process associated with the proposed solution: Preparation, crushing, acid extraction, heating, filtration (solid separation), alcohol precipitation, collection, purification, drying, packaging, storage, and distribution.

Feasibility and Viability:

- **Risks:** Chemical contamination and market demand.
- **Expertise Required:** Chemical processing knowledge, quality control.

- **Machinery Needed:** Crushers, extraction units, filtration systems, drying machines, packaging machines.
- **Conclusion:** Technically feasible with market opportunities and contamination control.

Market Access: Food processing companies, vegan product markets, and health food stores.

Opportunities: Pectin is widely used as a gelling agent in food products and as a vegan substitute for gelatin. The vegan and health-conscious consumer segments present significant opportunities.

Barriers: Ensuring a consistent supply of raw materials and maintaining high-quality standards are crucial. Market demand needs to be established through effective marketing strategies.

Support Needed: Quality assurance protocols, partnerships with food manufacturers, and marketing strategies emphasizing the health and vegan aspects of pectin.

Solution 3 - Cider Production from Unsold or Low-Quality Apples

Proposed Solution: Unsold or low-quality apples can be transformed into cider, creating a value-added product while reducing waste and tapping into the growing market for craft and artisanal beverages.

Process associated with the proposed solution: Preparation, crushing and pressing, juice collection, filtration, fermentation, bottling, packaging, storage, and distribution.

Feasibility and Viability:

- **Risks:** Market access and quality control.
- **Expertise Required:** Brewing and fermentation knowledge, quality control.
- **Machinery Needed:** Crushers, presses, fermentation tanks, filtration systems, bottling machines.
- **Conclusion:** Technically feasible with potential market opportunities.

Market Access: Specialty beverage stores, local markets, health food stores, and restaurants that offer craft and artisanal beverages.

Opportunities: Craft and artisanal beverages are gaining popularity. Transforming unsold or low-quality apples into cider not only reduces waste but also creates a high-value product. There is a growing market for locally produced artisanal alcoholic beverages.

Barriers: Ensuring consistent quality and taste of the cider, building brand recognition, and navigating regulatory requirements for alcoholic beverages.

Support Needed: Investment in quality assurance and product development to maintain consistency, marketing strategies to build brand recognition, and assistance with navigating regulatory requirements. Collaborations with local restaurants and beverage retailers can enhance market access.

Solution 4 - Waxing of Apples to Extend Shelf Life

Proposed Solution: Beeswax can be used to coat apples, extending their shelf life and reducing waste, while providing a natural alternative to chemical-based preservatives.

Process associated with the proposed solution: Preparation, melt the beeswax, dipping or brushing, cooling, and polishing.

Feasibility and Viability:

- **Risks:** Product quality and market acceptance.
- **Expertise Required:** Basic knowledge in food preservation techniques.
- **Machinery Needed:** Melting pots, dipping tanks, polishing equipment.
- **Conclusion:** Technically feasible and beneficial.

Market Access: Organic food markets, specialty stores, and health-focused retailers.

Opportunities: Increases shelf life and reduces waste, aligning with consumer preferences for natural food preservation methods.

Barriers: Ensuring consistent product quality and educating consumers about the benefits of beeswax-coated apples.

Support Needed: Quality assurance programs, consumer awareness campaigns, and partnerships with organic and specialty food retailers.

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Greening Growth

Aromatic Plants

Introduction

The cultivation of aromatic plants is highly suitable in Chouf, where the environment provides ideal conditions with minimal resource requirements. Although employing less than 5% of the workforce, the sector has a strong market presence, producing a range of products including essential oils and dried herbs. While regions like Baalbeck, Bekaa, and Hasbaya are not suitable for aromatic plant cultivation, Chouf has successfully developed this industry, leveraging its unique environmental conditions.

Secondary Data Review

The aromatic plants value chain in Lebanon, with a focus on Zaatar, is vital for agricultural sustainability and income generation in rural areas. The production of aromatic plants like Zaatar thrives in the country's diverse ecological zones and requires relatively low water and input costs, making it ideal for small-scale farmers. Despite its potential, the sector faces challenges, such as lack of access to improved seeds, limited technical knowledge among farmers, and insufficient post-harvest facilities. Additionally, the traditional approach to farming and minimal market linkages affects the scalability of aromatic plant production.

However, there are significant opportunities within this value chain. Expanding the cultivation of aromatic herbs, particularly Zaatar, which has a growing demand locally and internationally, could provide new income streams for smallholder farmers. Improvements in post-harvest handling, packaging, and quality control would allow farmers to tap into high-value markets. Supporting cooperatives and enhancing farmers' knowledge on sustainable and market-oriented farming practices could lead to increased productivity and profitability in the aromatic plants sector

Value Chain Swot Analysis

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Production of Repellent from Essential Oils

Proposed Solution: Essential oils can be used to produce natural repellents, catering to the growing consumer demand for eco-friendly and chemical-free products.

Process associated with the proposed solution: Preparation, steam distillation or cold pressing, formulation of repellent, packaging.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Knowledge in essential oil extraction and product formulation.
  Machinery Needed: Distillation units or cold press machines, mixing tanks, packaging machines.

- **Conclusion:** Technically feasible with strong market potential for natural repellents.

Market Access: Health and wellness markets, specialty stores, and eco-friendly product retailers.

Opportunities: High demand for natural repellents and potential niche markets driven by consumer preferences for eco-friendly and non-toxic products.

Barriers: Maintaining consistent quality and educating consumers on the benefits and efficacy of natural repellents.

Support Needed: Quality control protocols, marketing campaigns, and collaborations with eco-friendly retailers and wellness brands.

Solution 2 - Essential Oils for Beauty

Proposed Solution: Essential oils extracted from plants like lavender, tea tree, argan, and rosemary can be blended with carrier oils to create natural beauty products catering to the growing demand for chemical-free solutions in skincare, haircare, and aromatherapy.

Process associated with the proposed solution: Extracting essential oils from plants (e.g., lavender, tea tree, argan, rosemary) through steam distillation or cold pressing, blending with carrier oils, and packaging for beauty applications.

Feasibility and Viability:

- **Risks:** High competition in the beauty market, potential issues with supply chain sustainability, and proper quality control for purity and safety.
- **Expertise Required:** Knowledge of essential oil extraction, blending, and cosmetic product formulation. Understanding of regulatory standards for cosmetic products.
- **Machinery Needed:** Steam distillation or cold-pressing equipment, blending tanks, filtration systems, and bottling machines.
- **Conclusion:** Technically feasible with strong market growth potential, particularly in the beauty and wellness industries, where consumers are increasingly seeking natural alternatives for their skincare and haircare routines.

Market Access: Health and wellness markets, specialty stores, and eco-friendly product retailers.

Opportunities: Growing global demand for natural, chemical-free beauty products. Increasing consumer preference for organic, eco-friendly solutions in skincare, haircare, and aromatherapy. Essential oils can be incorporated into various products like moisturizers, serums, shampoos, and body oils.

Barriers: High competition, maintaining consistent quality, and educating consumers about the benefits and safety of using essential oils in beauty products.

Support Needed: Market research to identify key consumer segments, quality assurance programs, and promotional activities to highlight the benefits of natural and eco-friendly beauty products.

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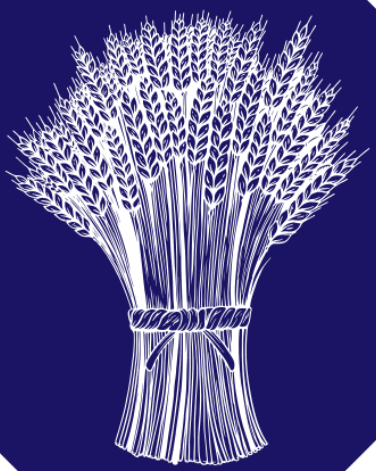
Greening Growth

Wheat and Barley



Introduction

Wheat and barley are staple crops in the regions of Baalbeck and Bekaa, where the soil and climate provide ideal growing conditions. These crops have been cultivated for centuries, requiring minimal resources while supporting local agricultural economies. In Baalbeck, wheat and barley employ 15-24% of the agricultural workforce, producing a variety of products like bulgur, freekeh, and traditional bread. In Bekaa, these crops engage 5-14% of the workforce and benefit from a regulatory framework that promotes sustainable practices and ensures product quality. Although other regions like Chouf and Hasbaya are not suitable for these crops, Baalbeck and Bekaa continue to sustain this sector with strong legislative support and a circular economy approach.

Secondary Data Review

Wheat and barley are staple crops in Lebanon, essential for food security. These crops are primarily grown in the Beqaa Valley, which is known for its fertile soil and favourable climate. Despite their importance, the wheat and barley sectors face significant challenges. Low productivity is a major issue, often due to outdated farming practices and reliance on imported seeds and fertilizers. Farmers also face high production costs and are vulnerable to climate change, which affects crop yields.

Opportunities for the wheat and barley sectors include introducing climate-resilient crop varieties that can withstand adverse weather conditions. Improving irrigation practices can enhance water use efficiency and boost crop yields. Supporting local seed production can reduce dependency on imports and lower costs for farmers. Additionally, developing better agronomic practices through farmer training programs can increase productivity. Strengthening market linkages and improving storage facilities can help stabilize prices and reduce post-harvest losses, ensuring a steady supply of these essential crops.

Value Chain Swot Analysis

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1- Use of Wheat Straw to Grow Mushrooms

Proposed Solution: Wheat straw can be repurposed to grow mushrooms, making effective use of agricultural waste while meeting the high consumer demand for mushrooms.

Process associated with the proposed solution: Preparation of straw, inoculation with mushroom spawn, cultivation.

Feasibility and Viability:

- **Risks:** None specified.
- **Expertise Required:** Knowledge in mushroom cultivation and agricultural waste management.

- **Machinery Needed:** Straw preparation equipment, mushroom cultivation chambers.
- **Conclusion:** Technically feasible with strong market demand and effective use of waste.

Market Access: Organic produce markets, specialty food stores, and local farmers' markets.

Opportunities: High demand for mushrooms, coupled with the use of agricultural waste, appeals to eco-conscious consumers and farmers.

Barriers: Raising market awareness and ensuring consistent quality of the mushrooms.

Support Needed: Market promotion, educational initiatives for consumers, and quality assurance programs to maintain consistency and appeal to eco-conscious buyers.

Solution 2 - Sprouted Green Barley for Local Feed Production

Proposed Solution: Sprouting green barley for local feed production offers a cost-effective and sustainable option that reduces dependency on imported feed.

Process associated with the proposed solution: Sprouting barley, harvesting.

Feasibility and Viability:

- **Risks:** None specified.
- **Expertise Required:** Knowledge in barley sprouting and animal feed production.
- **Machinery Needed:** Sprouting systems, harvesting equipment.
- **Conclusion:** Technically feasible with potential to enhance local feed production.

Market Access: Livestock feed markets, local farms, and agricultural cooperatives.

Opportunities: Provides a cost-effective and sustainable feed option, reducing dependency on imported feed.

Barriers: Market acceptance and ensuring feed quality.

Support Needed: Farmer education programs, quality assurance, and market access support to encourage local adoption and awareness of the benefits of sprouted green barley as animal feed.

Solution 3 - Building Silos to Improve Shelf Life

Proposed Solution: Constructing silos for grain storage can significantly improve shelf life, reduce post-harvest losses, and enhance food security in agricultural markets.

Process associated with the proposed solution: Construction of silos, storage management.

Feasibility and Viability:

- **Risks:** None specified.
- **Expertise Required:** Knowledge in storage management and silo operations.
- **Machinery Needed:** Silo construction materials, storage management systems.
- **Conclusion:** Technically feasible with significant benefits in reducing post-harvest losses.

Market Access: Agricultural markets, grain storage solutions providers, and cooperatives.

Opportunities: Improved grain storage reduces post-harvest losses and enhances food security.

Barriers: Initial investment costs and market awareness about the advantages of using silos for grain storage.

Support Needed: Financial support programs, market promotion, and partnerships with agricultural cooperatives to encourage adoption and investment in silo storage solutions.

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Greening Growth

Grapes/ Vineyards

Introduction

Grape cultivation is a prominent agricultural activity in the regions of Baalbeck and Bekaa, where the soil and climate are highly conducive to grape growth. This sector employs 4-15% of the workforce in these regions, producing a variety of grape derivatives such as raisins and vinegar. With minimal resource requirements, grape cultivation is both sustainable and economically viable. The well-established market and strong export potential further enhance the value chain, making grapes a lucrative agricultural product. While other regions like Chouf and Hasbaya are not suitable for grape cultivation, Baalbeck and Bekaa have successfully developed this sector due to favorable growing conditions.

Secondary Data Review

The grape value chain in Lebanon is crucial for agricultural productivity, especially in regions like the Bekaa Valley, which is well-known for its vineyards. The grape sector in Lebanon benefits from favorable climatic conditions and soil types, but it faces significant challenges that hinder its full potential. Smallholder grape farmers struggle with low productivity, high production costs, and limited access to improved farming techniques and technologies. Fragmented land ownership and the traditional agricultural methods employed by many farmers lead to inefficiencies in vineyard management and harvesting.

Despite these challenges, there are substantial opportunities within the grape sector. Enhancing productivity through the introduction of modern farming techniques, such as improved pruning and irrigation practices, could increase yields. Strengthening cooperatives could play a pivotal role in providing shared services, better market access, and technical training for small farmers. Moreover, investment in cold storage facilities and better market linkages, particularly with international markets, could reduce post-harvest losses and increase farmers' profitability. Given the increasing global demand for quality grapes and wines, Lebanon has the potential to expand its exports if quality control measures and value-added processing are enhanced.

Value Chain Swot Analysis

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Addition of Grape Pomace to Other Food Products

Proposed Solution: Grape pomace, a by-product of winemaking, can be utilized to create health-focused food products, offering an eco-friendly and nutritious alternative.

Process associated with the proposed solution: Drying, grinding, or using as-is.

Feasibility and Viability:

- **Risks:** Chemical contamination from pesticides and low nutritional quality, which could slightly impact implementation.
- **Expertise Required:** Basic knowledge in food processing and quality control.
- **Machinery Needed:** Dryers, grinders, packaging machines.

- **Conclusion:** The solution is technically feasible with proper attention to contamination and nutritional quality. Market potential needs to be assessed and developed.

Market Access: The potential market includes health food stores, organic markets, and specialty food retailers catering to consumers seeking nutritious and eco-friendly options.

Opportunities: The addition of grape pomace to food products creates a unique selling point focused on health benefits and waste reduction. The trend towards functional foods that offer benefits beyond basic nutrition supports this initiative.

Barriers: Ensuring consistent quality and safety of the pomace is crucial. Market awareness and consumer education on the benefits of grape pomace are needed to drive demand.

Support Needed: Quality control measures, marketing campaigns to educate consumers, and collaborations with health food retailers to promote these products.

Solution 2 - Grape Seed Oil Extraction

Proposed Solution: Grape seed oil can be extracted from the seeds of grapes, catering to the growing demand in culinary and cosmetic markets for natural oils with nutritional and skincare benefits.

Process associated with the proposed solution: Seed separation, drying (optional), cold pressing or solvent extraction, refinement (optional), packaging, storage, and distribution.

Feasibility and Viability:

- **Risks:** Pesticide residue and market opportunity are the main risks, potentially affecting the solution slightly negatively to a considerable success.
- **Expertise Required:** Knowledge in oil extraction techniques and quality control.
- **Machinery Needed:** Seed separators, cold press machines, filtration units, packaging machines.
- **Conclusion:** This solution is technically feasible, with significant market opportunities if the risks are mitigated.

Market Access: The culinary and cosmetic markets are prime targets for grape seed oil. Health food stores, gourmet shops, and cosmetic retailers are potential outlets.

Opportunities: Grape seed oil is in high demand due to its nutritional benefits and use in natural skincare products. The trend towards natural and organic products supports market growth.

Barriers: Market entry can be challenging due to competition from established brands. Quality and purity of the oil must be maintained to build consumer trust.

Support Needed: Market research to identify key demographics, promotional activities highlighting the benefits of grape seed oil, and partnerships with retailers to expand market reach.

Solution 3 - Disinfectant Production from Low-Quality Alcohol

Proposed Solution: Low-quality alcohol can be distilled and formulated into disinfectants, meeting the rising demand for hygiene products and offering an eco-friendly and cost-effective alternative.

Process associated with the proposed solution: Collection of low-quality alcohol, distillation, formulation of disinfectants.

Feasibility and Viability:

- **Risks:** Market access and environmental benefits are potential risks but can lead to considerable success.
- **Expertise Required:** Chemical processing knowledge, safety protocols.
- **Machinery Needed:** Distillation units, mixing tanks, bottling machines.
- **Conclusion:** Technically feasible with potential environmental benefits and market opportunities.

Market Access: The primary markets for disinfectants include hospitals, schools, public institutions, and health and safety product markets.

Opportunities: The demand for disinfectants has surged, especially post-pandemic. Producing disinfectants from low-quality alcohol offers an eco-friendly and cost-effective alternative, turning waste into a valuable product.

Barriers: Competition from established brands and ensuring consistent quality and efficacy of the disinfectants.

Support Needed: Quality control measures, certifications to verify efficacy, and marketing campaigns emphasizing the eco-friendly and cost-effective nature of the product. Partnerships with public institutions and health organizations can also boost market entry.

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Greening Growth

Vegetables and Legumes

Introduction

Vegetable and legume cultivation is a key agricultural activity in the regions of Baalbeck and Bekaa, where the soil and climate provide ideal conditions for these crops. In Baalbeck, this sector employs over 24% of the workforce, producing a wide range of fresh vegetables and traditional preserved foods. In Bekaa, vegetable farming engages 15-24% of the workforce, contributing to a variety of products such as fresh vegetables and pickles, which are in high demand. Both regions benefit from moderate resource requirements, strong market presence, and supportive legislative measures that ensure product quality and safety. While regions like Chouf and Hasbaya are not suitable for vegetable cultivation, Baalbeck and Bekaa have established a robust and thriving vegetable and legume sector.

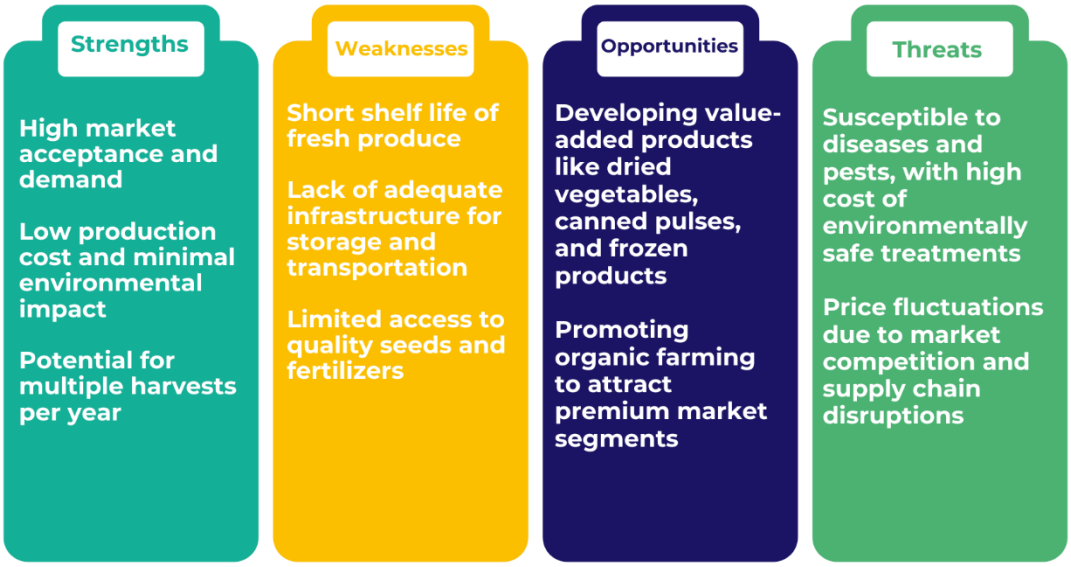
Secondary Data Review

Legumes are important for nutrition and soil health due to their nitrogen-fixing properties. These crops are grown in various regions, including Aley, Matn, and Beqaa. The sector, however, faces several challenges. Low yields are a significant issue, often due to the use of outdated farming practices and poor-quality seeds. Farmers also struggle with limited market access, which affects their ability to sell their produce at fair prices.

Opportunities for the legumes sector include developing better seed varieties that are high-yielding and disease-resistant. Improving agronomic practices through farmer training programs can increase productivity. Creating stronger market linkages can help farmers access better prices and reduce dependency on local markets. Developing value-added products, such as canned beans and lentil-based snacks, can create new income streams and employment opportunities. Additionally, promoting the nutritional benefits of legumes and Legumes can increase consumer demand and expand market opportunities.

By addressing these challenges and leveraging the opportunities, the value chains in Lebanon can become more resilient, productive, and competitive, ultimately contributing to the economic stability and food security of the country.

Value Chain Swot Analysis



Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Powdered Onion and Garlic Using Dry Freezing

Proposed Solution: Fresh onions and garlic can be preserved and processed into powdered forms using dry freezing, creating a value-added product with a long shelf life.

Process associated with the proposed solution: Preparation, dry freezing, grinding, packaging.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Knowledge in dry freezing techniques and food processing.
- **Machinery Needed:** Dry freezers, grinders, packaging machines.

- **Conclusion:** Technically feasible with potential market opportunities and high product shelf life.

Market Access: Spice markets, health food stores, and specialty food retailers.

Opportunities: Long shelf life and convenience make powdered onion and garlic attractive to consumers and the foodservice industry. There is a growing demand for high-quality, natural spices.

Barriers: Ensuring market demand and maintaining quality control.

Support Needed: Market promotion, quality assurance programs, and partnerships with spice retailers and foodservice distributors to maximize reach and impact.

Solution 2 - Modified Atmosphere Packaging for Ready-to-Eat Products

Proposed Solution: Modified Atmosphere Packaging (MAP) can be used to extend the shelf life of ready-to-eat products, retaining their freshness and quality, which appeals to consumers seeking convenient and healthy meal options.

Process associated with the proposed solution: Preparation, packaging, atmosphere modification.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Knowledge in packaging technologies and food preservation.
- **Machinery Needed:** Modified atmosphere packaging machines, sealing equipment.
- **Conclusion:** Technically feasible with strong potential for ready-to-eat market segments.

Market Access: Convenience food markets, health food stores, and supermarkets.

Opportunities: Extends shelf life and maintains freshness, appealing to busy consumers seeking healthy and convenient meal options.

Barriers: Ensuring market demand and managing the cost of packaging technology.

Support Needed: Market research to identify consumer preferences, cost management strategies, and collaborations with retailers to effectively position and market these products.

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Figs

Introduction

Fig cultivation is well-suited to the Hasbayya region, where the soil and climate provide ideal growing conditions. This sector employs a moderate percentage of the workforce, producing a range of products including fresh figs, dried figs, and fig-based preserves. Figs are well-accepted in both local and export markets, contributing to Hasbayya's agricultural diversity and economic sustainability. While other regions may not be suitable for fig cultivation, Hasbayya has developed a thriving fig industry that supports the region's economic growth.

Secondary Data Review

The fig value chain in Lebanon represents a valuable opportunity for smallholder farmers, with production concentrated in regions such as the Bekaa Valley and the southern parts of the country. However, the sector faces several challenges that limit its growth and profitability. Small-scale farmers primarily engage in fig cultivation, but they struggle with issues like outdated farming techniques, limited irrigation infrastructure, and poor market access. In addition, land fragmentation and insufficient technical support further hinder productivity and quality improvement in fig production. Farmers often sell their produce immediately after harvesting due to a lack of storage facilities, which results in lower prices and higher market dependency.

Despite these challenges, the fig sector offers promising opportunities for economic growth. By implementing modern agricultural practices, such as efficient irrigation systems and improved pest management techniques, farmers can significantly increase their yields. Developing cooperatives can help aggregate production, reduce costs, and improve access to technical support and markets. Investments in cold storage facilities and processing equipment could also help farmers store their produce longer, allowing them to access higher prices and diversify into value-added products like dried figs and fig-based jams.

Value Chain Swot Analysis

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Use of Figs in Cereal Bars and Desserts

Proposed Solution: Figs can be used in cereal bars and desserts to create a new product line that taps into the growing market for healthy snacks and utilizes locally sourced produce.

Process associated with the proposed solution: Drying, processing, mixing.

Feasibility and Viability:

- **Risks:** Market demand and quality control.
- **Expertise Required:** Food processing knowledge, product development.
- **Machinery Needed:** Dryers, mixers, packaging machines.
- **Conclusion:** Technically feasible with market opportunities.

Market Access: Snack food markets, health food stores, and specialty food retailers.

Opportunities: Incorporating figs into cereal bars and desserts taps into the growing market for healthy snacks. Figs provide natural sweetness and nutritional benefits, appealing to health-conscious consumers.

Barriers: Ensuring consistent supply and quality of figs, as well as raising consumer awareness about the benefits of fig-based products.

Support Needed: Product development efforts to create appealing fig-based snacks, marketing campaigns to promote these products, and collaborations with snack manufacturers to increase reach and visibility.

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All Value Chains

In an effort to drive sustainable transformation across various value chains, ACTED, in collaboration with industry experts, has identified key solutions that align with the principles of the circular economy. These solutions aim to enhance resource efficiency, reduce waste, and promote environmentally responsible business practices while ensuring economic viability for Micro, Small, and Medium Enterprises (MSMEs).

By integrating greener energy sources, optimizing waste management, and implementing innovative resource reuse strategies, MSMEs can reduce operational costs, increase profitability, and meet growing market demands for sustainability. The following proposed solutions have been assessed based on their feasibility, viability, market access, potential opportunities, existing barriers, and the support required for successful implementation.

Circular Solutions

The experts consulted by Acted have identified the following solutions and looked into associated feasibility, viability, market access, barriers, opportunities and support needed.

Solution 1 - Energy Usage During Processing (Solar Energy)

Proposed Solution: Solar energy can be utilized during processing to reduce operational costs and enhance sustainability, appealing to eco-conscious consumers and businesses.

Process associated with the proposed solution: Installing and integrating solar panels, energy conversion and storage, and operational monitoring.

Feasibility and Viability:

- **Risks:** Initial investment costs, regulatory hurdles, and weather dependency.
- **Expertise Required:** Knowledge in solar energy systems and integration.
- **Machinery Needed:** Solar panels, inverters, energy storage units, and monitoring systems.

- **Conclusion:** Technically feasible with strong market potential for cost reduction and sustainability.

Market Access: Local and national markets with high electricity costs or sustainability initiatives.

Opportunities: Solar energy can significantly reduce operational costs and enhance sustainability credentials. The growing demand for renewable energy solutions supports market growth.

Barriers: High initial costs, regulatory challenges, and dependency on weather conditions.

Support Needed: Government incentives, subsidies, and technical support for solar installations.

Solution 2 - Compost Production from Organic Waste

Proposed Solution: Organic waste can be converted into compost to meet the high demand in agriculture, gardening, and landscaping.

Process associated with the proposed solution: Collection of organic waste, composting, packaging, and distribution.

Feasibility and Viability:

- **Risks:** Market awareness and distribution logistics.
- **Expertise Required:** Knowledge in composting techniques and quality control.
- **Machinery Needed:** Compost turners, shredders, packaging machines.
- **Conclusion:** Technically feasible with significant environmental benefits and growing market demand.

Market Access: Local farmers, urban gardeners, and landscaping companies.

Opportunities: High demand for organic compost in agriculture, gardening, and landscaping.

Barriers: Raising market awareness and managing distribution logistics.

Support Needed: Marketing campaigns, partnerships with agricultural cooperatives, and logistical support.

Solution 3 - Vermicompost Production from Organic Waste

Proposed Solution: Earthworms can be used to produce vermicompost, benefiting organic farming and gardening with a high-quality fertilizer.

Process associated with the proposed solution: Collection of organic waste, vermiculture setup, composting, packaging, and distribution.

Feasibility and Viability:

- **Risks:** Knowledge gaps about vermicomposting benefits and logistical challenges.
- **Expertise Required:** Knowledge in vermiculture and composting techniques.
- **Machinery Needed:** Vermiculture bins, shredders, packaging machines.
- **Conclusion:** Technically feasible with strong market potential in organic farming and educational sectors.

Market Access: Local organic farmers, gardening enthusiasts, and educational institutions.

Opportunities: Increasing use of vermicompost in organic farming and gardening.

Barriers: Educating consumers about the benefits and addressing distribution challenges.

Support Needed: Educational initiatives, market awareness campaigns, and distribution networks.

Solution 4 - Feed Production from Organic Waste

Proposed Solution: Organic waste can be repurposed to produce cost-effective animal feed, reducing waste and costs.

Process associated with the proposed solution: Collection of organic waste, processing, drying, packaging, and distribution.

Feasibility and Viability:

- **Risks:** Ensuring consistent feed quality and market acceptance.
- **Expertise Required:** Knowledge in animal feed production and quality control.

- **Machinery Needed:** Processing units, dryers, packaging machines.
- **Conclusion:** Technically feasible with potential cost savings and waste reduction benefits.

Market Access: Local livestock farmers, poultry farms, and aquaculture operations.

Opportunities: Provides a cost-effective and sustainable feed option, reducing dependency on imported feed.

Barriers: Overcoming skepticism about feed quality and acceptance in the market.

Support Needed: Quality assurance programs, farmer education, and market access support.

Solution 5 - Encouraging Refilling Systems and Use of Stainless-Steel Storing Units

Proposed Solution: Implementing refilling systems and using stainless-steel storing units to reduce packaging waste and promote sustainable practices.

Process associated with the proposed solution: Setup of refilling systems, consumer engagement, and promotion.

Feasibility and Viability:

- **Risks:** Initial setup costs, consumer habits, and logistical challenges.
- **Expertise Required:** Knowledge in sustainability practices and consumer behavior.
- **Machinery Needed:** Stainless-steel storage units, refilling systems.
- **Conclusion:** Technically feasible with potential environmental benefits and growing consumer interest.

Market Access: Local grocery stores, health food stores, and zero-waste shops.

Opportunities: Reduces packaging waste and promotes sustainable practices, aligning with consumer interest in zero-waste solutions.

Barriers: Overcoming initial costs and changing consumer habits.

Support Needed: Consumer education, financial incentives for retailers, and logistical support.

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Recommendations and Conclusions

As part of its ongoing commitment to fostering sustainable economic growth and environmental resilience, the project has conducted an in-depth study to identify viable circular economy solutions within Lebanon's agricultural and agri-food sectors. The overall findings highlight broad opportunities for integrating circular practices that enhance productivity, resource efficiency, and market competitiveness.

The following recommendations are designed to guide external stakeholders, including government bodies, industry partners, and development organizations, in supporting and scaling circular economy efforts. As part of its role in this transition, ACTED will actively contribute to the pilot implementation of selected solutions, ensuring that successful models can be replicated and expanded across Lebanon's agricultural landscape.

Recommendations to support circularity

1. Pilot Implementation of Circular Solutions

- Green Actors, MSMEs, and other stakeholders are recommended to consider launching pilot initiatives for the most viable and feasible circular economy solutions identified in the study. Given that different solutions require varying levels of expertise, financial investment, specialized machinery, and sector-specific knowledge, these pilots should be tailored accordingly. A flexible and adaptive approach is essential to ensure scalability and replicability, enabling successful initiatives to expand across different regions and value chains.
- Continuous monitoring and evaluation is recommended to refine and optimize these pilots, ensuring they deliver the expected economic and environmental benefits.

2. Upscale Specialized Capacity Building and Training

- To support the adoption of circular economy practices and improve productivity, Green Actors and relevant organizations are recommended to consider leading extensive training programs for local farmers and MSMEs. These programs should cover advanced agricultural practices, circular economy principles, and the application of new technologies.

- Educational materials and resources are recommended to be developed to ensure ongoing learning and skill development among stakeholders.

3. Policy Advocacy and Support

- Engaging with government bodies and regulatory authorities is essential for developing supportive policies and frameworks that encourage sustainable agricultural practices and provide incentives for MSMEs. Green Actors and industry stakeholders are recommended to consider advocating for regulatory changes that facilitate market access and environmental sustainability.
- Collaboration with policymakers and other institutions are recommended to help shape a more enabling environment for circular economy practices in Lebanon.

Recommendations for Enhancing Market Opportunities

Strengthening market linkages is crucial for enhancing the economic viability of MSMEs.

1. Facilitate Private Sector Partnerships

- Green Actors and sectoral partners are recommended to consider facilitating partnerships with local and international buyers, promoting Lebanese agricultural products through targeted marketing campaigns, and participating in trade fairs and exhibitions.

2. Government Collaboration

Encourage collaboration between the government and key stakeholders to improve market opportunities for local MSMEs. This includes establishing specific regulations for circular economy products and involving major suppliers to promote local production.

3. Consumer Demand

Increase consumer demand through awareness campaigns and events that highlight the benefits of circular economy products. Schools and local communities should be actively engaged in these efforts.

4. Support Mechanisms

Implement policies and support mechanisms such as tax exemptions, grants, and financial incentives to encourage circular economy practices among MSMEs.

These initiatives are recommended to enhance the visibility and demand for Lebanese products, creating new market opportunities for MSMEs.

Conclusion

The transition to a circular economy presents a significant opportunity to enhance the resilience and sustainability of Lebanon's agricultural and agri-food sectors. By implementing targeted pilot initiatives, strengthening capacities, fostering market linkages, and advocating for supportive policies, the project aims to create a more inclusive and resource-efficient economic model that benefits both businesses and communities.

The recommendations outlined serve as a roadmap for achieving long-term impact, emphasizing the collective role of government bodies, private sector actors, and development organizations in driving systemic change. Encouraging collaboration, consumer engagement, and financial support mechanisms will be key to ensuring that MSMEs can successfully integrate circular economy principles and thrive in an evolving market landscape.

By implementing these initiatives, the project aims to empower Micro, Small, and Medium Enterprises (MSMEs), improve agricultural sustainability, and drive systemic change toward a more resilient circular economy.

Annexes

Annex A: Acted_Circular Agriculture Assessment_full report_2022

Annex B: Acted_Food Security Assessment - Phase 2 Report_final

Annex C: Acted_FS Assessment-VC Selection_A2015_final

Annex D: Acted_Honey Value Chain_Report

Annex E: Acted_Study Report_Towards Circular Economy_2020