CLIMATE AND FINANCE RISK ASSESSMENTS OF FIVE AGRIBUSINESSES USING AI-TOOLS

AI-advisory services in food systems

Consolidated Report

Nicole Muoki, Hauke Dahl, Nathanial Peterson

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About AICCRA Reports
Titles in this series aim to disseminate interim research on the scaling of climate services and climate-smart agriculture in Africa, in order to stimulate feedback from the scientific community.

Photos

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ABSTRACT

Agribusinesses across Africa face mounting financial and operational risks, intensified by climate change. Many small and medium enterprises operate with limited capital, narrow revenue bases, and exposure to drought, fuel, and currency shocks. These intertwined risks are hard for investors to assess, while traditional risk advisory services remain costly and out of reach for early-stage firms.

This report presents AI-assisted risk assessments as a scalable, low-cost solution. Five anonymized agribusinesses, spanning honey, rice, solar irrigation, poultry inputs, and oilseed processing, were analyzed to identify financial, climate, and organizational vulnerabilities.

The results reveal shared risks but also adaptive practices that enhance resilience. By standardizing and automating the assessment process, the AI tool enables faster, more transparent evaluation of enterprise risk profiles. The approach reduces transaction costs for investors and strengthens the capacity of agribusinesses to attract climate-aligned finance and build long-term resilience in Africa's food systems.

Keywords
AI-assisted risk assessment; agribusiness; climate resilience; investment readiness; Africa.

ABOUT THE AUTHORS

Nicole Muoki is a data scientist and Research Consultant at the Alliance of Bioversity International and CIAT (CGIAR)

Hauke Dahl is an economist and Research Specialist at the Alliance of Bioversity International and CIAT (CGIAR).

Dr. Nathanial Peterson is a behavioral economist and Senior Scientist at the Alliance of Bioversity International and CIAT (CGIAR).

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ACRONYMS

AI	Artificial Intelligence
COMESA	Common Market for Eastern and Southern Africa
CSA	Climate Smart Agriculture
CSV	Climate Smart Villages
ECMWF	European Centre for Medium Range Weather Forecasts
ERA5	Fifth Generation ECMWF Atmospheric Reanalysis Dataset
FAO	Food and Agriculture Organization of the United Nations
FX	Foreign Exchange
ICRISAT	International Crops Research Institute for the Semi Arid Tropics
IDA	International Development Association
IDRC	International Development Research Centre
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
MBS	Malawi Bureau of Standards
MSME	Micro Small and Medium Enterprise
MWK	Malawian Kwacha
NDVI	Normalized Difference Vegetation Index
NGO	Non Governmental Organization
PAYGo	Pay As You Go
SADC	Southern African Development Community
SME	Small and Medium Enterprise
UNDP	United Nations Development Programme

INTRODUCTION

Background information

Across Africa, small and medium agribusinesses play a critical role in linking smallholder farmers to markets, improving food security, and promoting climate adaptation (Hinson et al., 2019; Ozor, 2013; World Bank, 2016). Yet these enterprises face compounding risks such as limited access to finance, volatile input prices, weak infrastructure, and growing climate shock (Atiase et al., 2018; Reardon, 2015). Traditional risk assessments are often too costly or time intensive for early stage firms, leaving investors and development partners without reliable data to inform decisions (Fernandez-Vidal & Alarcon, 2025). To address this gap, an AI assisted risk assessment tool was piloted to provide a faster, more affordable, and scalable alternative for evaluating the financial and climate resilience of agribusinesses.

Objectives

The primary purpose of these assessments was to pilot and refine an AI assisted framework for evaluating agribusiness risks in a systematic, transparent, and cost effective way. Specifically, the assessments aimed to:

- Test the feasibility and reliability of AI based analysis
    - Evaluate whether automated and semi automated methods can accurately identify enterprise level financial, operational, and climate risks in data scarce environments
- Benchmark enterprise performance across comparable dimensions
    - Apply a standardized structure to assess diverse agribusinesses, enabling comparison of risk exposure and resilience strategies across sectors and geographies
- Support investment readiness and access to finance
    - Generate actionable risk profiles that can help small and medium agribusinesses communicate more effectively with investors, financial institutions, and development partners
- Integrate climate and financial risk perspectives
    - Bridge the gap between financial diagnostics and climate vulnerability assessment, providing a holistic picture of business resilience under environmental stress.
- Inform policy and programmatic support
    - Offer evidence to guide public and private sector initiatives aiming to strengthen agribusiness ecosystems through targeted finance, technical assistance, and risk sharing instruments.

Company overview

Company ID	Country	Primary Sector / Value Chain	Business Model	Size & Maturity	Climate Relevance	Key Distinctive Feature
A	Malawi	Honey production and forest conservation	Community sourcing and processing of forest honey from smallholder beekeepers	Early stage enterprise (founded 2019)	Protects forest ecosystems through income diversification	Links conservation incentives directly to farmer livelihoods
B	Uganda	Soybean processing and edible oil	Contract farming and value addition through oil expelling	Growth stage agribusiness (founded 2017)	Promotes climate smart farming through improved seed use	Integrates smallholders into domestic oilseed value chains
C	Tanzania	Solar irrigation and off grid energy	Agent network distribution and pay as you go financing	Early stage, youth led clean energy venture (founded 2022)	Enables drought resilience through irrigation access	Combines energy access with smallholder adaptation tools
D	Zambia	Agricultural inputs and poultry services	Decentralized retail network with farmer training and embedded finance	Established SME (founded 2008)	Promotes climate resilient inputs and advisory services	Uses rural retail shops as hubs for knowledge and finance
E	Kenya	Rice processing and irrigation management	Contract farming through irrigation scheme partnerships	Growth stage agribusiness (founded 2012)	Reduces water risk through irrigation and mechanization	Integrates production, processing, and market access

Table 1: Overview of companies (anonymized)

APPROACHES AND METHODS

Company selection

Enterprises were purposively selected to reflect diversity in sector, size, and business model while maintaining comparability across geographic and operational contexts. Each company had been previously supported through AICCRA interventions, such as bootcamps (Dahl, 2023). Selection criteria included:

- Active engagement in agricultural production, processing, or service delivery
- Relevance to climate adaptation or resilience
- Availability of sufficient financial and operational data for analysis
- Willingness to participate in a structured interview and data review process

AI tool design

The AI assisted risk assessment tool was developed by AICCRA and the Alliance of Bioversity International and CIAT to transform how investment readiness and climate advisory are delivered to agribusinesses in Africa. It is built on a modular, multi agent architecture that integrates financial, climate, and behavioral risk diagnostics into a single analytical framework.

At its core, the system uses a structured prompt engine that guides the AI to analyze enterprises across standardized dimensions such as business model, revenue structure, liquidity, cost exposure, and vulnerability to climate and behavioral risks. This structure ensures that each assessment follows the same logical flow, creating reproducible and comparable outputs across sectors and geographies.

The data layer automatically retrieves publicly available indicators from reputable sources including the World Bank, IMF, FAO, and CGIAR databases, alongside geospatial datasets like CHIRPS rainfall anomalies, ERA5 temperature projections, and IPCC regional climate outlooks. These are complemented by sectoral benchmarks and behavioral datasets drawn from similar enterprises, enabling contextualized analysis even when company level data is limited.

A set of specialized analytical agents then process this information.

- The finance agent interprets income sources, cost structures, working capital dynamics, and currency exposure.
- The climate agent models exposure to drought, heat, and rainfall variability based on enterprise location and production system.
- The behavioral agent evaluates organizational and farmer level dynamics such as key person dependency, side selling, and incentive alignment, drawing on behavioral economics and contract theory.

Their findings are synthesized by a meta-agent, which harmonizes tone, checks logical consistency, and ensures alignment across risk dimensions. The entire process, from data ingestion to synthesis, typically produces investor grade insights in a matter of hours compared to weeks or months for consultant led assessments, and at less than five percent of the traditional cost.

Technical features such as explainability (recording intermediate reasoning steps), reproducibility, and scalability make the tool suitable for portfolio level analysis. Outputs are compatible with digital climate advisory dashboards and can be integrated into investment analytics systems.

KEY FINDINGS

The five AI-assisted assessments reveal a convergent pattern of vulnerabilities and opportunities across African agribusinesses operating in diverse value chains.

Financial risks are dominated by *concentration and liquidity challenges.* Each enterprise depends on a single commodity or product line—honey, soy, solar equipment, poultry inputs, or rice—which leaves revenue highly sensitive to price or yield shocks. Working-capital shortages and restricted access to affordable credit are universal, reflecting systemic constraints in rural financial markets. Most firms rely on grants, supplier credit, or short-term facilities, creating fragility during lean seasons or after poor harvests. Currency depreciation and fuel price volatility further erode margins, especially for input-intensive operations such as feed or packaging.

Climate risks manifest differently by value chain but show common stressors: droughts, erratic rainfall, and rising temperatures. These hazards reduce productivity (e.g., lower honey flows, heat-stressed poultry, diminished irrigation water) and increase operational costs through energy disruptions and input scarcity. Nonetheless, several adaptive responses are emerging: solar energy use, irrigation management, improved seed systems, and ecosystem restoration through agroforestry and apiculture. Enterprises integrating climate-smart practices already exhibit stronger resilience and community goodwill.

Behavioral and organizational risks center on governance and human-factor dependencies. Founder-led structures, limited managerial depth, and informal recordkeeping constrain scalability. On the supply side, trust dynamics with farmers—side-selling, inconsistent adoption of recommended practices—remain critical behavioral bottlenecks. Yet high community engagement and purpose-driven missions (e.g., conservation, women's empowerment) mitigate these risks by anchoring loyalty.

AI-based assessment performance demonstrates high efficiency and reproducibility. The tool produced structured, investor-grade analyses within hours, drawing on both narrative and geospatial data. It successfully identified converging risk patterns and validated that automated methods can supplement expert due diligence at a fraction of the time and cost.

COMPANY REPORTS

Company A – Honey production in Malawi

1. Introduction

Company A is a Malawian agribusiness founded in 2019 (officially registered in 2022) with a mission rooted in forest conservation and rural empowerment. The company's origin story began as a community beekeeping initiative to protect indigenous woodlands from deforestation, using honey production as an incentive for locals to preserve trees instead of cutting them for charcoal or farmland.

Based in [location omitted] (Area 49) with operations in the forested [location omitted] district, Company A works with smallholder farmers – especially women – to produce sustainable, high-quality honey. The enterprise was founded by the founder, who envisioned beekeeping as a tool for both climate-smart agriculture and livelihood improvement. By keeping bees, communities can earn income without degrading the land, thereby aligning economic incentives with environmental stewardship. Company A's target impact includes rural income diversification, women's economic empowerment, and the promotion of climate-resilient agriculture practices through apiculture (beekeeping).

Though still relatively small, the company has garnered early recognition – in 2024, founder the founder won a MWK 10 million agribusiness pitch award from [bank omitted]'s [program omitted], reflecting confidence in Company A's potential. This capital is helping the startup scale up to meet growing local and international demand for Malawian honey.

In summary, Company A Produce is an impact-driven agribusiness marrying forest conservation with commercial honey production – a model that aims to protect nature while improving farmer livelihoods.

2. Business Overview

Company A operates as an integrated honey producer and aggregator, connecting remote beekeepers to markets. The company manages its own apiaries in the woodlands of [location omitted], [location omitted], and also acts as an off-taker for honey from rural community producers (with a focus on engaging women beekeepers).

In practice, this means Company A sources raw honey from village groups and small cooperatives, then handles processing, packaging, and distribution under its brand. By offering a reliable buying outlet, Company A incentivizes farmers to maintain beehives as a sustainable enterprise. Its competitive edge lies in sourcing premium, unadulterated honey from protected forest landscapes and upholding quality through careful processing. Farmers benefit by earning income from honey sales, while keeping their forests intact (bees thrive in intact ecosystems, creating a virtuous cycle).

Company A's product is raw natural honey and related bee products (like beeswax and propolis in smaller volumes). Value addition is done through modern processing and packaging: the honey is filtered and bottled in food-grade packaging to meet quality standards. With support from [country omitted]'s [program omitted] program, Company A is acquiring new beehives and installing a honey processing line, including modern extraction and bottling equipment. This upgrade will increase processing capacity and consistency, and the company is pursuing [country omitted] Bureau of Standards (MBS) certification to ensure its honey meets formal quality standards. Physical infrastructure for now includes the apiary sites in [location omitted] (hives often hung in trees or placed on stands in forest areas) and a small processing facility in [location omitted] for aggregation and packaging. Refrigeration needs are minimal since honey is naturally long-lasting, but safe storage (sealed containers to keep out moisture and ants) is important. Company A does not yet operate retail outlets, instead distributing through local shops, supermarkets, and direct sales.

Company A's target market is currently domestic, where demand for pure honey far outstrips supply. [country omitted] consumes an estimated 200 tonnes of honey annually, but only 60–90 tonnes are produced domestically. This gap means plenty of room for import substitution and growth for local producers like Company A. The company sells its honey in branded jars to individual consumers and is exploring contracts with supermarkets and hotels. Future plans also consider export markets – neighboring countries and beyond – given that East African honey is in demand ([country omitted], for example, earns about $77 million from honey exports annually).

To expand outreach, Company A is piloting a micro-franchise distribution model wherein youth and women entrepreneurs become resellers of its honey in various towns. This will build last-mile distribution while creating more jobs. [country omitted], the company aims to scale up production via an out-grower scheme: partnering with existing cooperatives and farmer groups to supply hives and

training, then buy back honey from them. By integrating at least three new farmer groups into its supply chain in the next phase, Company A plans to boost volumes and ensure consistency of supply. In essence, the business model is a hub-and-spoke: the company provides inputs (like beehives or technical advice) and market access, and hundreds of dispersed farmers provide the honey, which Company A then processes into a high-value product. This lean model allows rapid scaling without heavy fixed assets, but requires strong relationships and quality control across the chain.

Company A's competitive advantage is rooted in its authenticity and sustainability narrative. The honey is marketed as "Nature's Golden Gift from [country omitted]", emphasizing that it is pure, ethically harvested, and forest-friendly. By differentiating from cheap or adulterated honey, Company A can command a premium price. [country omitted], its community-based sourcing means it can ramp up production by empowering more farmers rather than investing in large plantations – a scalable and inclusive strategy. [country omitted], this also means the company must invest in farmer training and uphold trust, as the production process is largely in the hands of individual beekeepers. As of now, the scope of operations is early-stage: dozens of beekeepers and a few tons of honey per year. But with new equipment and capital, Company A aims to substantially increase output and expand to other regions of [country omitted]. [country omitted], the business vision is to create a nationally recognized honey brand that simultaneously preserves ecosystems and enriches rural communities, proving that climate-smart entrepreneurship can be profitable and socially inclusive.

3. Finance Risk Assessment

1. Revenue streams & concentration

Company A's revenue comes almost entirely from honey sales, making it a single-product business. Aside from minor by-products (like beeswax candles or propolis tinctures, which the company may explore but are not yet significant), honey is the core income source. This lack of diversification means earnings are highly sensitive to honey production volume and market prices. If annual honey yields drop due to weather or other factors, Company A currently has no alternative revenue to cushion the shortfall.

The company's strategy of focusing on premium unblended honey gives it a pricing niche, but also exposes it to any fluctuations in that niche market. For example, if a poor season limits how much honey the company can collect, it cannot readily

switch to another product to make up the revenue gap. [country omitted], a surge in honey output could strain sales if distribution channels aren't scaled in tandem.

Over time, Company A might consider diversifying (for instance, into beeswax products or related agri-products), but at present the income base is narrow and concentrated in one commodity. This amplifies risk: any shock to honey supply or demand directly and disproportionately impacts the company's financial health. Expanding the product line or services (such as selling beekeeping equipment, which one Malawian honey company already does to supplement income) could help diversify revenue, but would require additional capacity and capital.

2. Cost structure & input risks

The primary input cost for Company A is the purchase of raw honey from farmers. The company typically pays community suppliers per kilogram of honey delivered. This cost can be volatile – if competing buyers offer higher farm-gate prices or if honey becomes scarce (driving prices up), Company A may have to raise its purchase price to secure volume, squeezing its margins. Since honey is a somewhat luxury food item, there is a ceiling to passing cost increases onto retail customers; beyond a point, higher prices could dampen demand or push buyers toward cheaper (possibly lower-quality) alternatives. [country omitted], input price risk is real: a drought, for instance, might force Company A to pay farmers more per kg to reward whatever little honey they could harvest, even as the total volume for sale is down.

Apart from raw honey, packaging and processing materials form a significant cost. [country omitted], jars, and labels often need to be food-grade and visually appealing – these are often imported or tied to international resin prices, meaning a devaluation of the Malawian Kwacha can sharply increase packaging costs. [country omitted]'s currency has seen periodic depreciation, which could inflate Company A's expenses for jars, seals, or any machinery parts that must be bought abroad. Without an equivalent increase in local honey prices, this would erode profit margins.

[country omitted], logistics and transport are another cost driver. Collecting honey from dispersed rural producers involves travel to remote areas (like [location omitted] highlands), which incurs fuel and vehicle maintenance costs. High fuel prices – [country omitted] has experienced fuel shortages and price hikes in recent years – directly raise the cost of aggregation. Company A must transport heavy honey-filled buckets or containers to [location omitted]; any spike in fuel cost or difficulty in accessing fuel (not uncommon in [country omitted]'s volatile fuel market) can add unexpected expenses or delays. [country omitted], while honey

processing is not very energy-intensive compared to say milling or expelling oil, electricity reliability is a factor. If power outages occur during processing (a common issue in [country omitted]), Company A might need a backup generator, incurring fuel costs. For now, processing equipment is small-scale, but as capacity grows, energy costs and maintenance will become more noteworthy. There is also quality control cost: ensuring the honey meets standards (Moisture content tests, filtering, lab analysis for certification) requires equipment and lab fees. These are necessary investments to maintain premium pricing but add to overhead.

On the farmer support side, if Company A provides any inputs to farmers (such as modern hives on credit, bee suits, smokers, etc.), that represents a cost or at least a cash outlay upfront. The [program omitted] grant is helping with acquisition of beehives and gear, but scaling beyond that might require Company A to finance such inputs. If farmers mismanage or do not repay these in honey, that becomes a cost risk (similar to bad debt).

[country omitted], foreign exchange (FX) exposure lurks in the background: Company A earns revenue in local currency (Malawian Kwacha) but any import components (packaging, fuel, or machinery) are tied to forex. A weak Kwacha without corresponding price adjustments could "pinch" margins. In summary, Company A's cost base is moderately variable, with key risks being raw honey procurement price, transport/fuel costs, and any import-linked inputs. Keeping a tight control on operating costs and finding efficiencies (like bulk purchasing packaging or optimizing route collection) will be important to protect margins.

3. Working capital & liquidity

Like many agri-businesses, Company A faces seasonal cash flow needs that can strain liquidity. Honey flow in [country omitted] is seasonal – typically harvested at the end of the rainy season and again later in the dry season. This means at certain times of the year, the company must lay out a large amount of cash to buy honey in bulk from farmers (within a short window when harvesting happens) but will only recoup that cash gradually as it sells the bottled honey over subsequent months. This creates a cash flow gap. Company A must pay smallholders promptly to maintain trust (often at purchase, or shortly after delivery), but the honey inventory might sit for some time before converting to sales revenue. Without sufficient working capital, this could force the company to limit purchases (buying only what it can afford at that moment) or delay payments – both scenarios hurt the business (either by constraining volume or damaging farmer relationships).

[country omitted], Company A relies on founder's funds, small grants, and competition prize money for working capital, since traditional bank credit is hard to obtain. This is a precarious position: if a harvest is especially abundant but funds are low, Company A might be unable to buy all available honey, and farmers could sell elsewhere, undermining Company A's supply base. [country omitted], if Company A over-extends to buy honey and then sales are slower than expected, it could face a cash crunch for operating expenses in subsequent months.

Access to formal credit in [country omitted] for SMEs like Company A is notoriously limited – up to 75% of all SMEs lack access to formal financing, and about 59% are entirely excluded from bank lending. Company A is no exception: as a young company without substantial fixed collateral (land or buildings), it doesn't fit banks' typical lending criteria. High interest rates (often above 20% in [country omitted]) and stringent collateral demands make loans impractical or too risky for a small agribusiness. This constraint means liquidity risk is high: the company must carefully manage whatever internal funds and grants it has to make it through each buying-selling cycle. Any unexpected expense or shortfall in sales could leave it without cash to pay farmers or cover operating costs. The [bank omitted] Phuka award and the [program omitted] grant provided a welcome boost to liquidity, but these are one-time infusions.

Company A will likely need additional working capital facilities or short-term loans as it scales, or else risk stalling its own growth due to lack of cash. If not addressed, working capital limitations could even lead to factory under-utilization (e.g. having processing capacity but no honey to process because the company couldn't purchase it in time – a challenge observed in similar Malawian agribusinesses). Good financial planning and perhaps maintaining a buffer reserve (if possible) will be key for resilience.

4. Investment readiness & financial management

Being a relatively new enterprise, Company A's financial systems and record-keeping are still maturing. As with many Malawian SMEs, formal accounting practices may not yet be robust – though participation in accelerator programs means the company has likely received training in this area. Proper bookkeeping, invoicing, and cash flow tracking are essential for gauging performance and building credibility with funders. Any gaps here pose a risk: for instance, if accounts are not well tracked, Company A might misjudge its profitability or run into trouble paying suppliers on time, which can erode trust.

On the positive side, Company A has been proactive in seeking support: it has pitched to investors (evidenced by Mercy's participation in [program omitted] and other forums) and is working on quality certification, which will make it more attractive to both buyers and financiers. [country omitted], with only a short track record (commercial operations only ramping up in the last couple of years), lenders view the company as high-risk. Aside from some processing equipment and inventory, it has limited assets to offer as loan collateral. This means creditworthiness must be built through consistent performance and perhaps creative strategies (e.g. signing a purchase agreement with a large buyer could be leveraged to secure a loan, or using a guarantee scheme).

At the moment, Company A remains dependent on grants, prize funds, and reinvested earnings for capital, which, while non-debt, are not reliable or scalable sources year after year. The ability to attract an equity investor or a soft loan will likely depend on demonstrating solid financial management and growth potential. Improving financial reporting (perhaps getting audited financial statements in the future) and instituting internal controls will increase investor confidence. [country omitted], blending its social/environmental impact narrative with financial projections could appeal to impact investors who offer patient capital.

In summary, Company A's financial risk profile is one of a typical early-stage agri-social enterprise: high potential but under-capitalized, with a heavy reliance on a single income stream and vulnerable to cash flow crunches. The company will need to strategically manage costs, actively seek financial partnerships, and possibly diversify its income over time to reduce these risks. Until then, its finances will ride the ups and downs of each honey season and the broader economic climate in [country omitted].

4. Climate Risk Assessment

1. Climate hazards in Company A's operating environment

Company A operates in [country omitted]'s tropical savannah climate, which is increasingly characterized by erratic rainfall patterns and extreme weather events. Key climate hazards affecting the region include seasonal droughts, shifting rainfall timing, and bushfires. In recent decades, [country omitted] has experienced more frequent dry spells and droughts, punctuated by occasional intense storms or even cyclones (e.g. Cyclone Freddy in 2023). Drought is the single most significant climate risk for honey production – a prolonged drought can lead to flowering failure in plants, meaning bees have drastically reduced nectar sources. For example, during a severe East African drought in 2022, beekeepers in Kenya saw major

colony losses as forage and water for bees dwindled. [country omitted], in [country omitted] a rainfall deficit year could shrink honey harvests substantially (beekeepers report that extended droughts leave "dried-up water points and limited access to flowering plants," severely curtailing honey yields).

On the flip side, unpredictable rainfall and changes in rainfall timing pose a subtler risk: if rains come late or erratically, the blooming season shifts, which can throw off the synchrony between bee activity and flower availability. Bees time their colony growth to floral seasons; unusual rain patterns might cause some plants to flower earlier or later (or not at all), potentially leading to periods where bees have little to forage despite being active. This phenological mismatch due to climate change has been observed elsewhere (pollinators falling out of sync with plant flowering) and could emerge in [country omitted] as well.

Another hazard is extreme heat. Rising temperatures and heatwaves can stress bee colonies – bees can overheat if hive temperatures soar, leading to brood death or colony collapse. [country omitted], bees fan and cool their hives, but during prolonged extreme heat especially combined with drought (no water to drink), colonies can weaken. [country omitted], high heat can dry out nectar before bees collect it, reducing honey production even if flowers bloom. Heavy rainfall or flooding events, while less directly damaging to bees than drought, can still have negative impacts. Torrential rains can physically disturb hives (especially traditional hives in trees which might get waterlogged or knocked down by wind) and can disrupt foraging (bees don't fly in heavy rain). Floods can also cut off road access to remote apiaries, delaying harvest or causing some honey to spoil if it can't be collected. In extreme cases, floods or landslides could destroy habitat (e.g. the landslides during Cyclone Freddy denuded some areas), affecting the flowering plants bees rely on.

2. Deforestation and bushfire risks

While not a climate change phenomenon per se, deforestation is intertwined with climate risk in [country omitted]. Widespread cutting and burning of trees (often for charcoal or to open land for farming) has led to environmental degradation and localized climate effects (hotter, drier microclimates). For a company like Company A, which depends on forested landscapes for beekeeping, deforestation is a critical threat. If community forests are cleared, bee forage disappears and hives have nowhere to hang. [country omitted], beekeeping is actually being used as a strategy to combat deforestation – communities with hives are incentivized to keep the trees, and indeed in areas with active apiculture "little or no deforestation is

taking place" compared to rampant tree-cutting elsewhere. [country omitted], should economic pressures force people back into cutting trees (for example, if honey income falters due to drought, or if alternative livelihoods aren't present), forest loss could resume and accelerate climate risks in a vicious cycle.

[country omitted], the practice of using fire (slash-and-burn agriculture or traditional honey hunting with fire) introduces bushfire risk. In dry conditions, bushfires can easily ignite and spread. For bees, bushfires are devastating – they can directly burn hives and kill entire colonies, and also destroy the flowering plants bees need. In DRC and other African regions, bushfires (often started to clear land) have been noted as a significant cause of bee colony losses. [country omitted]'s dry season often sees bushfires in grazing or farming areas; a stray fire in a forest where hives are located could wipe out a beekeeper's entire harvest (and the company's source). The 2022 drought not only dried up forage but increased bushfire incidence in affected regions, illustrating how climate events compound risks (drought leads to both food scarcity for bees and more fires).

3. Sensitivity of honey production to climate events

Company A's supply chain is highly sensitive to climate variability because it relies on natural ecosystems. Small changes in rainfall or temperature can translate to significant differences in honey yield. Most of the farmers supplying Company A use extensive, rain-fed production – meaning bees forage in wild or semi-wild conditions, with no irrigation or supplementation. If a season's rainfall is poor, flower density can drop and nectar flows can be 30–50% lower (in extreme drought, near total failure is possible).

In [country omitted]'s context, droughts and dry spells have become frequent; these directly threaten the volume of honey available. A severe drought year could reduce Company A's honey collection by a large fraction (potentially 50% or more in worst cases), as bees either produce very little surplus honey or colonies even abscond in search of better areas. [country omitted], beekeepers in some African countries have reported absconding (entire colonies fleeing) when drought and food scarcity hit – essentially the bees relocate to find forage. This not only means no honey, but also the loss of the bee colony itself (needing to attract or purchase new swarms later). Such scenarios make the business output highly volatile year-to-year unless mitigated.

Another sensitivity is to temperature extremes and rainfall intensity. If climate change brings hotter dry seasons, bees may need water nearby to survive – without it, colony health declines. If the onset of rains shifts, beekeepers might mistime

when to put empty combs or supers for bees to fill, losing some potential yield. Heavy rains can wash nectar out of flowers or cause flowers to drop early, again reducing what bees can gather. Company A's farmers have minimal technical means to buffer these effects (few practice supplementary feeding or climate-controlled apiaries). Most adaptive capacity at farmer level is low – they depend on natural climate patterns. This makes the enterprise as a whole quite vulnerable: essentially, nature's performance each season largely dictates production.

Infrastructure and market access also have climate sensitivities. Company A's processing and storage in [location omitted] might be safe from floods, but rural roads connecting [location omitted]'s villages can be rendered impassable by heavy rains or flooding rivers, delaying honey collection or delivery to market. During Cyclone Idai in 2019 and other heavy rain events, many Malawian rural roads were cut off. If harvested honey cannot be collected in time (for example, if a bridge is out), it could spoil or be consumed locally, meaning lost revenue. Extreme humidity or rains at harvest time could also raise the moisture content of honey above safe levels, risking fermentation if not quickly processed – another quality risk linked to weather.

4. Adaptive capacity and current mitigation practices

Company A's model inherently carries a pro-adaptation angle: by promoting beekeeping in forests, it encourages an agricultural practice that is generally resilient relative to traditional crops (bees can forage over large areas and are not confined to a plot of land). In fact, some farmers view beekeeping as a climate adaptation; for instance, during droughts when crops fail completely, honey can still be harvested (providing some income). That said, there are limits to this resilience if droughts become too extreme.

[country omitted], much of the adaptation on the ground is traditional knowledge-based. Farmers often place hives in cooler, shaded spots (like deep in forest or on tall trees) – this naturally helps buffer temperature extremes. They may also schedule hive installations after the first rains, knowing that's when bee swarms come and flowers bloom. These practices, while helpful, may not suffice under intensifying climate stress.

There are emerging climate-smart practices that could boost resilience for Company A's network, but adoption so far is nascent. For example, providing water for bees during hot dry periods can reduce colony losses – a Kenyan study found beekeepers who supplemented water experienced up to 10% less colony decrease in hot seasons. the founder herself has noted the need for a sustainable water

source for the apiary to cope with water shortages and ensure consistent supply under climate change. This indicates the company is aware and starting to plan for such measures (e.g. setting up a nearby water tank or stream access for bees).

[country omitted], preservation of diverse forage is part of their model – by protecting forests, they maintain a variety of flowering plants, which is important. A diversity of plant species means that even if some fail in a given year, others might still bloom (providing at least some nectar flow). Encouraging or planting drought-tolerant flowering plants around apiaries could further enhance this, though it's not clear if this is being done yet.

In terms of formal CSA (Climate-Smart Agriculture) integration, there is room for growth. The company does engage with partners and programs that emphasize modern techniques – for instance, being in an agriculture accelerator and interacting with organizations like CGIAR means they are exposed to improved practices. We might expect that Company A will introduce modern beehives and better management to its farmers. Modern hives (like Kenya Top-Bar or Langstroth) allow for easier inspection and management of colonies (e.g. one can feed sugar syrup or medicate if needed), as opposed to traditional fixed-comb hives. Studies show that colony losses tend to be higher in traditional local hives compared to modern hive systems, partly because modern hives facilitate good management and pest control. By importing or building improved hives (the grant funding for new hives likely includes modern designs), Company A can help farmers upgrade. [country omitted], these hives must be used correctly; training is needed so farmers know how to inspect for pests or when to harvest without stressing the colony.

Another aspect of adaptive capacity is mobility: Some African beekeepers practice migratory beekeeping, moving hives to follow flowering seasons across regions. This requires coordination and transport, and is not traditionally done by Malawian smallholders. Company A could potentially introduce a limited form of this – for example, if one area's flowers dry up, perhaps transporting some hives closer to an irrigated estate or a eucalyptus grove elsewhere to extend the season. Migratory beekeeping has yielded mixed results in studies (lower losses in some cases, but not always), yet it remains an option for coping with spatially uneven rainfall. At present, it's unlikely farmers are doing this on their own due to resource constraints.

5. Pest and disease pressures

Climate change can exacerbate pest problems. Warmer temperatures could increase the prevalence of hive pests like wax moths, small hive beetles, ants, or even introduce new pathogens. [country omitted], African bees are relatively resilient and many serious bee diseases (like Varroa mites) have had limited impact so far in [country omitted] (Varroa is present in East Africa but not reported as devastating locally). [country omitted], as climates shift, bees weakened by heat or drought are more susceptible to pests. In [country omitted], for example, beekeepers identified pests (wax moth, hive beetles, etc.) as a cause of colony losses second only to drought/theft. Many of Company A's farmers may not practice active pest control (e.g. they might not regularly clean hives or use preventative measures), which means an infestation can decimate a colony. Adaptive capacity in this regard is low until training and interventions are provided.

[country omitted], Company A's climate risk exposure is high, but there are opportunities to build resilience. The very premise of the business – harnessing an ecosystem-based enterprise – means that preserving the ecosystem (forests) is a built-in climate adaptation strategy. Healthy forests not only provide consistent bee forage, they also regulate micro-climates (cooler temperatures, moisture retention) and reduce erosion and land degradation. This is a strength of the model.

Communities involved in beekeeping have a vested interest in preventing bushfires and deforestation now, which bodes well for climate adaptation and mitigation. That said, the enterprise's fate is tightly linked to environmental conditions each year. Company A will need to actively implement Climate-Smart Beekeeping practices to buffer against the increasing climate variability. This includes measures like providing water and shade, introducing drought-resistant bee forage plants, timing interventions with weather forecasts, and working with farmers on modern hive management. [country omitted], Company A's recent initiatives (supported by grants) show it is starting on this path – for instance, Mercy's priority of securing water for the apiaries, and the collaborative training that comes with programs like the [program omitted]. With such steps, the adaptive capacity can be improved over time. But until these measures are widespread, climate events (drought especially) remain a potentially catastrophic risk to annual production. A single bad season could result in a sharp revenue drop and test the enterprise's resilience on all fronts.

5. Behavioral Risk Assessment

The success of Company A's business hinges not just on climate and market forces, but critically on human behaviors – the practices, decisions, and reliability of the people within the company, its supplier farmers, and other stakeholders in the

value chain. We evaluate these behavioral risks in three arenas: internal (organizational and leadership factors), farmer and community level (supplier behavior and adoption of practices), and the broader value chain (partners, competitors, and community perceptions).

1. Internal Governance & Capacity

Company A is a young, founder-led enterprise, which inherently carries key-person dependency risk. the founder, as Founder and Managing [country omitted], is the driving force behind strategic decisions, partnerships, and day-to-day operations. This concentration of knowledge and relationships in one individual means the company is vulnerable to disruptions if anything were to happen to her or if her bandwidth is exceeded. Early-stage companies often rely on the passion and vision of the founder, but as investors frequently note, over-reliance on a single leader is a red flag ("key person risk"). At Company A, while there may be a small team (perhaps a processing technician, a field officer, an accountant etc.), critical functions like securing financing, maintaining buyer relationships, and community trust likely still revolve around the founder's engagement. If Mercy were temporarily unavailable or if turnover hit any nascent management team, there is a risk of operations stalling. Mitigation will require building a second line of leadership – empowering other team members with decision authority, and documenting processes so that knowledge is not solely in one person's head.

Another internal risk is limited management capacity and systems, typical for SMEs. Research on Malawian MSMEs finds they often have gaps in business planning, financial management, record-keeping, and human resource management. Company A may face similar challenges. For instance, if bookkeeping is weak or not up-to-date, the company could misjudge its cash position or profitability, potentially leading to cash shortages or inability to pay farmers on time. Paying farmers late would quickly erode trust and tarnish the company's reputation at the community level. [country omitted], if inventory and production planning are informal, Company A might struggle to synchronize honey purchases with processing capacity or market demand, resulting in either unsold stock or unmet orders. As a small startup, formal HR policies or training programs are likely minimal – the enterprise runs in a "all-hands-on-deck" mode. This can work with a tight-knit team, but it also means a lot depends on individual employees' integrity and motivation. Any lapses (e.g. if a field officer responsible for coordinating with farmers slacks in visiting apiaries, or an employee mishandles cash meant for buying honey) could have outsized impact on operations. Without strong internal controls, mistakes or even small misbehaviors might go unnoticed until damage is

done. For example, inaccurate recording of honey volumes bought could lead to losses or disputes.

Governance-wise, Company A as a private startup may not yet have an independent board or advisors who formally oversee strategy and accountability. Decisions might be made ad hoc by the founder. This can lead to decision biases or blind spots – e.g., focusing on expansion (more hives, more farmers) without fully assessing risk, or setting prices without a robust analysis of costs. The lack of structured oversight is a risk in that missteps might not be caught early. [country omitted], being part of accelerator programs does provide some external mentorship and oversight, which is beneficial. As Company A prepares to engage with investors or lenders, it will need to demonstrate sound governance and transparency. Ensuring transparent record-keeping, instituting basic checks and balances (for instance, dual sign-off on large payments, regular inventory audits of honey stock, etc.), and possibly forming an advisory board can all improve internal resilience. The good news is that these are achievable with training and time. Mercy's recognition in programs indicates willingness to learn and adopt best practices. Addressing internal behavioral risks through capacity building (training staff in business skills, using digital accounting tools, etc.) is just as important as addressing external risks, because a well-run organization will be better equipped to handle shocks when they come.

2. Farmer & Supplier Behaviors

Company A's supply chain is built on trust and collaboration with hundreds of small-scale beekeepers in rural communities. These farmers are independent actors with their own motivations and constraints, so their behavior can introduce significant variability and risk. One major behavioral risk is side-selling – farmers choosing to sell their honey to other buyers despite any understanding or verbal agreement to sell to Company A. In contract farming of other crops, side-selling is a notorious issue in [country omitted]; for example, in cotton and oilseeds, many farmers defaulted on contracts when traders offered slightly higher prices in cash. For honey, the risk is similar: if an itinerant trader or another honey company comes to the village offering a better price (or immediate cash versus Company A's perhaps scheduled payment), some farmers might be tempted to divert their honey elsewhere. This would leave Company A with lower volumes than expected, undermining its ability to meet orders or utilize its processing capacity. Side-selling is especially likely if farmers do not feel deeply loyal or if they face urgent cash needs (e.g. needing money for school fees at that moment). Since Company A

provides some training and possibly equipment, one would hope farmers feel a sense of obligation, but when short-term needs press, that can be overpowered.

To mitigate this, Company A must maintain competitive farm-gate pricing and reliable, quick payments, so that farmers see little advantage in selling to others. They may also consider formalizing agreements with farmer groups or cooperatives, though enforcement in rural settings is tricky. Some companies implement incentives like bonus payments at season's end for those who stick to the program, or provide small loans during the year to reduce farmers' temptation to get cash elsewhere. Company A could explore such strategies (bearing in mind it then must manage the credit risk).

Another farmer-related risk is variable adoption of recommended practices. Company A can train and advise beekeepers on improved methods – for example, proper hive maintenance, gentle harvesting techniques (to not destroy brood or provoke bees), or timely harvesting to maintain quality. [country omitted], farmers may not consistently follow this advice. Changing long-standing practices (such as traditional honey harvesting at night with fire) can be slow. Reasons include habit, lack of resources (maybe they don't have a protective suit so they revert to using smoke and fire excessively), or skepticism about new techniques. In agriculture, adoption rates for new practices in [country omitted] are often low – a study in Eastern [country omitted] found only ~26% of smallholders adopted promoted climate-smart practices, and only if they were simple and compatible with what they were used to. In beekeeping, if the new methods require more labor or upfront cost (e.g. feeding sugar water in drought, or buying/making top-bar hives), farmers might not embrace them fully. This can lead to outcomes like: hives provided by Company A not being used properly (or kept clean), resulting in pests and lower yields; or farmers not implementing protective measures, resulting in colony losses that could have been prevented. For Company A, this means actual honey collected might fall short of potential because some farmers underperform. It can also cause quality issues – e.g. if farmers harvest too early (when honey has high moisture) or store it improperly, the honey can ferment. One specific risk is adulteration or quality dilution: a few unscrupulous individuals might add water or sugar to honey to increase volume for sale. If Company A unknowingly collects such honey, it could spoil whole batches or tarnish their brand if it reaches customers. While we would hope farmers in the program wouldn't do this (especially if trained and monitored), it's a known issue in honey value chains globally. Vigilance through testing is required.

Trust and commitment are crucial behavioral factors. Farmers need to trust that Company A will weigh their honey honestly and pay fairly, and Company A needs to trust that farmers will not cheat on quality or volume. Any misstep can break this trust. For example, if a farmer suspects that the company's field agent is under-weighing their honey or using faulty scales, they will lose faith and perhaps exit the arrangement. [country omitted], if the company finds a farmer consistently delivering sub-par or tampered honey, it may drop that farmer. Maintaining transparency (like allowing farmers to observe weighing, or implementing a clear grading system for honey quality) will be important to avoid suspicions. In [country omitted], many contract farming and aggregation schemes have collapsed due to distrust, often born of miscommunication or past breaches. Company A should proactively address this by clear communication of expectations and building a community rapport.

Another behavioral challenge is community dependency and expectations. As Company A expands, it might become an important buyer in some villages. The community might begin to pin hopes on the company to provide other support (like community projects, or buying honey from everyone even if quality is low). Managing these expectations is delicate – the company has to be a good community citizen but also cannot solve every local issue. If not handled, unmet expectations could sour community relations (for instance, if only some farmers are in the out-grower scheme, others might feel left out and could cause friction).

[country omitted], gender dynamics may play a role. Since Company A focuses on women producers, it's empowering women with income in communities. This is positive but can sometimes cause pushback in patriarchal settings – perhaps some husbands or male community leaders might initially resist women controlling this enterprise. the founder's leadership is itself a model that challenges norms. So far, it appears communities are embracing it (given women's involvement), but maintaining inclusive engagement of both men and women (for example, ensuring men see benefits too, or involving them as needed in training) can mitigate any social tensions.

3. Value Chain Competition & Community Perceptions

In the broader honey value chain, several behavioral risks come from outside actors and general market dynamics. Competition was touched on – other buyers can disrupt Company A's supply chain by offering slightly better terms. This competitive behavior can be opportunistic; for instance, a trader might free-ride on Company A's training and input support by swooping in at harvest to buy honey without

having invested in the farmers. This has happened in other sectors (called "side-buyer" problem). If honey prices rise regionally, competitors (including possibly larger companies or even informal cross-border traders) might become more active. Company A will need to stay agile in its pricing and perhaps build loyalty through non-price benefits (like providing containers, consistent purchases, etc., which traders might not). On the market side, if Company A's product gains traction, other brands may attempt to copy its marketing or undercut on price. We also can't ignore the risk of adulterated honey in the market – if unscrupulous sellers flood the market with cheap adulterated "honey", consumer trust in all honey can drop. Company A must differentiate and possibly engage in consumer education about pure honey to ensure its premium positioning isn't undermined by bad actors' behavior.

From a regulatory and partnership standpoint, behaviors of partners also matter. For example, if the [country omitted] Bureau of Standards process is slow or if officials demand informal fees (as sometimes happens in bureaucracies), it could delay certification – a risk stemming from institutional behavior. [country omitted], if a microfinance partner is engaged to finance farmers, their treatment of farmers (e.g. if they are too harsh in collections) could reflect back on Company A. Being mindful in partner selection and setting clear, fair terms for all parties is needed to maintain trust throughout the value chain.

Community perceptions are a softer but crucial factor. [country omitted], some community members might have been skeptical about beekeeping as a viable business ("people were laughing at us, saying where will you find bees to fill those hives?" as one Malawian beekeeper recounted). Over time, as results show (honey income coming in, forests regenerating), perceptions typically improve. In places where beekeeping projects have succeeded, local leaders and even skeptics turn into supporters. Company A should continue to engage community leaders (chiefs, village headpersons) to keep them on board. There is also an element of fear of bees in some communities – bees can be dangerous if provoked. If hives are near paths or farms, occasional stinging incidents could occur. It's noted that communities often fear bee stings and that fear helps protect hives (loggers avoid areas with hives). [country omitted], if someone is seriously stung or if livestock get attacked, it could create backlash against having hives in the area. Company A and its farmers should practice proper siting of hives (not too close to homesteads or along routes where they might be disturbed) and educate neighbors on bee behavior. Sharing benefits (like giving some free honey to neighbors) can turn potential complainers into allies.

Another community behavior risk relates to forest use: communities have to collectively refrain from destructive activities like charcoal burning for the sake of the bees. This requires a sustained behavior change. If external pressures (like rising charcoal prices or newcomers who don't share the conservation ethos) come in, there might be a resurgence of tree-cutting that undermines the beekeeping effort. Continuous community awareness and perhaps revenue-sharing (making sure a broad base of community members benefit from the honey enterprise, not just a select few) will encourage the protective behavior to continue. In one project, providing hives to many groups in the community led to regeneration of over 25 km² of forest – because the whole community had a stake in keeping trees (and enforced rules that "now you either endure bee stings or face legal penalties if you cut trees"). This demonstrates the powerful effect of aligning community behavior with conservation via economic incentive. Company A's challenge is to maintain that alignment: if honey profits grow, ensure the community sees those benefits widely; if external shocks happen, help the community not resort back to old habits.

In summary, behavioral risks for Company A range from internal execution risks (can the team professionally manage growth?) to farmer reliability (will farmers deliver the quantity and quality expected, and stick with the program?) to external interactions (competitors and community dynamics). Each of these human factors can significantly influence outcomes. The encouraging aspect is that these risks can be mitigated by building strong relationships, offering the right incentives, and fostering a sense of shared purpose. Company A's cause – protecting forests while earning income – naturally builds a sense of mission that can unite stakeholders. Already we see buy-in: local chiefs are appreciating the beekeeping initiative and farmers are proud of intact forests. By continuing to nurture trust, transparently sharing information, and adapting to stakeholder needs, Company A can turn many of these behavioral risks into strengths (for example, loyal farmers and supportive communities are a huge asset that competitors would lack). [country omitted], the company must remain vigilant. Human behavior is often the hardest to predict and control, so ongoing engagement and capacity building are essential to ensure that people remain the solution – not the problem – in this climate-smart honey venture.

6. Overall Risk Summary

Company A faces a multifaceted risk landscape, where financial, climate, and behavioral risks intersect and can amplify one another. On the financial side, the company's narrow product focus and limited capital base make it vulnerable to shocks: a poor honey season (a climate shock) would directly translate into revenue loss, potentially leaving fixed costs uncovered and straining liquidity. Climate risks

– particularly drought and high temperatures – could cause honey production to plummet by a considerable margin (in a severe drought, losses in honey yield of 50% or more are conceivable, as seen in analogous apiculture contexts). Such a drop in output would not only slash Company A's sales for that year, but also set off knock-on effects: reduced revenue might delay payments to farmers or limit reinvestment, which in turn could erode farmer trust and commitment.

[country omitted], these interdependencies are critical: for example, if a drought causes flowering failure (climate risk), the honey harvest is small (production risk), the company's cash inflow is low (financial risk), and it may be unable to pay all farmers promptly or offer the support they expect. Those farmers, facing hardship, might then abandon beekeeping or revert to charcoal burning for income (behavioral/community risk), thereby worsening environmental degradation and making future production even harder. This illustrates how a single shock can reverberate through the system – drought → low honey output → revenue shortfall → farmer dissatisfaction → potential defection and deforestation, a downward spiral if not managed.

[country omitted], good management of behavioral and financial factors can cushion climatic blows. For instance, if the company maintains a reserve fund or secures emergency credit (financial buffer), it can pay farmers even in a bad year, which maintains trust (behavioral resilience), so that farmers continue with the program into the next season (ready to rebound when conditions improve). [country omitted], if farmers are well-trained in climate adaptation (like providing water to bees, or splitting colonies to avoid losses), the impact of climate shocks can be mitigated, protecting both yields and incomes. [country omitted], Company A's overall risk profile is best viewed as a holistic matrix rather than isolated silos. The convergence of risks is high: climate variability directly affects supply and quality; financial constraints limit adaptive investments; human factors determine whether the enterprise can respond effectively or not.

At present, several vulnerabilities stand out. Working capital constraints and reliance on one revenue source pose a financial vulnerability – if anything upsets the honey production or the market, the company has little else to fall back on. Climate change is a looming threat with tangible near-term manifestations (erratic rains, hotter dry seasons); it threatens the core resource (honey) that the business depends on. And behavioral risks – such as key staff dependency and farmer loyalty – could either undermine the company or, if managed well, become the glue that holds it together during tough times. One can think of Company A's risk exposure using a "traffic-light" analogy, where red signifies high risk that needs urgent

attention, yellow (amber) indicates moderate risk to monitor/manage, and green would indicate low risk. In Company A's case, both financial and climate risk categories tilt towards the higher side (red), while behavioral risk, though significant, might be deemed moderate (amber) given the strong community buy-in but still-present management challenges.

Traffic-Light Risk Rating:
Financial Risk: 🔴 High – Company A's financial stability is highly vulnerable to fluctuations in honey output and prices. With a thin capital cushion and 75%+ of Malawian SMEs lacking formal financing options, the company faces persistent working capital pressures. A bad season or unexpected expense could quickly lead to cash flow crises given the narrow income base and difficulty accessing credit.
Climate Risk: 🔴 High – The company's supply is directly tied to natural climate conditions. [country omitted], erratic rainfall, or environmental degradation could drastically reduce honey yields. Key climate threats (drought, heat, bushfires) have a high likelihood and high impact for Company A, putting the enterprise in the red zone for climate vulnerability. Without significant adaptation measures, climate events could cause major operational and financial setbacks.
Behavioral Risk: 🔶 Moderate – There are notable behavioral risks (dependency on founder, farmer side-selling or inconsistent practices, etc.), but these are relatively manageable with the right strategies. Company A benefits from generally positive community relations and the motivational impact of tangible benefits (income, forest conservation) which moderate this risk. While internal capacity gaps and value-chain trust issues exist, they can be addressed through training, incentives, and governance improvements. As long as the company proactively cultivates trust and professionalism, behavioral risks should remain in the moderate range, though not negligible.

In conclusion, Company A's overall risk profile is significant but not insurmountable. Financial and climate risks form a potent combination – a climate shock could translate swiftly into financial distress, and financial limitations in turn constrain climate adaptation investments. Behavioral factors are the wildcard that can tip the balance either way. If farmers remain committed and the team adept, they can help absorb shocks (for example, loyal farmers might accept slightly delayed payments in a drought year if trust is strong, giving the company breathing room). If not, those human factors could exacerbate a crisis (farmers abandoning the scheme or staff mismanaging under pressure).

The interlinkages mean the real danger lies in concurrent hits – e.g., a climate shock happening when the company is financially stretched and perhaps

experiencing a leadership transition would be a worst-case scenario. [country omitted], strategic risk mitigation in one domain reduces risks in others (for instance, improving financial reserves can prevent behavioral fallout during a climate shock).

Company A sits at a pivotal juncture where it must strengthen its resilience across the board. By addressing its financial fragility (through better financing) and actively implementing climate adaptation for its beekeeping system, while continuously nurturing the trust and capacity of its people, the enterprise can turn many of these "red" flags to "yellow" or "green" over time. In the next section, we outline recommended Climate-Smart Agriculture interventions to reduce climate and some behavioral risks, and thereafter financing options to support those interventions and overall growth.

7. Recommended CSA Interventions

To enhance resilience against climate risks and ensure stable production, Company A should adopt a suite of Climate-Smart Agriculture (CSA) interventions tailored to the apiculture value chain. These measures focus on improving the capacity of both bees and beekeepers to withstand droughts, temperature extremes, and ecological changes, while also supporting sustainable community practices. Many of these interventions align with CGIAR/AICCRA goals of promoting adaptation and sustainability in agriculture.

1. Drought-Resilient Forage and Agroforestry

Expand the availability of flowering plants that can thrive in dry conditions to provide nectar even during droughts. This can be done by working with communities to plant drought-tolerant, bee-friendly trees and shrubs around apiaries and village lands. Indigenous trees like acacias, shea (if suitable to the area), moringa, or certain aloes can produce blossoms in relatively arid conditions and extend the foraging season. By maintaining diverse floral resources, the beekeeping system is less reliant on any single rainfall-sensitive bloom. Company A can integrate this with its forest conservation efforts: for example, encouraging farmers to plant fast-growing flowering hedge plants or reforest degraded areas with multi-purpose trees that benefit both people and bees. Not only does this improve honey flows (more continuous nectar supply), it also contributes to ecosystem restoration (which in turn can modulate micro-climate and improve soil moisture retention).

Communities have already seen that "you need trees to hang beehives" – reinforcing this with actual tree-planting programs (possibly supported by environmental grants) would cement the symbiosis between forestry and apiculture. This intervention leverages integrated landscape management: bees pollinate the very trees that sustain them, creating a positive feedback loop. Over time, a flowering agroforestry buffer around villages can act as a green shield against climate variability, ensuring bees don't starve during lean periods.

2. Water Provision and Hive Microclimate Management

Given the increasing frequency of hot, dry spells, providing supplementary water sources for bees is a simple but effective adaptation. Company A should ensure each apiary has an accessible, clean water point – for instance, placing shallow containers with clean water and floats (so bees can land) near hives, or advocating for small farm ponds. Research in Kenya shows that beekeepers who provided water saw significantly lower colony losses in dry seasons (up to 10% improvement). the founder has highlighted water access as a key climate adaptation for their apiaries, so implementing this is urgent. [country omitted], hive placement and shading should be optimized. Hives can be kept under tree cover or given shade roofs to prevent overheating in midday sun.

Farmers can be trained to site hives facing east (bees get morning sun but avoid the fiercest afternoon heat) and to use locally available materials (thatch or grass) to cover hive tops during extreme heat waves. Maintaining moderate hive temperatures helps brood development and honey ripening even during heat stress. If temperatures keep rising, Company A could also pilot improved hive designs that offer better insulation and ventilation. For example, Kenyan innovators have developed modified hives with ventilation features to cope with climate stress. While traditional log hives tend to have thick walls (good insulation), modern Kenya Top Bar or Langstroth hives might need shade or reflective paint to keep cool. By adjusting these micro-climate factors, beekeepers can significantly reduce heat-induced colony losses or absconding events.

3. Modern Hives and Apiary Management Training

Transitioning farmers from traditional hive practices to modern beekeeping techniques will improve adaptive capacity and yield. Modern hives (with removable frames or bars) enable beekeepers to manage pests and harvest selectively, which is crucial under climate stress. Studies found that colony losses are much higher in local-style hives than in modern ones, partly because modern hives allow interventions like pest removal and supplemental feeding. Company A should use

part of its grant to distribute modern hives (it's already planning to acquire new hives) and, critically, provide hands-on training in their use. This training (a form of CSA capacity building) should cover: regular hive inspections (to check for pests or disease), hive hygiene (cleaning out wax moth infestations, etc.), and gentle harvesting methods that protect the colony.

By enhancing apiary management, farmers can preempt climate-exacerbated issues – for example, a well-managed hive is less likely to abscond during a dearth because it's kept strong and free of heavy pest loads (absconding is often a stress response to pests or lack of food). Training should also emphasize timing of interventions: farmers can be taught to anticipate the season (e.g. if forecast says rains will be late, perhaps delay adding more hive boxes; or if a drought is forecast, harvest early and feed the bees). Incorporating local climate information services would be ideal – for instance, working with extension or AICCRA programs to send SMS alerts about weather (e.g. "Expected high temperatures next week – ensure water for your hives"). This way, farmers can adjust their practices proactively. In essence, professionalizing the beekeeping at the smallholder level turns it into a more controllable agricultural activity, rather than leaving everything to nature. Such empowerment is CSA in action: it increases productivity (more honey in good times) and reduces losses in bad times, making livelihoods more resilient.

4. Integrated Pest and Disease Management (IPM) for Bees

As climate warms and beekeeping intensifies, pest pressures may grow – thus a bee-focused IPM program is needed. Company A should train farmers to identify common pests (wax moth larvae, hive beetles, ants, etc.) and simple control measures. For example, applying grease or used engine oil on hive hanging wires or stand legs can prevent ants from climbing into hives. Regularly cleaning and removing old comb can reduce wax moth infestation. If small hive beetles (which thrive in warm, humid conditions) become an issue, farmers can be taught to use beetle traps or keep colonies strong (since strong colonies fend off beetles). Many farmers currently lack knowledge on managing these threats – surveys indicate knowledge gaps in identifying and managing bee pathogens/pests among African beekeepers. By filling this gap, Company A can cut losses significantly (pests like wax moth and beetles have caused up to 32% colony losses in some cases when unmanaged). If any disease (like Nosema or others) emerges, having a network of trained eyes means early detection and response (perhaps contacting agricultural extension for help). Company A might also collaborate with veterinary or ag research departments to monitor bee health periodically – a kind of community animal health approach but for bees.

As a preventative measure, encouraging good hive hygiene and discouraging use of harmful agro-chemicals near apiaries is important (pesticide poisoning is a risk if farmers spray crops; promoting Integrated Pest Management in crop farming around the apiaries can indirectly protect bees). The bottom line is, keeping bee colonies healthy and pests under control will make them more robust to withstand climate stresses like drought, since a pest-free, healthy colony can survive lean times better. This intervention aligns with CSA principles by protecting the productive asset (bees) against shocks and stresses.

5. Climate-Resilient Harvesting and Post-Harvest Practices

Adapting how and when honey is harvested can mitigate climate risks. For instance, in extremely dry years, harvest scheduling might be adjusted – instead of the usual schedule, farmers might do smaller, more frequent harvests to prevent hive resource depletion (leaving enough honey for the bees to survive). Training farmers on leaving some honey in the hive as insurance for the colony (especially heading into a harsh dry season) is a climate-smart practice; it might slightly reduce immediate sales but ensures colony survival for next season. [country omitted], improving post-harvest handling under variable climate conditions is key. In very humid weather, honey can absorb moisture and ferment – farmers should be taught to cap and store honey properly or deliver it promptly to Company A's facility.

Using airtight food-grade buckets and keeping them in cool, shaded places is a simple practice. Company A's pursuit of [certification omitted] will impose some standards here, which will help. They can provide or recommend proper containers to farmers at harvest. [country omitted], avoidance of fire in harvesting is both a safety and environmental measure: rather than smoking out bees excessively (which can lead to accidental fires and also destroys beneficial bees), farmers should use just enough smoke or use bee escapes. Promoting harvesting during cooler times of day (or at night but with protective gear rather than large torches) can prevent situations where a whole tree might catch fire. These behavioral tweaks ensure the sustainability of the resource – bees and their habitat – under increasingly unpredictable conditions.

6. Community-Based Climate Adaptation & Risk Sharing

Beyond on-farm practices, Company A can engage the community in broader climate adaptation initiatives. One idea is establishing a community forest monitoring committee linked to the beekeeping groups. During extreme dry seasons, this committee can be vigilant about bushfire risks – for example, doing controlled early dry-season burns to reduce fuel load (if appropriate) or quickly

extinguishing any fires that start near apiaries. They can also enforce bylaws against charcoal burning in apiary areas. In essence, leverage the community's interest (they now have "skin in the game" via honey) to protect the landscape during climate stress.

[country omitted], Company A could explore index-based weather insurance for its network (more on insurance in the next section, but mentioning here as an adaptation tool). For instance, an index insurance scheme could be designed where if rainfall in [location omitted] falls below a threshold or if vegetation indices (satellite NDVI) indicate severe drought, farmers receive a payout to compensate for likely lost honey yield. This acts as a safety net, preventing farmers from reverting to forest-destructive coping strategies when climate disasters hit. Some innovative work in Africa is being done on index insurance for livestock and crops; bees could be the next frontier. By piloting such insurance (perhaps with a partner NGO or insurer), Company A would be at the cutting edge of CSA. Not only would it protect farmers' income, but it would also ensure they have the means to replenish hives or feed bees if needed, thus maintaining the supply chain post-disaster.

All these interventions should be implemented in a participatory manner, involving farmers in testing and feedback. Demonstration apiaries can showcase practices (e.g. one demo hive with a water feeder vs one without, to show difference). Farmer-to-farmer exchange visits could be organized, such as visiting a successful cooperative (like the Kabunduli Cooperative in Nkhata Bay which manages 200 hives and protected a forest reserve) so Company A's farmers see the benefits of climate-smart practices in action.

In summary, the CSA strategy for Company A centers on ensuring bees have what they need (food, water, shelter) under a changing climate, and that farmers have the knowledge and tools to support the bees. By investing in resilient ecosystems (forest and forage), providing water and shade, modernizing beekeeping methods, controlling pests, and hedging against climate extremes (through insurance and adaptive harvest practices), Company A can significantly reduce its climate and environmental risks. These interventions will help safeguard the honey supply even as weather becomes more erratic, thereby stabilizing incomes for farmers and raw material for the enterprise. [country omitted], many of these actions have co-benefits: tree-planting and forest protection enhance biodiversity and carbon sequestration (mitigation co-benefit), integrated pest management avoids chemical use (environmental health co-benefit), and water harvesting benefits other farm needs too. [country omitted], implementing these CSA measures will

not only climate-proof Company A's operations but also contribute to broader sustainable development goals in the community.

8. Financing Options & De-risking Instruments

Implementing the above interventions and scaling Company A's business will require innovative financing solutions and risk-sharing instruments. Traditional financing alone is often inadequate for agribusinesses facing high climate and market risks. Company A should pursue a blended finance approach, combining grants, concessional loans, guarantees, and insurance, to stabilize its operations and fund growth. Below are key financing options and de-risking tools tailored to Company A's context:

- Working Capital Facility with Partial Guarantee

To address immediate liquidity needs during procurement season, Company A would benefit from a dedicated working capital line of credit. This could be structured as a short-term revolving facility from a local bank (e.g. [organization omitted] or [organization omitted] in [country omitted]) to be used for buying honey from farmers and packaging it, then repaid after product sales. Given banks' hesitancy to lend to SMEs without collateral, a partial credit guarantee can make this viable. Institutions like the African Guarantee Fund ([organization omitted]) are active in [country omitted] and have partnered with banks to unlock SME financing. Company A could engage [organization omitted] or a similar entity (perhaps via the National Bank or through programs like the Agricultural Commercialization Project) to backstop, say, 50-70% of a loan's value. With such a guarantee, a bank would be more willing to offer a reasonable interest rate and limit collateral demands.

The guarantee essentially de-risks the loan by assuring the bank that if Company A defaulted (perhaps due to a bad harvest year), the guarantor covers a large portion. For Company A, this means access to cash when it's most needed – right at harvest – enabling it to buy all the honey its farmers produce (preventing loss of volume to competitors) and to do so on time (maintaining farmer trust). The size of this facility can grow as the business grows. Having a reliable source of working capital will smooth operations and reduce the risk of liquidity crunches that could otherwise cripple the company in a tough season.

- Blended Capital for Expansion (Grants + Concessional Loans)

For longer-term investments (like expanding processing capacity, setting up additional storage, or rolling out new hives and training in new communities),

Company A should seek blended finance – a mix of grant funding and low-interest (concessional) loans. Grants (or result-based financing) can come from climate adaptation funds or development programs given the strong environmental and social angle. For example, a donor like [organization omitted] or [organization omitted] Small Grants Programme might fund the distribution of 1,000 climate-smart hives to communities, or support a training program for women beekeepers in climate resilience techniques. These grant-funded assets directly bolster Company A's supply chain without loading debt on the company.

[country omitted], concessional loans (possibly from impact-oriented lenders or government schemes) can co-finance infrastructure like a larger honey processing and value-add facility, or a collection vehicle, etc. The [country omitted] Innovation and Challenge Fund or organizations like [organization omitted] ([country omitted] Agriculture and Industrial Investment Corp) are potential sources – indeed [organization omitted] has shown interest in honey sector by financing African Honey & Food Products for equipment and beehive supply.

Company A could pitch a proposal highlighting how financing its scale-up will yield rural jobs, women's empowerment, and forest conservation. Concessional terms (low interest, longer grace period) are appropriate because immediate financial returns might be modest while the impact returns are high. By mixing grant and soft loan, the effective cost of capital remains manageable. Blended financing ensures that Company A isn't over-leveraged with commercial debt while still obtaining the funds needed to grow and implement CSA measures. For instance, a blended package could fund a "Honey Hub" – a central facility with solar-powered processing equipment (mitigating grid outage risk), quality testing labs, and storage. A grant might cover the solar equipment (aligning with climate mitigation), while a loan covers the building and machinery, and Company A's co-investment is training staff to run it.

- Community-Level Microfinance and Savings Schemes

To de-risk farmer behaviors (like side-selling or low adoption due to financial constraints), it can help to improve farmers' access to finance. Company A can facilitate the formation of Village Savings and Loan Associations (VSLAs) among its beekeepers or link them to a microfinance institution willing to support apiculture. The idea is to provide small loans or advance payments to farmers secured against future honey deliveries. For example, farmers could receive an advance at the start of dry season (for school fees or inputs) with an agreement that they will repay in honey at harvest. If managed carefully (perhaps initially on a pilot scale with known

reliable farmers), this can reduce side-selling by addressing the root cause (urgent cash needs). To further de-risk this, Company A could partner with a microfinance NGO that administers the loans, or use a group guarantee model (group of farmers collectively responsible).

Embedding finance in the value chain – sometimes called "embedded credit" – has been done in other sectors; here, perhaps a hive leasing scheme could be tried: the company or a microfinance provides modern hives on loan, and farmers pay back with a portion of additional honey produced. Such schemes increase farmer loyalty (since those in debt to the program have incentive to stay and deliver honey) but must be done prudently to avoid over-indebting farmers. Grant-funded guarantee funds could also be set up to encourage micro-lenders to extend credit to beekeepers (similar to how AGRA or other bodies have guaranteed loans for small farmers elsewhere). In summary, improving farmers' financial capacity will indirectly de-risk Company A's supply; it keeps farmers committed and able to adopt recommended practices (they can afford a smoker, or a bee suit, etc., if they have a small loan for it).

- Weather-Indexed Insurance

To protect against the worst-case climate scenarios, Company A should explore index insurance for both its farmers and itself. For farmers, a simple index based on rainfall in their district could trigger payouts when a severe drought occurs (e.g. rainfall < 50% of normal = payout of a certain amount per hive to compensate lost honey). This helps farmers recover and encourages them to continue investing time in beekeeping next season (rather than saying "the bees gave nothing, I give up"). It also could cover, for instance, if bushfires (correlated with drought) destroy hives – since drought often increases fire, the same payout can help replace hives. For the company level, a meso-insurance product could be structured: if region-wide honey production (or an index like vegetation greenness) falls below a threshold, Company A receives a payout to help cover its overhead costs for that year and perhaps provide minimum payments to farmers. This concept is akin to business interruption insurance triggered by weather. While index insurance for apiculture is novel, it aligns with a growing recognition of climate risk in agriculture finance.

Company A could work with an insurer or an insurtech startup (some exist that do index insurance via satellites and mobile payouts). Premiums for such insurance might initially be subsidized by a donor (as a pilot) to make it affordable. Over time, if it proves effective, the cost can be built into operations (or reduced by competition among insurers). The benefit is peace of mind: Company A and its

farmers would know that even if a catastrophic drought hits, they won't be completely devastated financially. This makes all stakeholders more willing to invest in growth (farmers will hang more hives, the company will invest in expansion) because the tail-risk is covered. It essentially de-risks investment in a climate-sensitive venture. Index insurance has been successfully piloted for drought-prone crops and pastoralists; bees could be a next frontier given their importance to livelihoods and ecosystems.

- Strategic Partnerships with Impact Investors

Company A's social enterprise nature and growth potential could attract impact investors or socially responsible equity investors. These are investors who are willing to take modest returns in exchange for positive impact on climate resilience, gender empowerment, and poverty reduction. Engaging such an investor would bring in not just capital, but also expertise and credibility. For example, impact funds like [organization omitted], [organization omitted], or regional venture funds focusing on agriculture might find Company A appealing. the founder's recent award suggests the business has a compelling story – exactly what impact investors look for. By bringing on an equity partner, Company A could secure a larger capital injection to scale (e.g. to expand to other districts or build a larger processing plant). Unlike debt, equity doesn't require immediate repayment, which frees up cash flow for the company to reinvest. An investor might also help institutionalize the company (help set up better governance, connect to new markets). To prepare, Company A should strengthen its financial records and perhaps get a valuation or investment readiness assessment.

[country omitted], any equity deal should be structured considering Mercy's vision – finding an aligned investor who values the environmental mission and will be patient through climate fluctuations is key. Patient capital can be transformative: it could allow, for instance, experimentation with new products (like pollen or propolis harvesting for additional revenue) or entry into export markets, without the pressure of short-term loan repayment. Impact investors often bring grants or technical assistance alongside investment too. For instance, they might fund a consultant to help implement an MIS (management information system) for tracking farmer deliveries, which improves efficiency. In the long run, if Company A truly succeeds and expands regionally, impact investors could later help crowd in commercial investors or facilitate low-cost debt once the risk profile improves (this trajectory has been seen in other African agribusiness startups incubated and then scaled).

- Public-Private Partnerships and Government Support

Company A should also tap into any government or donor programs aimed at climate adaptation and SME development. For example, [country omitted]'s Ministry of Agriculture with support from [organization omitted] or [organization omitted] has programs for climate-smart agriculture – while most focus on crops, Company A could advocate that apiculture be included given its clear benefits. This might open opportunities for grants (e.g. purchasing a solar dehydrator to dry honey to perfect moisture, or funding to train 500 new youth beekeepers). The government might also provide in-kind support like extension officers to assist in training (reducing Company A's costs).

[country omitted], as a women-led enterprise, Company A could benefit from gender lens investing initiatives (there are funds specifically targeting women entrepreneurs in Africa). Engaging with institutions like the African Development Bank's Affirmative Finance Action for Women (AFAWA) could yield guarantee or credit line support specifically earmarked for women-owned SMEs, as one Malawian bank partnership with [organization omitted] indicated focus on women and youth.

- Revenue Diversification and Value Addition Finance

Another de-risking strategy is to finance the development of complementary revenue streams, which spreads risk. For instance, with modest investment, Company A could start processing beeswax (making candles, soaps or selling filtered wax to cosmetics buyers) – this could use the residual by-product of honey processing for extra income. There are specialty grants or challenges (like "value addition" challenges) that could fund R&D or equipment for this. Even exploring propolis-based medicinal products or pollination services (leasing bee colonies to orchards) could be future avenues, for which early grant funding might be available. While these are ancillary to the main honey business, they create buffers – if honey output is low, perhaps wax sales or a pollination contract could bring some income. Targeted small financing (say a $10k grant to set up a wax rendering facility) can kickstart these micro-ventures.

In implementing the above, timing and combination is crucial. A likely path might be: secure a guarantee-backed working capital loan immediately for the upcoming season, simultaneously apply for a climate adaptation grant (to fund CSA interventions and expansion), and engage with an impact investor for a larger equity deal in a year's time once initial scale-up shows results. Insurance can be piloted in parallel on a small scale and then expanded if it proves useful. Microfinance tie-ups can grow organically as farmer groups mature. The blend of

instruments ensures that no single stakeholder bears all the risk – banks are comforted by guarantees, investors by insurance and CSA measures (reducing risk of failure), farmers by microcredit and insurance (so they stick with the program), and the company by the influx of affordable capital to grow.

By utilizing blended finance and risk transfer mechanisms, Company A can overcome the classic financing hurdle that stymies many small agribusinesses. It will enable the company to invest in long-term resilience (like better equipment, training, inventory stockpiling in good years) rather than always firefighting short-term cash issues. This financial strategy is essentially a parallel to the CSA strategy: it is climate-smart financing. It acknowledges risk (droughts, etc.) and builds in safeguards (insurance, guarantees) and buffers (equity, grants) to absorb those shocks. As donors and investors are increasingly looking to support ventures that address climate change and inclusion, Company A should position itself as a prime candidate – which it genuinely is, given its triple bottom line of profit, people, and planet.

With the right capital structure, Company A can scale sustainably and achieve a self-reinforcing cycle: more investment → more honey production with climate adaptation → higher revenues → stronger financials → ability to attract even more investment. This will allow the enterprise not only to remain financially viable but to deepen its social and environmental impact – improving incomes for hundreds of rural women, contributing to [country omitted]'s forest cover restoration, and demonstrating a model of inclusive, climate-resilient agribusiness that can be replicated elsewhere. The journey will certainly have risks, but by recognizing and proactively managing those risks through the strategies discussed, Company A can continue its upward trajectory even amid a changing climate and economic landscape.

Company B – Soybean processing in Uganda

Introduction

Company B is a Ugandan agribusiness enterprise focused on soybean value addition. Established in 2017, the company contracts about 3,500 smallholder farmers across Uganda to grow soybeans, which Company B buys back and processes into cooking oil. It operates as an agro-dealer and value-add processor – farmers receive inputs and market access, while Company B's expeller facility produces soybean oil (with soybean cake as a byproduct).

The enterprise targets the domestic cooking oil market (high demand due to imported oil substitution) and emphasizes inclusion of local farmers (notably women and youth) in its supply chain. This model both empowers farmers and secures raw material supply for the processor.

Business Overview

Company B operates at the intersection of smallholder farming and agribusiness processing. Headquartered in [location omitted] with operations in districts like [location omitted], Uganda, the company engages thousands of farmers in contract farming arrangements. Under this model, Company B typically provides participating farmers with agricultural inputs (for example, improved soybean seeds) and training in modern farming techniques. These climate-smart practices – such as using better seed varieties and good agronomic practices, help farmers boost yields and resilience. At harvest, Company B buys back the produce (notably soybeans) from its contracted growers at a pre-agreed price, aggregating the crop for processing. The company owns an oil expeller machine and processes the soybeans into cooking oil, thereby adding value before sale. The processed cooking oil can be sold in local markets, reducing reliance on imported edible oils, while the by-product (soy cake) is used as high-protein animal/fish feed – in fact, Company B's sister company plans to use this soy cake to manufacture affordable fish feed, creating an integrated value chain synergy.

By linking smallholders to a guaranteed market and providing extension support, Company B's model addresses two key needs: market access for farmers and reliable supply of raw material for the processor. The venture is still in an early-growth stage, testing and refining its operations with farmers and expanding processing capacity. It faces typical challenges of young agribusinesses in Uganda: limited access to finance, climate variability, and the logistics of aggregating crops from widely dispersed producers. Notably, Company B's founder (the founder) and core team bring experience in agribusiness and supply chain management, and they have at least one field extension officer on staff to work directly with farmers. However, like many small enterprises, resources are stretched and the enterprise's success relies heavily on effective coordination and trust between the company and its farmers.

Before delving into risk factors, it's important to acknowledge that Company B's work aligns with climate-smart agriculture goals. By promoting improved seed varieties (which often are more drought-tolerant or pest-resistant) and better farming practices, the company helps farmers adapt to climate stresses. Moreover, developing a local value chain for soy can improve resilience of the food system.

Yet, the impact of these innovations ultimately depends on human behavior – how well farmers adopt new practices, how loyally they honor contracts, how the company's staff and partners perform, etc. Below, we examine the behavioral risks in three arenas: internal (within Company B's organization), farmer-level, and the broader value chain.

Finance Risk Assessment

1. Revenue sources & diversification: Company B's income comes mainly from edible oil sales. Its revenue is not highly diversified – it depends on soybean oil and related products. (Byproducts like oilcake for animal feed provide a secondary revenue stream, but oil is primary.) This concentration means sales and margins are very sensitive to soybean market dynamics. Expanding into other oilseed crops or products could diversify income, but currently soybean is key.

2. Input and cost sensitivities: The major input is soybean grain from farmers, so raw material availability and price are critical. Poor harvests or higher farm-gate prices directly raise Company B's costs and squeeze margins, since passing on cost increases in retail oil prices is limited by competition from importers. Farming inputs like fertilizer or seed affect farmer yields – if prices for these inputs soar or farmers can't afford them, soybean output falls, raising Company B's procurement costs.

   Processing operations also face energy costs (to run expellers and refining equipment). Increases in electricity or fuel costs in Uganda (which has had power reliability issues) can raise operating expenses. Company B's model of buying from many small farmers means logistics costs (collection from widespread villages) are significant; higher fuel or transport costs directly impact profitability.

3. FX exposure: Uganda is a net importer of cooking oil, and while Company B produces locally, it still faces foreign exchange risks. Packaging materials (bottles, labels) or machinery parts are often imported – a devaluation of the Ugandan kwacha drives these costs up. Similarly, if soybeans are scarce locally, importing soy or oil would be costly due to FX. On the revenue side, Company B sells domestically in local currency, so it doesn't earn forex to naturally hedge these costs. Thus, a weak kwacha can inflate input costs without a matching increase in local selling prices, pinching margins.

4. Liquidity & working capital: This business has high working capital needs – buying crops at harvest in bulk and holding inventory for processing.

Company B must pay farmers promptly (often at harvest) but then incur processing and packaging costs before oil is sold, creating a cash flow gap. Limited access to credit was identified as a major challenge. Seasonal spikes in procurement (buying a year's soy supply during harvest) strain liquidity. If cash is insufficient, Company B might delay purchases or buy less, risking factory under-utilization. In past seasons, financing constraints have likely limited its ability to purchase all farmers' output.

The company's credit/investment readiness is evolving – it has participated in investor forums (e.g. [organization omitted]) and expressed need for capital. However, with a short track record and collateral mostly in equipment, securing bank loans is difficult. Improving financial record-keeping and demonstrating stable supply contracts (e.g. with big buyers for oil) would enhance creditworthiness. So far, Company B remains dependent on owner funding or small grants for working capital, which is precarious for scaling up.

Climate Risk Assessment

1. Key climate hazards: As a rain-fed crop in Uganda, drought and erratic rainfall are the biggest climate risks for soybean farmers supplying Company B. Uganda has faced late onsets of rains and periodic mid-season droughts which can significantly cut soybean yields. Conversely, intense rainfall or flooding (especially flash floods or waterlogging in fields) can damage soybean crops and delay harvests.

   Another emerging threat is pest and disease outbreaks exacerbated by climate – e.g. soybean rust or pod-sucking pests can thrive in changing conditions, and fall armyworm (though known for maize) can also attack soy in drought-stressed fields. Increasing temperatures and heat waves during the growing season could also reduce yields or oil content.

2. Exposure and sensitivity: Company B's supply chain is highly exposed to climate variability. The 3,500 farmers are mostly smallholders in Uganda's rural districts, farming without irrigation. Their production is highly sensitive to rainfall patterns – a poor rainy season directly translates to lower volumes of soy delivered to Company B. Most farmers have low adaptive capacity (limited irrigation, small landholdings, and minimal financial buffers), which means climate shocks cause sharp drops in production. Company B itself feels the impact: if a drought hits multiple soya-growing areas, the company faces raw material shortages and perhaps has to idle processing capacity.

This sensitivity was evidenced by the company explicitly naming "climate resilience" as a challenge to their agribusiness. In addition, quality can suffer – drought can raise aflatoxin levels or reduce oil yield per ton of soy, affecting processing efficiency.

3. Adaptive capacity and practices: Currently, Company B's adaptive capacity relies largely on its farmers' practices. Some resilience measures are in place: soybeans can fix nitrogen, improving soil fertility naturally, and many farmers intercrop or rotate soy with maize or groundnuts, which helps soil health. Company B encourages contract farming, which could enable guidance on planting time and possibly input support. However, advanced climate-smart practices (e.g. drought-tolerant soybean varieties, water conservation, weather-informed advisories) are not widely documented in Company B's model yet.

   The company's engagement with organizations like [organization omitted] suggests an interest in modernization – for instance, plans to produce cooking oil locally imply they recognize the need for efficient, perhaps climate-resilient processing (e.g. energy-efficient machinery). On the farm side, introducing short-cycle or drought-resistant soybean varieties would improve resilience; indeed, [organization omitted] and partners have been promoting climate-smart seed varieties in the region, which Company B could leverage. Thus far, Company B's smallholders mostly rely on traditional knowledge and the company's basic agronomic advice. Use of irrigation among these soy farmers is minimal – a major limitation in drought years.

   The company does not yet have its own climate information service for farmers, but working with extension programs or [organization omitted] initiatives could change that. In terms of soil management, soy rotations help (as noted, nitrogen-fixation reduces fertilizer needs), and Company B's promotion of local processing could reduce emissions from transport (minor climate mitigation benefit). Overall, adaptive capacity is moderate – Company B is aware of climate issues and works with a climate-sensitive crop, but systematic CSA (Climate-Smart Agriculture) integration is still nascent.

Internal Behavioral Risks (Organizational)

Internal behavioral risks refer to challenges stemming from the people and processes within Company B's own organization. For a small but growing

agribusiness like Company B, these internal factors can significantly influence operational effectiveness and investor confidence:

- Key-Person Dependency: As a young venture, Company B is likely highly dependent on its founder and a few key team members. The Managing Director (who is also the founder) drives strategic relationships and day-to-day decisions. This presents a risk that if any key person were to leave the company or underperform, the business could struggle. For instance, much of the trust with farmer communities and buyers may be built through personal relationships of the founder/leadership. Investors often flag "key person risk" in early-stage companies, especially when formal governance structures (e.g. a broad executive team or independent board) are limited. In Company B's case, while the team has defined roles (Managing Director, Head of Operations, Accountant, etc.), it remains relatively small. The loss of a key individual or even temporary incapacitation could disrupt operations and decision-making, potentially stalling progress. Mitigating this risk involves grooming a strong second-line management and documenting processes so the company is not solely reliant on any one person's implicit knowledge or relationships.

- Capacity and Management Practices: Like many Ugandan SMEs, Company B may face gaps in business management capacity. Research on Uganda's MSMEs finds they often have limitations in areas such as business planning, financial management, record-keeping, and employee management. These limitations can lead to operational inefficiencies or errors – for example, if bookkeeping is weak, the company could misjudge its finances or fail to pay farmers on time, which in turn would erode farmer trust. Similarly, if planning and inventory tracking are suboptimal, Company B might struggle to match processing capacity with raw material supply or fulfill orders on schedule. Employee management is another aspect: ensuring that staff (like field officers or processing workers) are well-trained, motivated, and ethical is crucial. A small company may not have formal HR policies or extensive training programs, so much depends on the personal commitment and integrity of each staff member. Any lapses – say, an extension officer not visiting farmers regularly or an employee mishandling cash meant for farmer payments – could introduce significant risks. Building internal capacity through training, mentorship (perhaps via programs like the [organization omitted] accelerator or other incubators), and instituting basic management systems (for tracking finances, farmer contracts, etc.) will be key to strengthening Company B's internal resilience.

- Governance and Controls: Early-stage ventures often lack robust governance structures. In Company B's case, decision-making might be highly centralized with the founder, and informal processes could prevail. This can sometimes lead to biased or suboptimal decisions (e.g., focusing on expansion without a proper risk assessment) or difficulties in accountability. Additionally, without strong internal controls, there is potential for mistakes or even malpractices going unnoticed. For example, if there isn't a clear system for measuring and grading the soybeans purchased from farmers, staff might inadvertently or intentionally favor certain suppliers or misreport quantities. While there is no suggestion of wrongdoing at Company B, it is a general risk that in the absence of systematic controls, human behavior under pressure can lead to cutting corners. To be investor-ready, Company B will need to demonstrate sound internal controls – such as transparent record-keeping, checks and balances in cash handling, and a governance framework (maybe an advisory board) – to ensure the company's growth is managed prudently.

In summary, internal behavioral risks center on whether Company B's team can effectively manage and scale the business. The passion and vision of the founder have driven the company this far, but going forward, instituting professional management practices and reducing over-reliance on individuals will be critical. Investors look for signs that the enterprise can run reliably and transparently, since that increases the chances that any financial or technical support will translate into sustained impact. Addressing internal behavioral risks by capacity building and better governance is thus as important as tackling external risks.

Farmer Behavioral Risks

The success of Company B's model hinges on the behavior of the 3,000+ smallholder farmers who supply its raw materials. These are independent individuals with their own motivations, constraints, and choices. Even with contracts in place and training provided, farmer behavior can be unpredictable and poses several risks to the business. Key farmer-related behavioral risks include:

- Side-Selling and Contract Default: One of the greatest risks in contract farming is that farmers may side-sell their produce to other buyers instead of honoring the agreement with the contracting company. This typically occurs if a trader or competitor offers a higher price (often in cash on the spot) at harvest time, tempting farmers to bypass their contract for immediate gain.

In Uganda, side-selling is a well-documented challenge – for instance, in the cotton sector, companies that provided inputs and extension services to farmers often faced "increased side-selling to ginners that... pay higher prices," especially when new buyers entered the market offering better terms without having invested in the farmers. The same dynamic can happen with soy or other crops: if market prices surge at harvest or if an informal trader arrives in the village with cash, some farmers might breach their contract with Company B.

This behavior directly threatens Company B's supply chain reliability – the company could end up with insufficient soybean volume to keep its oil expeller running at optimal capacity, undermining revenues and processing efficiency. Moreover, side-selling often goes hand-in-hand with defaulting on input credit: if Company B provided seeds or other inputs on the promise of repayment in produce, a farmer who sells produce elsewhere might not repay the advance. A history of widespread side-selling and input loan defaults in Uganda's oilseed market led to significant distrust between farmers and agribusinesses in the past. Ginners (buyers) became reluctant to front inputs when over 60% of smallholders failed to deliver as expected, breaking down contract schemes. For Company B, this risk means the company must carefully vet farmers, build loyalty, and perhaps institute incentives or enforcement to uphold contracts. Strategies like providing small cash advances or loans during the season (to reduce farmers' liquidity needs at harvest) can help minimize side-selling, but they must be paired with enforcement mechanisms to be effective. Clear communication of contract terms, fair pricing, and timely payment on delivery are also critical to discourage side-selling.

- Low Adoption of Recommended Practices: Company B invests in training farmers on modern farming techniques – for example, proper spacing, use of improved seed varieties, pest management, and climate-smart practices. However, a major behavioral risk is that farmers may not fully adopt these recommended practices on their fields. Changing agricultural habits is difficult; smallholders might revert to traditional seeds or planting methods due to convenience, skepticism, or risk aversion.

  In general, adoption rates for new practices among Ugandan smallholders are often low. A recent study in Eastern Uganda found that only about 26% of farmers had adopted promoted climate-smart agricultural practices, and that adoption was largely driven by how compatible and simple the

innovations were with existing practices. Labor- or capital-intensive practices tend to be avoided by farmers. This insight is very relevant to Company B's work – if the improved practices or seeds the company promotes require extra labor, new knowledge, or upfront costs, many farmers might not implement them fully or correctly. For instance, Company B might train farmers on proper post-harvest handling (to reduce moisture or aflatoxin in soybeans), but if this involves, say, extra drying time or materials, some farmers might skip it, leading to lower quality grain. Likewise, farmers might partially adopt advice (plant improved seed but then not apply the recommended fertilizer or pest control, due to cost or skepticism), resulting in yields below expectations. Such behavioral gaps can hurt both parties: farmers won't see the full benefit (which could make them less interested in future participation), and Company B may receive lower quantity or quality of produce than projected.

To mitigate this, Company B needs to ensure its extension services are persistent and persuasive – possibly demonstrating on lead farmers' plots, ensuring the practices are context-appropriate, and addressing farmers' constraints (for example, facilitating access to inputs or labor-saving techniques). Continuous farmer engagement and showing short-term benefits can gradually shift behaviors. However, the risk remains that adoption is uneven, and thus, actual productivity gains and climate resilience outcomes may fall short of what's intended.

- Trust and Transparency Issues: The relationship between Company B and its farmers fundamentally relies on trust – trust that the company will offer fair prices, accurate weighing/grading, and timely payments, and conversely, trust that farmers will deliver the agreed crop of the promised quality. Any breakdown in this trust can trigger adverse behaviors. Farmers in Uganda often are distrustful of buyers' grading and pricing practices (fearing they might be cheated on quality assessments or paid less than market value), while agribusinesses can be skeptical of farmers' ability to meet quality standards. For example, if Company B grades soybeans for moisture or purity and pays a premium for better quality, farmers might suspect the grading process is unfair or opaque, potentially causing resentment. Likewise, farmers strongly prefer prompt, spot payments at delivery, whereas companies sometimes delay payment (to aggregate sales or due to cash flow). If in the past a farmer experienced delayed payment

or felt underpaid due to quality deductions, they may lose confidence and decide to side-sell or exit the scheme next season.

Additionally, lack of transparency or communication can fuel rumors – e.g., if there's a rumor that Company B's prices are lower than what a trader offers, farmers might not appreciate factors like input support or loyalty bonuses and simply chase the higher price. It's crucial for Company B to proactively manage this risk by fostering transparency (explaining how prices are set, how quality is measured, perhaps even jointly measuring with farmers) and by honoring all commitments scrupulously (especially regarding payment timing).

Building long-term relationships – sometimes including addressing farmers' social needs as the [organization omitted] study suggests (for instance, some contracts added funeral insurance, which surprisingly boosted farmer loyalty by addressing a community need) can strengthen the bond and reduce opportunistic behavior. Nonetheless, in the early stages, Company B likely faces the challenge of proving its reliability to farmers, one season at a time. Each farmer's decision to stick with the program or not is a behavioral outcome influenced by their trust in the company.

- Repayment and Misuse of Inputs: If Company B provides inputs (like seeds, fertilizer, or agro-chemicals) on credit or as part of the contract package, there is a behavioral risk around how those inputs are used. Some farmers might misuse or even divert inputs – for instance, selling a portion of the provided fertilizer or using it on a crop not under contract – which can lead to lower yields for the intended contract crop. Others might simply fail to repay the value of inputs if the repayment is not directly deducted. In Uganda's previous contract farming experiences, when farmers are cash-strapped, the temptation to side-sell produce or not repay loans is high, especially if enforcement is weak.

  Company B must be cautious in extending credit and likely needs to enforce repayment through produce delivery (i.e., deducting the cost of inputs from the harvest payment). Even so, in a bad year (say drought or flood), farmers might default not out of malice but necessity, which still leaves the company bearing the cost. This risk underscores the importance of not only careful farmer selection (choosing committed farmers with a track record, if available) but also having contingency plans (such as crop insurance or social safeguards) so that one bad season doesn't permanently sour the

farmer-company relationship. It's a delicate balance – too lenient, and some farmers might take advantage; too strict, and farmers feel alienated or overly pressured. Social dynamics in villages also play a role: if a few farmers default or side-sell and face no consequence, others may imitate that behavior, whereas if loyal farmers are visibly rewarded (e.g., with bonus or timely services), it sets a positive norm.

In summary, farmer behavioral risks center on loyalty, adoption, and trust. These risks are interrelated – for example, a farmer who doesn't see the benefit of the new practices (low adoption) may be more likely to side-sell, and a farmer who doesn't trust the buyer may be less attentive to meeting quality standards. For Company B, managing these risks is perhaps the most critical part of its business model. The company's ability to scale will depend on creating a network of farmers who are not only formally contracted but genuinely engaged and satisfied. This likely requires continuous communication, fair benefit sharing, and possibly innovative contract designs. (Indeed, research suggests that better contract design – such as offering insurance, cash advances, or social benefits in the contract – can align interests and reduce defaults.)From an investor's perspective, these farmer behavior factors also determine whether climate-smart innovations delivered through Company B will actually be adopted on the ground. Thus, solutions to improve farmer behaviors (from training approaches to incentive structures) are a key area of focus.

Value Chain and External Behavioral Risks

Beyond the farmers and the company itself, Company B operates within a broader value chain ecosystem that includes input suppliers (e.g. seed companies), competitors or informal traders, buyers of its oil or surplus grain, financial partners, and even government agencies. The behavior of these external actors can pose significant risks to Company B's success. We highlight a few such value-chain related behavioral risks:

- Opportunistic Competition and Informal Markets: As touched on earlier, one of the external risks is the presence of other buyers (competitors) who may behave opportunistically, especially at harvest time. In Uganda's agricultural markets, it's common for informal traders to roam and offer farmers slightly better prices in cash, since these traders often have lower operating costs and may evade formal regulations.

For example, Uganda's edible oil sector has seen scenarios where informal processors or middlemen, by skirting taxes and standards, can pay farmers more for raw oilseeds than formal processors can economically afford. This creates a disincentive for farmers to stick with formal supply chains. In Company B's case, even if the company invests in farmers (training, maybe inputs), an informal trader could swoop in offering a higher price per kg for soy at harvest (perhaps because that trader doesn't provide any farmer support or avoids VAT and therefore has a margin to outbid formal players). Farmers, acting in their immediate financial interest, might sell to the trader, undermining Company B's supply.

This competitive behavior is a risk emanating from the structure of the market – essentially a collective action problem where each farmer's defection is individually rational but undermines the organized effort. Company B must anticipate this by either matching market prices (ensuring its contract price is attractive, possibly with end-of-season bonuses) or by locking in loyalty through non-price benefits (e.g., guaranteed pickup, input provision, or community goodwill). It may also need to time its payments and procurement to beat the traders at their game (for instance, being present in villages right at harvest with cash or immediate payments). Over the long run, advocacy for a more level playing field (such as enforcement of regulations so that all buyers have similar costs) would help, but as a single company Company B primarily has to out-compete or differentiate itself from the informal buyers' tactics.

- Input/Partner Reliability: On the input side, Company B might rely on partnerships with input suppliers or technology providers (for example, partnering with a seed company like [organization omitted] for improved soybean seeds, or using digital platforms for advisory services). There is a risk that these partners may not fulfill their commitments or may have misaligned incentives. For instance, if a seed company partner is supposed to supply certified seed to Company B and its farmers, any delay or quality issue in seed delivery will affect the season's outcome. If the partner's behavior is profit-driven to the point of, say, providing subpar seeds or raising prices last-minute, it puts Company B in a tough spot with farmers.

  Conversely, if Company B engaged farmers in a seed multiplication scheme on behalf of a partner (where farmers grow certified seed for the seed company), there is a risk on both sides: farmers might be tempted to sell that seed as regular grain if market prices are high, and the seed company

might back out if their demand changes. These kinds of coordination risks require Company B to maintain good communication and alignment with its partners. It needs to select reliable partners and possibly have backup options. From a behavioral standpoint, building trust with partners is as important as with farmers – a breakdown could lead to finger-pointing and farmers being left in the lurch (for example, a promised input that never arrives can cause farmers to lose faith in Company B). Thus, Company B must manage partner relationships diligently, perhaps through formal MOUs and by not over-promising to farmers what depends on third parties.

- Market Behavior and Consumer Preferences: After processing the cooking oil, Company B needs to sell it in the market. Here, consumer behavior and intermediary behavior can pose risks. Ugandan consumers are price-sensitive, and if they perceive local soybean oil to be expensive or unfamiliar, they might opt for cheaper informal oils or other brands. There may also be ingrained preferences (for example, some consumers might trust imported vegetable oil more, or prefer the taste of sunflower oil over soy oil).

  Changing consumer behavior takes marketing and time. On top of that, the wholesalers and retailers who carry cooking oil might not give a new, small-brand product prime shelf space, or they might demand consignment (payment after sale) which strains Company B's cash flow. In other words, the buyer behavior down the value chain – whether it's a distributor delaying payment or a retailer not pushing the product – can affect Company B's revenue. If Company B cannot compete on price due to higher production costs (Uganda has in the past had tax-related cost issues for formal oil producers), it might find its oil accumulating inventory.

  This risk means Company B should also focus on branding, quality consistency, and perhaps targeting a niche (like a "locally produced, healthier oil" angle) to influence consumer behavior in its favor. Additionally, any major shifts in market conditions, such as government policy (e.g., removal or re-introduction of VAT on cooking oil) can alter the behavior of market players overnight – for example, if the government waives VAT for formal producers, formal sector prices drop and informal traders lose some edge, which would benefit a company like Company B. Staying attuned to these external changes and being agile in response is part of managing value-chain risk.

- Regulatory and Institutional Behavior: While not a "behavior" of a single individual, the actions of government institutions can reflect policy behavior that impacts Company B. For instance, sudden export bans or government buying programs can change the market dynamics. In Uganda, policy interventions in maize and other commodities have been known to be unpredictable and opaque, which affects business planning.

  For oilseeds, if the government decided to, say, distribute free soybean seed to boost production or impose price controls on cooking oil, how actors behave will shift (farmers might feel less need to stay with Company B if free inputs are elsewhere, or consumers might flock to cheaper subsidized products). While Company B cannot control such external institutional behaviors, recognizing them as a risk is important. Engaging in policy dialogue through associations or leveraging support from development partners (like [organization omitted] or others who might interface with policy makers) could help voice the needs of small agribusinesses so that well-intended interventions don't unintentionally undermine business models that are actually beneficial to farmers in the long run.

In essence, the value chain behavioral risks for Company B revolve around how other stakeholders' decisions affect the company's operations. From competitors at the farm gate to partners in inputs and buyers in the marketplace, Company B must navigate a landscape where not everyone's incentives are aligned. Opportunistic behaviors – whether a trader poaching produce or a buyer squeezing prices – tend to occur when there are imbalances or information asymmetry in the chain. For an investor, these risks highlight that Company B's growth is not just about what happens on the farm or in the factory, but also about managing relationships and competitive positioning in a wider system. Fortunately, Company B's integrated approach (spanning inputs, farmer support, and value addition) gives it some control and differentiation in this system. The company's ability to create a loyal value chain – with committed farmers, trustworthy input suppliers, and satisfied end customers – will be a marker of its resilience against these external behavioral risks.

Overall Risk Profile Summary

Key risks: Company B faces a convergence of financial and climate risks. On the financial side, limited working capital and dependence on a single commodity are significant vulnerabilities.

Access to finance is a persistent issue, which constrains raw material purchases and expansion. If a climate shock shrinks soybean supply, Company B may also suffer revenue loss and struggle to service any debts or operational costs. Climate-induced supply shortages could force the plant to operate below capacity, driving up unit processing costs.

Another risk is price volatility – a drought can send soybean prices soaring, which, without hedging, undermines Company B's margin since it may not easily raise oil prices in step.

On the climate side, a severe drought or flood could reduce farmers' production by 30–50%, directly cutting Company B's oil output and sales. Such events can also erode farmer trust in the value chain (if crops fail, farmers may default on input loans or drop out of the scheme).

Potential financial impacts: A significant drought year could see Company B's throughput fall sharply, leading to perhaps 50% lower revenue that season. Fixed costs (staff, machinery maintenance) would then weigh heavily, potentially putting the enterprise in loss. In extreme cases, if successive bad seasons occur, the company's liquidity could be exhausted, as it still must maintain equipment and minimal operations.

Climate shocks can also deteriorate bean quality; higher aflatoxin or lower oil content means Company B gets less marketable oil per ton, hitting profitability.

In a flood scenario, infrastructure could be damaged (rural roads cut off delaying collections, or warehouses flooded destroying stock). Additionally, foreign exchange fluctuations often accompany macro shocks – e.g. drought can hurt Uganda's economy and currency, raising costs of imported inputs like packaging, compounding the financial strain. These multi-faceted impacts illustrate how quickly a climate event can translate into financial stress for Company B.

A deep-dive into behavioral risks shows that human factors at every level can significantly influence outcomes. Internal dynamics (like leadership capacity and management practices) determine if the organization can effectively deliver on its promises. Farmer behaviors (loyalty, adoption of innovations, and trust) directly affect productivity and supply stability. And the actions of value-chain actors (competitors, partners, consumers, regulators) can either enable or hinder Company B's progress.

Company B stands at a promising juncture with its integrated agribusiness model. Tackling the behavioral risks discussed – from reinforcing internal management to

nurturing farmer trust and strategically navigating market dynamics – will be key to unlocking its full potential.

Recommended Climate Smart Agriculture interventions

To mitigate these risks, Climate-Smart Agriculture (CSA) interventions are advisable across Company B's supply chain. First, Company B should work with partners ([organization omitted], extension services) to distribute drought-tolerant soybean varieties and promote their uptake. These varieties mature earlier and endure dry spells better, helping stabilize yields.

Secondly, water management practices can be introduced: training farmers in rainwater harvesting (such as small farm ponds) or conservation farming (mulching, zero tillage to retain soil moisture) would build resilience. Company B could pilot irrigation support in key clusters – e.g. enabling a group of farmers to access solar-powered drip irrigation for seed production plots. Even if not all farmers irrigate, having a core irrigated acreage ensures a minimum production each year.

Advisory services are another CSA tool: Company B can provide weather forecasts and planting advice via SMS, so farmers can adjust planting dates to rainfall onset. Aligning sowing with climate information can avoid losses from false starts of rain.

Additionally, promoting integrated pest management will be crucial as pest pressures shift with climate – training farmers to scout and control outbreaks (or using pest-resistant seed) can prevent climate-related pest explosions from wiping out crops. Soil health practices like rotating crops and using soybean cake as organic fertilizer on fields can improve yields and buffer drought impacts through better soil structure.

By being highly nuanced and proactive in understanding human behavior, Company B can turn these risks into opportunities: loyal farmers can become champions of climate-smart agriculture in their communities, a strong organizational culture can spur innovation, and fair partnerships can catalyze sector growth.

Finally, Company B might explore index-based weather insurance for its contract farmers. If a drought index triggers payouts, farmers get some compensation and are more likely to repay input advances or replant next season, keeping Company B's supply chain intact. Combining these interventions – climate-smart seeds, water management, advisories, pest control, soil health, and insurance would significantly reduce the climate risk to Company B's soybean supply.

Financing options

Addressing Company B's financial and climate risks will likely require blended financing solutions. For immediate needs, a working capital facility (e.g. a revolving line of credit) would help Company B purchase soy in bulk at harvest without cashflow shortfalls. Development banks or impact investors could offer this, potentially backed by a partial guarantee to account for climate risk. Given Company B's role in climate adaptation (local oil reduces import reliance, supports farmers), a concessional loan or grant could be sought to upgrade its processing and storage capacity (e.g. silos to store soy in good years as a buffer for bad years).

Company B might also tap into climate finance programs – for example, the company could partner with a CSA project to finance irrigation equipment or drought-tolerant seed distribution to its farmers (leveraging grants that aim to build resilience in value chains).

Agricultural insurance can be bundled: Company B could work with insurers to insure its inventory and maybe offer meso-insurance that pays out to the company if a climate event slashes aggregate procurement (helping cover fixed costs in bad years). If Company B can demonstrate reduced climate risk (through CSA adoption by farmers), it may improve its credit profile – at that point, engaging commercial banks for inventory financing or equipment leasing (for processing equipment expansion) becomes more feasible, especially if accompanied by a guarantee or insurance.

Lastly, equity investment from impact investors is an option: Company B's integrated farmer-processor model and social impact (3,500 farmers) could attract investors who provide capital and technical assistance for scaling up, absorbing some risk in exchange for long-term growth potential. This equity could fund climate resilience measures (like setting up an irrigation hub or farmer training center) that ensure sustainable supply and thereby protect the investment. In summary, a combination of working capital loans, climate adaptation grants, insurance products, and possibly equity infusion would bolster Company B's financial resilience and enable the CSA interventions that reduce climate risk in the long run.

Both development partners and investors have a role to play in supporting Company B on this path, ensuring that the venture not only remains financially viable but also socially resilient. With continued attention to these behavioral components, Company B can continue to scale up its impact – increasing farmer

incomes, contributing to Uganda's food oil self-sufficiency, and demonstrating how inclusive agribusinesses can thrive even amid complex human-centric challenges.

Company C – Solar irrigation in Tanzania

Introduction

Company C is a youth-led renewable energy enterprise founded around 2020 that operates in Southern Africa (based in [location omitted], Tanzania). Its mission is to enhance access to affordable, sustainable solar power in last-mile communities, particularly for underserved rural households and farms. Company C's core value proposition is providing clean energy solutions – such as solar lighting, home systems, and water pumps – that improve livelihoods and climate resilience for smallholder farmers.

The company is positioned in the agri-energy sector, focusing on solar-powered irrigation and off-grid energy for agriculture. This niche is highly relevant to smallholders: across sub-Saharan Africa, only ~4% of agricultural land is irrigated (compared to 28% in North Africa), and rural electrification rates are very low (only ~14% of rural Zambians have electricity access). By supplying solar water pumps and home solar systems, Company C addresses these gaps – enabling year-round crop production and reducing dependence on costly fuels. The company explicitly aims to promote climate-smart farming; one of its stated objectives is to "improve irrigation agriculture through distribution of affordable water pumping systems". In doing so, it not only provides clean energy but also helps farmers adapt to droughts and erratic rainfall.

Company C aims to address three major rural constraints: unreliable rainfall, poor access to energy for productive use, and low adoption of sustainable farming technologies. By bridging the irrigation and energy access gap, it enables farmers to improve yields, diversify crops, and reduce climate exposure. The company's broader ambition aligns with Tanzania's national agricultural commercialization and climate adaptation goals — particularly in promoting import substitution through expanded domestic food production and reducing seasonal hunger in vulnerable areas.

Company C's model targets inclusive development: by reducing the labor burden associated with manual irrigation, solar systems free up time for women and youth while increasing farm profitability. The company also trains local agents and technicians, building a workforce for Tanzania's emerging green economy. Its

expansion into bundled CSA services and embedded finance reflects a strong commitment to scalable, market-driven climate adaptation.

Business Overview

Business Model: Company C operates as a last-mile distributor of solar-powered equipment, using an innovative agent-based model. It builds a network of local sales technicians and agents – often young people and women from target communities – to market and deliver its products in remote areas. These agents are trained and equipped with motorcycles, enabling them to reach logistically challenging villages well beyond the electric grid. The company offers flexible payment options (including pay-as-you-go solar financing and mobile money payments) so that low-income customers can afford the products over time. Small retail kiosks with mobile payment capability are set up as local service points, and field agents conduct demonstrations and community meetings to build awareness.

Company C's distribution ecosystem is intentionally inclusive: by recruiting local women and youth as micro-entrepreneurs, it not only creates jobs but also taps into trusted community networks to drive adoption. This high-touch model helps overcome rural customers' hesitancy with new technology through in-person marketing, training, and after-sales support. The business model essentially combines product sales with micro-finance and extension services – Company C sells the equipment and often finances it, while agents provide user education and basic maintenance service in the field.

Products & Services

The company offers a portfolio of clean energy solutions tailored to off-grid smallholders. Its product line includes: solar lanterns and multi-light kits (small solar lamps and home lighting systems for basic household use), larger solar home systems (with panels, batteries and appliances to power lights, phone charging, radios, or TVs), solar water pumping systems for irrigation, and energy-efficient cookstoves and charcoal briquettes for cleaner cooking.

Company C partners with reputable manufacturers – for example, it distributes [organization omitted]™ solar products and uses the [organization omitted] platform for pay-go management (indicating a robust supply chain for quality hardware). In addition to ready-made products, the company provides design and installation services for solar power systems, which means it can customize larger solar setups (e.g. for a school, clinic, or a farm's specific needs). The solar water pumps are a flagship offering aimed at small farms: these are typically low-power pumps suitable for shallow wells, rivers or rainwater catchments, capable of

supporting drip irrigation on small plots. By selling pumps on credit and coupling them with farmer training, Company C enables year-round farming – an [organization omitted] case study in Tanzania noted that access to solar irrigation can allow smallholders to farm in the dry season, boosting productivity and income. Alongside pumps,

Company C's efficient cookstoves address another rural need: they reduce firewood consumption and smoke, bringing health and environmental co-benefits. The breadth of products indicates a holistic approach to energy access: from household lighting (improving quality of life) to productive equipment (improving livelihoods). All products are offered with warranties and the promise of local after-sales support, which is key to building trust in technology among rural clients.

Customer Base

Company C's primary clientele consists of smallholder farmers and low-income rural households living off-grid or with unreliable access to electricity and irrigation. These customers are often dependent on rain-fed agriculture, particularly for staple crops and vegetables, and are vulnerable to increasingly erratic climate conditions. For many, a solar irrigation system or basic energy kit is not merely a convenience — it is a transformative tool for income stability, food security, and household well-being.

The company's cross-sectoral positioning allows it to serve both the agricultural and off-grid energy markets. A typical Company C customer might be a female farmer cultivating half a hectare of tomatoes or leafy greens who uses a solar pump to irrigate during the dry season and a solar lighting system to power her household. Company C also supports rural microenterprises and institutions — such as agro-dealers, cooperatives, or rural schools — that may purchase larger solar systems for group irrigation or electricity access.

Company C's approach to customer acquisition is grounded in affordability and reach. Recognizing that most smallholders lack upfront capital to purchase solar systems outright, the company offers flexible financing options and last-mile service delivery. Its door-to-door engagement model reduces transaction costs and builds trust among remote clients. During its pilot phase, Company C set a goal to distribute 1,750 solar lamps to reach 8,750 users, with an ambition to scale this outreach to 50,000 individuals within two years. This illustrates the breadth of its vision for impact and its emphasis on democratizing access to renewable technology.

The value proposition is especially strong in Tanzania's agricultural landscape, where over 90% of farmland is rain-fed and climate-vulnerable. By enabling year-

round irrigation and replacing hazardous kerosene lighting with clean solar alternatives, Company C equips rural households with dual resilience tools — one for production, the other for daily life. Each new system deployed represents a tangible climate adaptation upgrade for a smallholder family or community.

Geographic Footprint & Infrastructure

Company C is headquartered in [location omitted], Tanzania, and its confirmed operations span multiple districts within the country, including [location omitted], [location omitted], and surrounding areas. These regions are home to dense smallholder populations and experience significant seasonal water stress — conditions that make them ideal markets for decentralized solar irrigation.

The company's infrastructure model is intentionally lean and adaptive. Rather than investing in fixed, capital-intensive facilities, Company C builds out regional hubs or micro-distribution outlets, often in collaboration with local agro-dealers or technician networks. It maintains a central warehouse for inventory management and uses motorcycles for last-mile delivery and technical support. This allows it to reach dispersed farming communities while keeping costs low and response times quick.

Company C has demonstrated the ability to seed early presence across key agricultural zones. Its deployment strategy prioritizes accessibility, product reliability, and service uptime — essential factors for technologies like irrigation pumps and solar batteries, which must function under variable rural conditions.

Company C's value-chain impact is broad and enabling rather than extractive. It does not buy or sell crops, but rather facilitates production through water and energy access. Its irrigation solutions serve high-value horticulture (tomatoes, onions, leafy greens), staple crops (maize, groundnuts), and in some cases, livestock production (by ensuring reliable water points). Solar lighting indirectly supports small-scale poultry rearing and household-level processing — extending farm productivity into non-daylight hours.

This multi-sector footprint creates both opportunity and complexity. To serve its diverse customer base effectively, Company C must remain fluent in agricultural cycles, gendered labor dynamics, and smallholder financial behavior — making it as much a rural development partner as it is a technology distributor.

Financial Risk Assessment

1. Revenue Streams & Concentration

Company C's revenues come from the sale of its solar products and related services. This includes upfront cash sales and, significantly, the installment payments from pay-as-you-go customers. For example, when a farmer obtains a

pump on a 12-month payment plan, that creates a stream of revenue for Company C over the year. Initially, the company's emphasis was on smaller solar lighting products – as evidenced by their [organization omitted] award for distributing solar lamps – which are lower-priced items. This means a large portion of early revenue may have been from high-volume, low-margin sales of solar lanterns and home kits. Such revenue can be quite sensitive to rural purchasing power and donor-supported campaigns (since lantern distribution is sometimes boosted by NGO programs).

As Company C expands into higher-value systems like irrigation pumps and solar home systems, it diversifies its revenue mix; however, those sales often involve financing, which delays full revenue recognition and introduces credit risk. A potential concern is revenue concentration in certain products or customer segments. For instance, if 70% of Company C's income came from basic solar kits, any saturation of that market or influx of competitors offering cheap lanterns would squeeze its main income source. Likewise, if a few institutional clients (say an NGO bulk-ordering pumps) account for an outsized share of revenue in a year, the loss of such a client could hit cash flow hard. Diversification is underway (pumps, stoves, etc.), but managing a balanced product mix and avoiding over-reliance on any single segment is an ongoing challenge.

2. Cost Structure

Company C operates a capital-intensive model typical of last-mile solar and irrigation technology providers, with a significant proportion of its cost base driven by hardware procurement and rural service delivery. The most substantial line item is the cost of goods sold — namely, solar panels, pumps, batteries, controllers, and lighting kits — most of which are imported from international manufacturers. This exposes the company to fluctuations in global shipping costs, foreign exchange volatility, and import duties. In the Tanzanian context, inconsistent application of customs policies, port clearance delays, and unpredictable FX rates can create bottlenecks and drive up landed costs.

Additional financial strain arises from freight and logistics, especially in getting inventory from central warehouses to dispersed rural locations. Company C must maintain a stock buffer to ensure seasonal product availability, particularly during planting seasons or festive periods, when demand for irrigation and lighting solutions spikes.

A second major cost driver is sales and distribution operations. This includes salaries and commissions for field agents, travel and motorcycle fuel for last-mile delivery, community-level marketing, farmer demonstrations, and after-sales support. Because Company C targets remote, low-density communities, its customer acquisition costs are higher than urban-based retailers — a tradeoff required to reach underserved markets.

Operational overhead includes a lean headquarters team based in [location omitted], comprising management, administrative support, customer service, and technical backstopping. While this core remains small by design, expansion into new districts or scaling the number of pay-as-you-go (PAYGo) customers increases the complexity and cost of operations.

Crucially, Company C's financing component introduces a financial cost layer. As it offers pay-over-time options for solar pumps and kits, the company must absorb the time gap between when it pays suppliers and when it recovers revenue from customers. This creates either an interest cost (if debt is used) or an opportunity cost (if grants or equity capital are drawn down to fund working capital). If the company does carry commercial debt, interest expenses may be modest but still material.

Additional recurring costs include:

- Warranty fulfillment and replacements for faulty systems;
- Customer defaults or non-completion of payments under PAYGo;
- Technology fees (e.g., mobile money integrations, PAYGo platforms like [organization omitted]);
- Customer service and product education, often bundled into the delivery model.

Company C's cost structure thus includes both high fixed costs (inventory, staffing) and variable costs that scale with growth (distribution, installations). While maintaining lean operations is critical, under-investing in training, maintenance, or credit screening could undermine system performance, hurt repayment rates, or erode customer trust — all of which would ultimately impact profitability.

3. Working Capital and Liquidity

Working capital management is one of Company C's most pressing financial vulnerabilities — and a common challenge among energy access and agri-tech

ventures that sell high-value durable goods on credit. The company's model requires it to outlay substantial cash upfront to purchase solar irrigation systems and distribute them, while revenue is recovered over several months through customer installment payments.

For example, if Company C sells a $500 solar pump under a 10% upfront, 12-month PAYGo model, it must cover the remaining $450 immediately — either through equity, grants, or supplier credit — and recover roughly $37.50 monthly from the customer. If this is replicated across hundreds of clients, receivables quickly accumulate into tens or hundreds of thousands of dollars of tied-up capital.

This mismatch between cash outflows (inventory procurement, shipping, staff salaries) and delayed cash inflows (PAYGo repayments) creates ongoing liquidity pressure. Any disruption — such as late donor disbursement, foreign exchange loss, poor sales in a given month, or higher-than-expected customer default — can trigger short-term cash shortfalls.

Company C must also hold inventory ahead of demand surges, especially at the onset of the dry season or before holidays. If forecasts are inaccurate and sales underperform, capital is trapped in unsold goods. Conversely, if demand outpaces stock and there is insufficient cash to restock quickly, sales are lost.

Liquidity management is further complicated by foreign exchange exposure. Since Company C imports most of its hardware and sells to customers who pay in local currency (Tanzanian Kwacha), any depreciation — such as the ~31% drop seen in Zambia in late 2024 — would increase restocking costs and reduce purchasing power. In extreme cases, this can also impact customer repayment behavior, as farmers' disposable income shrinks under inflation.

Without revolving credit lines or deep internal reserves, Company C relies heavily on external injections of cash to maintain solvency. To date, the company has received support from development partners and innovation accelerators (such as [organization omitted] and the [organization omitted]), which have helped bridge liquidity gaps during growth. However, these funds are episodic and not guaranteed for scale.

In short, Company C's financial model is a balancing act: it must manage large inventory and credit outlays without compromising liquidity. Without fit-for-purpose working capital instruments — such as revolving PAYGo debt facilities,

credit guarantees, or structured investor capital — growth could strain its operational bandwidth and financial health.

4. Revenue Quality and Profitability

Another financial aspect is the quality of revenue – meaning how secure and profitable the sales are. Revenues from paygo customers are not fully secured until the customer finishes payments; any interruption can turn expected revenue into a loss. Non-payment or delinquency directly affect cash flow and also incur additional costs (collections efforts). The gross margins on products can be healthy (solar products often have 20-30% gross margin), but effective net margin can erode due to credit losses and high operational costs. Right now, Company C's profitability is likely thin or negative, given early-stage companies prioritize growth and market penetration.

The investment readiness of Company C hinges on improving these financial metrics. Currently, it may not yet have achieved consistent positive cash flow without grants – which is common at this stage. However, by demonstrating a growing customer base and prudent financial management, it aims to attract larger investments. Key to investment readiness will be indicators like: portfolio repayment rate (a high percentage of on-time payments would indicate credit risk is under control), customer acquisition cost vs. lifetime revenue (showing the model can be profitable per customer), and unit economics of each product line. If those numbers trend positively, Company C can make the case for scaling up with investor capital. If not, the financial risk remains that the business cannot sustain itself purely on operating income.

In summary, financial risks are high: Company C is navigating the classic startup challenges of a capital-intensive model in a developing market. Liquidity crunch, insufficient capital, and credit defaults are prominent red flags (requiring external de-risking, as discussed later). The company will need careful financial planning, likely mixing grants, equity, and debt, to manage these risks as it grows.

4. Climate Risk Assessment

1. Key Climate Hazards

Company C operates in a context of accelerating climate volatility, particularly in Tanzania where its operations are concentrated. The two most dominant hazards are drought and flood events — both of which pose challenges to the functionality and demand for solar-powered irrigation systems.

Drought represents the most pervasive and disruptive threat for Company C's smallholder customer base. Tanzania, like much of Southern Africa, has witnessed an increase in seasonal variability, including delayed onset of rains, prolonged dry spells, and shorter growing seasons. Rain-fed agriculture dominates the landscape — with over 90% of smallholders dependent on rainfall — so even moderate shifts in precipitation can lead to food insecurity and farm-level distress.

Historical data reinforces this vulnerability. The 2015–2016 and 2023–2024 El Niño events triggered widespread agricultural losses, plunging millions into food insecurity. Reduced groundwater recharge and streamflow during these periods directly compromised the availability of surface water — the very resource solar irrigation systems depend on. In severe drought years, wells and boreholes may dry up, undercutting the effectiveness of solar pumps.

Conversely, Tanzania is also experiencing increased flood events, particularly in its southern and central districts. Intense rainfall episodes lead to flash flooding, washing away crops, roads, and rural infrastructure. For Company C, these floods pose dual risks: they can physically damage distributed assets (e.g. pumps, solar panels) and impede access to clients by cutting off rural roads or damaging community water infrastructure.

Lastly, increasing temperature extremes — particularly heatwaves — present more subtle risks. High heat reduces poultry and crop productivity and may slightly reduce solar panel and battery efficiency. Dust from prolonged dry conditions can reduce panel performance if cleaning routines are not maintained. Taken together, these patterns reinforce that Company C operates in a high climate-risk geography that requires both adaptive technology design and responsive service models.

2. Geographic Exposure

Company C's operations in Tanzania span multiple agro-ecological zones, each with distinct climate profiles. For example:

- Central Region (e.g., [location omitted], [location omitted], [location omitted]): prone to dry spells and increasing temperature volatility. Groundwater availability is variable, with high inter-annual fluctuation.
- Southern Region (e.g., [location omitted], [location omitted]): highly vulnerable to flash flooding and riverine overflow, especially in low-lying areas. Infrastructure is frequently disrupted during heavy rains.

- Northern Region (e.g., [location omitted]): more stable in rainfall distribution but facing a rise in temperatures and pest pressure.

Operating in drought-prone or flood-prone zones creates differentiated exposure: in the south, damage and inaccessibility may be the key risks, whereas in central Tanzania, falling water tables and pump inefficacy during dry years could drive non-payment or equipment underutilization.

Additionally, poor road infrastructure in flood-prone areas means Company C's mobile teams may struggle to reach clients during peak rainy seasons. For a business reliant on doorstep delivery, training, and maintenance, this access fragility could lead to service disruptions.

Company C's urban operations hubs (e.g., [location omitted]) are less exposed to direct climate hazards but remain indirectly affected — for instance, drought-induced power outages may impact communication and logistics coordination.

3. Product and Service Climate Sensitivity

While Company C's core products — solar pumps and solar home systems — are positioned as resilience tools, they are not immune to climate dependencies. Solar irrigation systems require a minimum level of water availability, typically from boreholes, shallow wells, or surface water. During multi-year drought cycles or extended dry seasons, these sources may decline or vanish altogether, rendering pumps ineffective even if technically functional.

This mismatch between product intent and situational applicability is a key vulnerability. A customer who defaults due to pump unusability during drought may not reflect unwillingness to pay, but rather a system performance issue due to hydro-scarcity. Company C must account for this dynamic in credit models.

Conversely, in seasons of excessive rainfall, irrigation demand drops. Farmers may delay payments under PAYGo models if they perceive minimal usage during wet months. While solar lights may gain value during power outages (e.g., drought-induced load shedding), the solar kits themselves are subject to risks: heat-degraded battery life, dust accumulation reducing panel output, and occasional storm damage from hail or lightning. These are manageable but require active customer education on maintenance and durability.

Seasonality also interacts with technology performance. Tanzania enjoys high solar irradiation overall, particularly in dry seasons when irrigation is needed. However, unexpected shifts in rainy season timing — due to climate change — may reduce predictability of both pump usage and income generation for customers.

4. Infrastructure and Operations Vulnerability

Company C's infrastructure footprint is modest but operationally sensitive. Its reliance on motorcycles and rural access roads makes it vulnerable to rainy season disruptions. Washed-out roads or flooded crossings can delay or prevent agent travel, deliveries, or maintenance visits. During the 2022 floods in Southern Tanzania, several districts were cut off for days, underscoring this risk.

Additionally, the company faces indirect operational disruptions from broader infrastructure failure. Power rationing due to drought (as hydropower plants lose generation capacity) can disrupt mobile money networks, impact supplier logistics, or delay communications. While Company C can use its own solar tools for business continuity, systemic failures (e.g., banks offline, petrol shortages) affect its ecosystem.

Warehouses and field offices may be at risk if situated in low-lying areas. Proper siting, drainage, and stock shelving protocols are essential to reduce flood-related inventory loss. The upstream supply chain also contains climate exposure — floods or shipping disruptions in source countries (India, China) could delay stock arrival.

Company C can enhance resilience by pre-positioning stock before rainy seasons, training riders in adverse condition navigation, and partnering with community leaders for flood contingency planning.

5. CSA Practices Promoted

Company C's business model inherently promotes climate-smart agriculture (CSA), especially in water management and energy transition. Its solar irrigation systems are an adaptive technology that enhances productivity in the face of rainfall variability. By enabling dry-season production, they help farmers diversify income, extend growing periods, and stabilize food supply.

Unlike diesel pumps, solar irrigation systems reduce greenhouse gas emissions and require no fuel logistics — increasing their sustainability and reliability. In areas

with chronic fuel shortages or price volatility, this makes solar a superior CSA option.

Company C also distributes improved cookstoves, which contribute to climate mitigation by reducing firewood consumption. This protects forests (key carbon sinks) and reduces deforestation-linked flooding and land degradation. From a household perspective, these stoves lower indoor air pollution and improve health, indirectly supporting resilience.

However, Company C's CSA contribution is strongest when hardware is paired with training and advisory support. Promoting practices like:

- Drip irrigation for water efficiency
- Crop diversification enabled by irrigation
- Mulching and soil conservation
- Safe panel installation and maintenance

...would amplify impact. Partnering with extension services, NGOs, or CSA platforms could transform Company C from a tech distributor into a full-service CSA enabler. Relay of weather advisories via SMS, bundling pumps with seed input packages, or facilitating access to climate-indexed insurance are all realistic next steps.

Company C's inclusive model — engaging women and youth in delivery and use — enhances resilience by spreading skills and opportunities. This aligns well with [organization omitted] and [organization omitted] priorities, which emphasize equity and localized adaptation. In summary, while its core products address climate risk directly, Company C's potential for system-wide CSA impact increases as it layers services, partnerships, and education into its rural footprint.

Behavioral Risk Assessment

1. Internal Risks (People & Processes)

   As a young, founder-led enterprise, Company C faces typical internal behavioral risks. One major risk is key person dependency. The founder/CEO (the founder) and a few core team members drive strategy, partnerships, and daily decisions. If, for any reason, one of these key individuals becomes unavailable or leaves, the organization could struggle to execute plans or maintain relationships (with funders, suppliers, etc.). This risk is heightened in startups where roles are concentrated and institutional systems are still maturing.

Company C has been taking steps to mitigate this: participation in capacity-building programs has "strengthened the team's confidence to lead activities independently", reducing over-reliance on the founder. The company now has defined roles (sales technicians, finance assistant, client service rep, etc. per their team listing) and has begun instituting better internal processes and record-keeping. Nonetheless, retaining talent is a challenge – skilled staff may be poached by larger firms, and the workload in a mission-driven startup can lead to burnout. Another internal risk is informal systems and controls. In early growth, companies often juggle operations with basic tools (spreadsheets for accounts, informal inventory tracking). This can lead to errors or even fraud if not tightened. For example, an agent might collect cash from customers and fail to remit it fully if controls are weak; or inventory might go missing without proper logs.

Company C's use of digital paygo platforms and mobile money does create an audit trail for many transactions, which helps. But areas like cash handling (for customers who pay in cash), stock management, and loan monitoring need robust processes. Investors will look at whether Company C has implemented standard operating procedures and if management information systems are in place. Encouragingly, Company C has shown awareness of these needs by engaging in mentorship that covered internal systems.

Governance structure is another aspect – as a private company, does it have an advisory board or mentors who hold management accountable and provide guidance? Many social enterprises at this stage rely on an informal board of advisors. The absence of strong governance can be a risk if strategic decisions are made without sufficient oversight or if conflicts of interest arise. Summarily, internally Company C must manage the transition from a scrappy start-up to a more structured organization. The behavioral risk here is that the company's growth could outpace its organizational capacity, leading to missteps. This can be mitigated by continuing to build a strong team (hiring experienced managers as needed), documenting processes, and fostering a culture of accountability and learning.

2. Farmer Adoption and Usage Behaviors

The success of Company C's model hinges on behavior change at the smallholder level – a notoriously difficult facet. Adoption risk is significant: rural farmers may be skeptical of new technology, or simply very conservative in financial decisions. Many smallholders have been exposed to failed development

projects or poor-quality products in the past, which can breed distrust. Also, the concept of paying over time for a product (essentially taking a loan) is not universally accepted – there is a cultural aversion in some communities to taking on debt, especially when secured against an asset like a solar device.

Studies have shown that smallholders are often averse to credit due to fear of losing collateral and uncertainty of yields. Company C encounters this when trying to convince a farmer to invest in a pump – the farmer might fear that if rains fail or markets crash, they'll be unable to pay and risk some penalty. Moreover, low awareness is an initial hurdle: many remote farmers simply haven't seen a solar pump working. Off-grid energy technologies still have relatively low penetration, and awareness of their benefits is limited in isolated areas. Company C addresses this by doing community demos and leveraging satisfied early adopters as testimonials. Still, scaling adoption is a slow, trust-building exercise.

A related risk is misuse or suboptimal use of the products due to behavioral patterns. For example, a farmer might procure a solar pump but not use it to its full potential – perhaps irrigating the same small plot of maize rather than diversifying into higher-value crops, due to habit or lack of knowledge. This could lead to less-than-expected income gains, making the investment seem not worthwhile. Training and hand-holding are needed to change ingrained practices; without it, technology alone may not deliver promised results, affecting word-of-mouth for Company C.

Behavioral biases also play a role: farmers might overestimate their ability to repay (optimism bias during a good season) and take on a loan, then default when conditions worsen. Conversely, they might underestimate the benefits (status quo bias) and not adopt even when it's economically viable. Addressing these requires a deep understanding of farmer psychology and perhaps innovative approaches like trial periods or money-back guarantees to overcome hesitation.

3. Customer Credit Risk Behaviors

When customers do adopt via credit, their repayment behavior is crucial. Default risk in this context is partly driven by external factors (weather, prices) but also by behavioral factors – e.g., willingness to pay and perceived consequences of default. If a farmer's crop yield is good, will they prioritize using the cash to pay Company C, or will other needs take precedence? Often, school fees, medical expenses or social obligations can divert funds, leading to

missed payments. If the farmer perceives that the only penalty for non-payment is losing the device (which they might think they can live without, or attempt to bypass the technology's lock-out), they might be less motivated to pay in difficult times.

Enforcement in rural areas is tricky – Company C cannot and would not want to engage in aggressive collection tactics in tight-knit communities, as that would harm its reputation. Thus, it relies on the technology (shutting off a solar system remotely if unpaid) and on trust. However, savvy customers might attempt to tamper with devices to keep them running without pay (some paygo solar companies have encountered tampering issues). This is a risk if the devices are not tamper-proof.

Another dimension is group lending dynamics if Company C works through cooperatives or farmer groups (as some pump distributors do). Group pressure can improve repayment, but it can also cause chain reactions – if one member defaults and isn't penalized, others may follow suit, whereas if one influential member refuses to pay, it can undermine the group's morale. The behavioral economics of rural customers suggests that making payments convenient (via mobile money, timed to harvest times) and demonstrating tangible benefits (so they value keeping the service) are key to good repayment behavior.

Company C has an advantage in that solar products directly improve quality of life or income, so customers have a reason to keep them functioning by paying. For instance, a solar lighting kit provides nightly benefits – households typically highly value the light and will strive to keep it on, as seen in other paygo ventures with high repayment rates for solar lighting. Solar pumps are a bit different: the benefit is in the form of increased income, which is subject to external factors, and the pump might not be in use year-round (thus customers might procrastinate on payments during off-season). Company C may need to structure payment schedules that align with crop cycles (larger payments after harvest, smaller or token payments in off-season) to accommodate farmer behavior and cash flow.

4. Value Chain and Community Dynamics

Company C does not operate in a vacuum, it interacts with existing value chains and community norms, which present risks if not navigated well. One aspect is supplier dependency: Company C sources from specific manufacturers (e.g., a certain solar pump brand). If that supplier has delays or quality issues, Company C's reputation in the community can suffer. Farmers won't distinguish

between the product and the provider – a pump failure due to a manufacturer defect will be seen as Company C "selling bad products." Thus, the company is very invested in quality control and working with reputable suppliers. Still, any quality lapses (say a batch of batteries that don't hold charge) can cause community backlash, where multiple customers complain and local word-of-mouth turns negative. In rural markets, trust and brand reputation are everything – one bad experience can dissuade a whole village. On the flip side, if competitors or other actors (e.g., a government program giving out free solar pumps) enter the scene, community dynamics can shift.

Free or subsidized distribution by others can make people less willing to pay Company C's commercial rates, expecting handouts. Also, there can be envy or social friction – if one farmer prospers with irrigation, neighbors might demand the same opportunities or, in worst cases, there could be theft or sabotage (stealing solar panels out of envy). These are not uncommon in some contexts and represent a community-level behavioral risk that Company C needs to mitigate by community engagement and inclusive targeting.

Another risk is misalignment with existing practices or beliefs. For example, if local culture has traditional views on water usage rights, a farmer pumping water from a shared resource might cause disputes. Company C has to be mindful of not inadvertently sparking conflict (hence working with groups and local leaders helps). There is also dependence on partners like mobile operators (for mobile payments) – if farmers are not used to or trusting of mobile money, they may prefer cash, which complicates the paygo system. Training customers to use mobile payments is partly a behavior change exercise.

Lastly, community trust in Company C as a company is crucial. The enterprise must follow through on promises – e.g., if it promises warranty service, it must deliver promptly. Any sign of neglect (an agent not showing up to fix an issue, or unexpected fees) can quickly erode trust. Being an outsider company (even if employing locals) means Company C has to continually earn its social license to operate in each village. Thankfully, by employing community members as agents and focusing on customer service, Company C is actively building trust. Continued presence (agents regularly visiting, providing farming tips, etc.) can integrate the company into the local social fabric, which in turn improves customer retention and referrals.

In summary, behavioral and social risks require Company C to be as much a relationship manager as a tech provider – it must understand and influence

customer behavior, ensure goodwill, and align its offerings with local norms and expectations. This is a challenging aspect, but one that Company C's inclusive model is designed to tackle.

Overall Risk Summary

In aggregate, Company C presents an attractive high-impact investment opportunity with an elevated risk profile. The key risks span financial viability, climate exposure, and behavioral factors – each interacting with the others. Below is a synthesized "traffic-light" assessment of the risk areas:

- Financial Risk – 🔴 High

Company C's financial risk is acute, largely driven by its capital-intensive operating model and dependency on customer credit repayment. The business must continuously bridge a timing mismatch between large upfront outlays (for imported inventory and last-mile delivery) and slowly accruing PAYGo repayments from rural farmers. This creates persistent liquidity pressure. Margins are further compressed by high logistics costs and the overhead of financing small transactions over long repayment horizons.

At its current stage, Company C is not financially self-sustaining and relies on grants and prize capital to cover its working capital gaps. This dependence introduces volatility and limits its ability to scale predictably. Without continued concessional finance, the enterprise risks liquidity shortfalls that could stall operations. The path to profitability is real but steep, requiring efficiency gains, capital recycling, and expanded portfolio performance data. For traditional investors, this profile remains firmly in the red — high risk but with potential for blended finance solutions to bridge the gap.

- Climate Risk – 🟠 Moderate

Although Company C exists to combat climate vulnerabilities in smallholder systems, it is itself moderately exposed to those same risks. Droughts — Tanzania's most pervasive hazard — can dry up shallow water sources, rendering solar pumps temporarily useless and increasing customer default rates. Conversely, floods can damage distributed assets and block access to rural clients, impairing both delivery and maintenance operations.

However, Company C's own assets (solar kits, pumps, logistics hubs) are relatively climate-resilient — robust against heat, with minimal physical footprint at risk. In a strategic sense, climate volatility actually increases long-term demand for the company's services, strengthening its position as a CSA enabler. Still, without integrated customer support (e.g., water conservation training, diversified

financing, insurance), climate stress could cause short-term financial strain. The risk is moderate, not severe — but only with active geographic diversification and embedded resilience strategies.

- Behavioral Risk – 🟠 Moderate to High

Company C's success hinges on human behavior — both in its customers and its internal team. PAYGo adoption requires trust, product literacy, consistent usage, and timely repayment — all challenging in contexts of economic precarity and climate disruption. The company's early-stage clients may lack formal financial histories, while its decentralized workforce (agents, technicians) must deliver complex technical and relational services at the last mile.

Pilot programs show promising signs: uptake is growing, community trust is being built, and repayment rates have held steady. However, as Company C scales from pilot to regional presence, these behavioral dynamics will be tested at greater volume and with thinner margin for error. Key-person dependency, staff turnover, customer misinformation, or reputational risk from equipment failure could all elevate exposure. At this stage, we assess this risk as amber shading toward red — not due to failure, but due to the inherent uncertainty of human-scale expansion in frontier markets.

Risk Interdependence and Strategic Positioning

Company C's most critical exposure lies in the nexus between financial and behavioral risk, particularly under climate pressure. A drought reduces farmers' cash flow, leading to default and revenue loss, which in turn tightens Company C's working capital and limits its ability to serve new customers — a potential downward spiral. Because these risks are tightly interconnected, mitigation cannot occur in silos. It must be systemic.

Fortunately, Company C's positioning offers counterweights. This draws donor and investor interest that can absorb some early-stage risk. The company also actively trains users, decentralizes its maintenance network, and tailors its product offerings to local realities.

Yet gaps remain. It currently lacks climate-indexed insurance to buffer revenue shocks, and its financial model needs more flexible working capital solutions to maintain operational liquidity. Human resource capacity — especially for rural outreach and field-level coordination — will need to scale in step with demand. Until these buffers are in place, Company C must be closely supported to ensure it does not overextend.

Risk Profile Summary

Company C's overall risk profile is characteristic of a catalytic social enterprise in an underserved, high-potential market. It carries clear red flags in liquidity and

scalability, and amber warnings in climate resilience and behavioral complexity. But it also possesses green signals in terms of alignment with climate-smart priorities, proven customer impact, and technology fit. For donors, DFIs, and patient capital providers, this is a high-reward scenario — where early risk absorption can yield long-term gains in adaptation, equity, and inclusive growth.

Recommended CSA Interventions

To enhance Company C's impact on climate resilience and ensure its farmer-clients truly benefit under changing climate conditions, a number of climate-smart agriculture (CSA) interventions are recommended to complement its core business:

1. Bundle Solar Pumps with Drip Irrigation and Training

Rather than selling a pump in isolation, Company C can offer a "solar irrigation kit" that includes a drip irrigation system (pipes, drip lines, fittings) and on-farm training in water-efficient farming. Drip irrigation dramatically improves water-use efficiency, delivering water directly to plant roots and reducing wastage. By bundling this, farmers can get more crop per drop of water – a critical advantage in drought-prone areas. Alongside hardware, Company C's field agents (or partnered agronomists) should train farmers on scheduling irrigation: e.g., irrigating at dawn or dusk to minimize evaporation, using just the right amount for each growth stage, etc. This ensures that the limited water is used optimally, preserving aquifers and extending the viability of wells through dry seasons.

Research by [organization omitted] suggests that solar irrigation's benefits are maximized when combined with good agronomic practices like proper spacing, improved seeds, and soil fertility management. Company C can integrate such recommendations into their training. This bundled approach not only makes the product more turnkey for farmers (increasing adoption likelihood), but also improves the success rate of irrigation (so farmers see higher yields and can comfortably repay loans). It effectively turns Company C into a one-stop solution for climate-smart irrigation. Moreover, the company could demonstrate model plots (using drip with solar pumps) in each community as a showcase of CSA in action, driving home the difference it makes versus traditional watering or rain-fed methods.

2. Climate-Resilient Crop Planning Services

With irrigation in hand, farmers can diversify into new crops and planting cycles. Company C should facilitate this by providing or partnering to provide CSA advisory services focused on crop choices and planning under climate

uncertainty. For example, farmers can be guided to integrate drought-tolerant crop varieties or short-cycle crops that fit the water availability. If a region is projected to have a shorter rainy season, advisors might suggest planting certain staples early and then using the pump to grow a dry-season vegetable crop. Company C could partner with agricultural extension officers or climate-smart agriculture projects to get tailored crop recommendations to its clients.
Simple interventions like promoting crop rotation and intercropping with legumes (to improve soil moisture retention and fertility) can be communicated. Additionally, encouraging farmers to plant part of their land with quick-yield crops (leafy vegetables, tomatoes) for income, while using improved seeds for staples on the rest, can increase resilience – because they won't rely on one crop's success. By enabling multi-cropping with irrigation, Company C helps farmers hedge against climate risk (if the rainy-season maize does poorly, maybe the irrigated onion crop will save the year). To support this, Company C could include a "CSA handbook" with each pump sold – covering topics like water management, recommended crops, planting calendars, and integrative practices (mulching, composting, etc.). The cost of developing such content is low, but the benefit in terms of farmer outcomes is high. This turns the tech adoption into a package of improved practices adoption. The result will be more climate-resilient farming systems and, in turn, more robust customers for Company C.

3. Weather and Climate Information Integration

Timely access to localized weather and climate information is a critical but often overlooked component of climate-smart agriculture. For Company C's smallholder clients, who are highly exposed to rainfall variability and temperature extremes, even basic forecasts can help guide daily and seasonal farming decisions. Leveraging its existing digital infrastructure and customer engagement channels, Company C is well-positioned to become a trusted conduit for such information.
By partnering with the Department of Climate Change and Meteorological Services in Tanzania (or regional climate information providers), Company C could integrate localized weather and seasonal forecasts into its SMS communication systems. These messages — currently used for repayment reminders or service support — could also deliver alerts on anticipated dry spells, flooding risks, heatwaves, or El Niño/La Niña forecasts. A simple notification such as "Rainfall expected to delay two weeks – adjust seedling timing" or "Heavy rainfall expected next week – pause irrigation" could help farmers reduce losses and optimize pump usage.

In addition to digital delivery, Company C could convene pre-season orientation meetings in communities where it operates. These brief, practical sessions — held at the beginning of the rainy or dry season — could introduce farmers to the season's climate outlook, basic implications for irrigation or planting timing, and CSA practices to mitigate risks. For example: "This season, early drought is likely — consider shorter-maturing crops and mulching," or "Expect intense rains in February — ensure fields are well-drained." Even low-tech visual aids or printed handouts could make these forecasts actionable.

This climate information integration would not only improve farmer resilience but also support Company C's own business outcomes. Farmers informed about upcoming weather events are more likely to plan irrigation effectively, maintain repayment capacity, and remain loyal customers. Moreover, by positioning itself as a climate adaptation partner — not merely a product vendor — Company C can deepen its role in the value chain and unlock climate finance opportunities tied to CSA service delivery.

In Tanzania's national climate strategy, expanding the reach and impact of agro-meteorological services is a key adaptation priority. Company C's decentralized presence and farmer communication infrastructure give it a unique role to help operationalize that strategy — bridging the last-mile information gap that limits effective on-farm climate response today.

4. Community Water Resource Management

Since Company C's pumps draw from communal or shared water sources (groundwater, rivers), it's vital to ensure sustainable use of these resources under climate stress. Company C can promote community-level CSA interventions like rainwater harvesting and water sharing arrangements. For example, it can encourage or even facilitate installation of roof catchment systems on farmers' houses or barns, collecting rain into a tank which the solar pump can later distribute. It might bundle a 1,000-liter water tank (where feasible) with the pump on financing. This increases water availability for farmers during dry periods and reduces pressure on wells.

Company C could also work with village committees to develop simple water management plans – ensuring that multiple pump users in one area are not over-abstracting the local aquifer. In some cases, constructing a small community reservoir or farm pond (with technical help from NGOs) can create a buffer water supply. The solar pump can then be used to lift water from that pond. These kinds of interventions dovetail with CSA principles of conserving excess rainwater for use in drought times. Additionally, Company C might promote agroforestry around water sources – planting trees along stream banks

or around wells to protect them and enhance groundwater recharge. While outside its direct business, Company C can partner with environmental NGOs for this, since it ultimately secures the water that the pumps need. By taking a stewardship role in water resources, Company C demonstrates long-term commitment to the community's resilience. It can also mitigate any potential negative perceptions (e.g., "these pumps might dry our river") by actively ensuring sustainable use. In sum, fostering collective action on water will enhance the climate resilience of the entire community and ensure Company C's solutions remain viable year after year.

5. Energy-Efficient Product Extensions

Another CSA angle is reducing climate impacts through energy efficiency and post-harvest management. Company C can introduce complementary products like solar-powered cold storage or driers that help farmers cope with climate variability. For instance, in a glut season (perhaps due to good rains or successful irrigation), prices drop and produce can rot – a solar cold room or dehydrator could preserve produce to sell later or process for value addition. This fights the impact of climate on market volatility and food security. While more advanced, these solutions can be introduced when working with cooperatives or progressive farmers.

Additionally, Company C could expand its efficient appliance range: solar milling machines, solar egg incubators, etc., which help diversify farmers' income (a form of livelihood resilience). Every new technology should come with proper training on operation and maintenance as well as how it fits into climate adaptation strategy. For example, a solar grain mill means farmers can process during rainy days when they can't travel easily, or avoid multiple trips to far millers (saving time that can be used on farm tasks). These efficiency gains make farmers more resilient to erratic weather. Importantly, all these should be integrated into Company C's financing scheme – offering them on affordable terms. Many CSA technologies fail to reach scale due to upfront cost; Company C's financing platform can overcome that barrier. By broadening its catalog to a "climate-smart farm kit", Company C not only opens additional revenue streams but also deepens impact per customer, making each customer more robust (and potentially a better credit risk).

Financing and De-risking Instruments

To address the financial and behavioral risks identified and to attract investment, Company C will benefit from deploying targeted financing and risk transfer instruments. The following measures are recommended, in line with best practices for de-risking agribusiness and clean energy ventures in emerging markets:

1. Blended Finance (Grants + Concessional Capital)

Company C's growth can be accelerated and de-risked through a blended finance structure. This means combining philanthropic or public funding with private investment to buffer the latter against losses. For example, a development fund or climate donor could provide a first-loss grant or subordinated loan that absorbs initial defaults or currency devaluation impacts, thereby protecting the senior (private) investors. This effectively lowers the risk profile for commercial co-investors. Company C could seek a climate resilience grant that will pay Company C $X for every solar pump installed in a vulnerable community, up to a certain number. This brings in cash flow to cover upfront costs and makes the venture more attractive to lenders.
Additionally, concessional loans (loans at below-market interest or with flexible terms) from impact-focused institutions can provide the working capital without the pressure of high interest. These might come from sources like social impact funds, development banks, or programs like [organization omitted] CleanStart, etc. The idea is to align with investors who value the climate and social outcomes (SDGs) and are willing to accept lower returns or higher risk tolerance. By blending in grant funding that explicitly covers early-stage losses or currency risk, Company C can then confidently take on some scale-up debt or equity. Investors, seeing that part of their downside is protected by the junior tranche, will be more willing to commit. This structure has been effective in other African agribusiness financing – essentially a public-private partnership in financing. For Company C, the result would be access to the larger capital needed to grow (e.g., to open new branches, buy more inventory) while keeping its cost of capital affordable. As it matures and proves its model (thus inherently lowering risk), it can gradually move to more commercial capital.

2. Credit Guarantee Scheme

One major concern is the risk of customer default en masse (especially due to climate shocks). To relieve this, Company C can work with a credit guarantee scheme. For instance, a donor-funded guarantee fund could be set up wherein the guarantor agrees to cover, say, 50-70% of losses on a defined loan portfolio

(either the loans Company C gives to farmers or a loan a bank gives to Company C for on-lending). This mechanism encourages local financial institutions to engage – for example, a local bank might be hesitant to lend to Company C given the unfamiliar business model, but if [organization omitted] or another entity guarantees half the loan, the bank's risk perception improves.

Similarly, if Company C partners with a microfinance institution (MFI) to finance farmers, a guarantee can encourage the MFI to lend to those smallholders. Guarantees have been used in agriculture to overcome the collateral problem. Here, since pumps and solar kits are often not accepted as collateral by banks, a guarantee fills that role. It socializes the risk – spreading it between the company, the bank, and the guarantor. One could envision Company C creating a portfolio of, say, 1000 pump loans and a guarantee facility standing ready to pay a portion of any defaults in that pool. This would give Company C confidence to scale lending without fear of total loss, and also potentially allow it to offer slightly better terms to farmers (since the risk premium is lower). For the farmers, this is invisible – they just interact with Company C or the MFI normally – but the backstop exists to keep the finance flowing even after a bad season.

Guarantee instruments could also support inventory financing: if Company C needs to import $100k of inventory, a guarantee to its supplier or bank can ensure payment, allowing them to get goods on credit. Institutions like [organization omitted], [organization omitted], or specialized guarantee funds (e.g., [organization omitted]'s DCA, now DFC, has done such guarantees for solar home system companies) could be tapped. In essence, a guarantee doesn't remove the risk of default, but it transfers a chunk of it to an entity that can shoulder it (often an entity with development mandate). This directly de-risks Company C's credit model.

3. Insurance-Linked Finance (Weather Index Insurance)

To explicitly handle the climate-driven default risk, index-based weather insurance can be bundled into Company C's financing scheme. As discussed in the risk assessment, one worry is a drought causing widespread inability to pay. With index insurance, a payout is triggered by an objectively measured event (e.g., rainfall below a certain threshold in the region). Company C can integrate this by either purchasing an index insurance policy for its portfolio or facilitating each farmer to have one. The innovative model of Risk-Contingent Credit (RCC) works exactly this way: farmers take a loan for inputs (or pumps), and if a severe drought or flood occurs, the insurance reduces or pays off their loan

obligation. This was shown to reduce default rates and even encouraged farmers to invest more since they had peace of mind against climate risk.

For Company C, partnering with an insurance provider (or programs like the African Risk Capacity or local insurance companies supported by re-insurers) to create a tailored index for its operating areas would be ideal. For example, an index could be "seasonal rainfall at station X below Y mm" triggers a payout sufficient to cover, say, 50% of all remaining installments for farmers in that zone. Farmers themselves might not even need to interact with the insurance – it could be structured such that Company C is the policyholder receiving payout to cover its receivables, and it in turn forgives the corresponding portion of loans. Alternatively, the farmer could be the beneficiary, using the payout to pay off Company C. The key is simplicity and low cost (index insurance has no loss adjustors and low admin cost, which keeps premiums down).

Donors or government could subsidize initial premiums to get this started. Insurance bundling effectively transfers catastrophic risk to the insurance market, away from Company C's books. It addresses the extreme tail-risk (the 1-in-5 year drought) that could otherwise wipe out the portfolio. Additionally, it sends a positive message to farmers: "if disaster strikes, you won't be left in debt," which might make them more willing to take on financing in the first place. Implementing this for Company C would likely involve collaboration with climate insurance initiatives (perhaps the IFC's Global Index Insurance Facility or local companies like Mayfair, etc.). Over time, as data on rainfall and defaults accumulate, the insurance can be refined for pricing and effectiveness.

4. Dedicated Working Capital Facilities

To solve Company C's day-to-day liquidity needs, specialized working capital financing is needed. Traditional commercial banks often shy away from lending to asset-light startups or demand collateral that Company C doesn't have. However, impact investors and development finance institutions (DFIs) have recognized the need for working capital in the off-grid energy sector. One instrument is a revolving credit facility that allows Company C to draw funds to purchase inventory and then repay as it sells that inventory, on a rolling basis. This could be structured as a line of credit with a grace period matching the customer payment cycle (for example, a 18-month facility where Company C pays interest only for 12 months and then principal after, aligning with a pump loan cycle).

Another approach is receivables financing or securitization: as Company C accumulates a portfolio of customer receivables (future payments), it could

borrow against that portfolio. Essentially, the predictable cash flows from paygo contracts can be packaged and used as collateral for a loan or even sold to investors at a discount for upfront cash. Some solar companies have issued notes or used fintech platforms to raise money secured by their portfolio quality. To do this effectively, Company C will need solid data on repayment rates to convince financiers of the portfolio's value. DFIs like IFC or organizations like [organization omitted] (now part of Mirova) have experience lending to off-grid companies for inventory and receivables. They often require certain covenants but provide the much-needed cash to bridge the gap between paying suppliers and collecting from customers.

Additionally, foreign exchange hedging instruments can be part of the facility – for instance, a DFI loan in local currency, or a hedge provided by a donor so that Company C isn't fully exposed to Kwacha fluctuations when it borrows in USD. Accessing a working capital facility will allow Company C to confidently increase stock levels ahead of demand (e.g., having enough pumps ready for a big irrigation campaign) and avoid the feast-and-famine cycle of waiting for customer payments to reinvest in new inventory. It also means they can negotiate better with suppliers (buying larger quantities possibly at discount) and meet customer demand promptly, which is crucial for market position.

5. Performance-Based Incentives and Subsidies

Because Company C's work yields public goods (climate adaptation, reduced emissions, poverty reduction), leveraging smart subsidies can lower risk for all parties. One model is results-based financing (RBF) where Company C is paid a fixed amount per verified outcome – for example, $100 for each farmer it successfully supplies with a solar pump and who uses it for, say, one year. This external payment essentially improves unit economics. It could be funded by a climate adaptation fund or a government program (similar to how some solar home systems companies got RBF per system installed under certain initiatives).

Another example: a subsidy to buy down interest rates for end-users – a program could pay part of the interest or principal for loans to women farmers or to those in extreme drought districts. This makes the product cheaper for the most vulnerable (improving equitable adoption, a concern in CSA efforts) and also means Company C gets more of its money upfront (reducing default risk).

The key is to design subsidies that incentivize performance (e.g., only pay if pump remains operational and in use, ensuring Company C provides good after-

sales service) and that do not distort the market (maintain the customer's co-investment so they value the product). By lowering the effective cost to customers, subsidies increase uptake and broaden Company C's market, which spreads its overhead over more units – improving financial sustainability. A time-bound subsidy for solar irrigation could work similarly until volumes drive prices down. Investors often look favorably on such arrangements because they directly reduce risk by injecting additional cash flows and demonstrating government or donor support.

6. Technical Assistance and Capacity Building:

Finally, alongside financial instruments, providing technical assistance (TA) can de-risk the venture by improving its capabilities. Donors or impact investors often have TA facilities to help portfolio companies. For Company C, TA could fund the hiring of a seasoned financial controller to tighten accounts, or a consultant to implement a robust management information system (MIS) for tracking customers and payments. It could also support training programs for Company C staff on credit management, or for agents on agronomy (to better deliver CSA advice). Essentially, TA addresses the behavioral/internal risks by upgrading skills and systems. One specific suggestion is to get assistance in developing a credit scoring model using Company C's data, which can predict which customers are lower risk and tailor credit terms accordingly – reducing default rates.

Another is TA to structure the insurance and guarantee solutions properly (since these can be complex to design initially). Many impact investors pair their capital with such non-financial support precisely to ensure the business can grow into the capital sustainably. For example, if an investor provides a $500k loan, they might also fund $50k of consulting services to help Company C improve its loan recovery processes – thus protecting their investment. Company C should actively seek such support, as it accelerates the move from a startup to an investable growth company. Over time, stronger internal capacity will reduce perceived risk and enable access to pure commercial finance.

In combination, these instruments would drastically lower the risk profile of investing in or partnering with Company C. A blended capital stack means the company isn't crushed by the cost of capital; guarantees and insurance offload the worst-case losses from shocks; working capital facilities keep operations smooth;

and smart subsidies accelerate market creation while TA fortifies the business fundamentals.

For impact investors and donors, supporting these mechanisms is a way to amplify the positive impact (climate adaptation, rural development) that Company C delivers, while ensuring the company can eventually stand on its own feet financially. Given the cross-sectoral nature of Company C's work (energy, agriculture, climate), a consortium approach might be taken – e.g., an agriculture resilience fund could provide the guarantee, a renewable energy fund the working capital debt, and a development bank a grant for RBF. Company C's role is to coordinate these and demonstrate clear impact metrics (farmers reached, income increase, emissions avoided, etc.) to justify the support. Over the next 3-5 years, as these de-risking measures take effect, we would expect Company C to significantly scale its customer base in Tanzania, improve its financial performance, and thereby become a candidate for larger growth equity or debt investments without heavy concessional support.

In essence, these tools are the bridge over the "valley of death" for the company – ensuring it can thrive and attract the kind of capital needed to achieve meaningful scale in building climate-smart, inclusive agribusiness in the region.

Company D – Agricultural inputs and poultry services

Introduction

Company D is a Zambian agribusiness founded in 2008 to improve smallholder producers' access to high-quality agricultural inputs and technical services. Headquartered in [location omitted], the company has evolved from a single retail outlet into a network of over 20 farm supply shops distributed across Zambia's [location omitted], [location omitted], and [location omitted] provinces. Its primary mission is to improve food security, incomes, and productivity for rural and peri-urban producers by offering convenient, affordable access to inputs and agricultural knowledge. Company D's core business includes the retail distribution of day-old chicks, animal feed, crop seeds, fertilizers, and veterinary products, complemented by producers training and extension support.

The enterprise was established by a the founders-and-the founders team, both former producers, with a vision to close the persistent access gap between smallholder producers and formal agro-input markets. The early years of the

business were shaped by grassroots experience and demand-led learning. From selling chicks out of the back of a vehicle, Company D has become a known brand among Zambian smallholders and an essential link between input manufacturers, service providers, and end-users in the country's fragmented rural supply chains.

Company D seeks to empower women and youth in agriculture and reduce the productivity gap among smallholder producers by integrating them into profitable value chains. Approximately 60% of its customer base is composed of women, many of whom rely on small-scale poultry farming as a key income source to support household expenses and children's education. By creating an ecosystem where producers can access bundled inputs, advisory services, and informal credit, the company facilitates upward mobility among rural families.

The firm aligns strongly with Zambia's national ambitions for import substitution in poultry and staple crop production, and has begun to integrate climate-resilient practices in its offerings. In the medium term, Company D aims to scale its outlet network to over 40 locations and broaden its scope to include poultry breeding, feed blending, and climate-smart technology adoption — all while deepening engagement with under-resourced farming communities. The company's mission is strongly aligned with development partner goals, particularly those focused on inclusive agricultural commercialization, climate adaptation, and food systems transformation.

Business Overview

Operating Model

Company D operates a decentralized, retail-based agribusiness model focused on supplying agricultural inputs and services to smallholder and emerging producers. Its retail shops, strategically positioned in peri-urban and rural centers, function as micro service hubs. These shops offer an accessible source of high-quality inputs such as seeds, fertilizers, animal feed, veterinary drugs, and day-old chicks.

Unlike businesses centered on contract farming or centralized procurement and processing, Company D does not purchase output from producers. Instead, its model is front-loaded — providing producers with the tools, products, and

knowledge to optimize their own production. This approach significantly reduces capital lock-up and post-harvest risk for the company while enabling rapid expansion. The firm works with multiple suppliers and distributors to stock reputable input brands and curates bundled packages that reflect common production systems in Zambia.

Each store is staffed by trained service providers, often including at least one certified animal health a team member or agricultural a team member. Their role is to provide in-shop technical advice, organize local training days, and troubleshoot challenges in real time with producers clients. This model not only builds loyalty but ensures that product sales translate into effective and safe use on farms.

Producers Engagement

Engagement with producers is high-touch and relationship-based. Beyond walk-in retail, Company D hosts regular "producers Days" at its shops, during which input manufacturers and technical experts demonstrate product use, provide training, and distribute informational material. Shop staff also conduct informal field visits, particularly for high-value clients (e.g., poultry growers with large flocks or repeat customers).

A key innovation is Company D's input credit initiative, which allows producers with a track record of purchases to access bundled starter packs (e.g., 100 chicks + feed + vaccine) on deferred payment terms. This form of embedded finance, offered in partnership with institutions like [organization omitted], has proven critical for micro-enterprise poultry producers who lack collateral or formal credit histories. Repayment is typically structured around sales cycles, and failure rates remain low due to the trust-based relationship between shop staff and customers.

Customer loyalty is further deepened by product consistency, local availability, and fair pricing. The shops have become trusted knowledge centers in areas where government extension is overstretched or underfunded. This proximity, continuity, and technical orientation differentiate Company D from itinerant or low-trust input vendors that dominate informal rural markets.

Processing & Facilities

Company D currently does not operate aggregation centers, processing plants, or bulk storage depots. Its infrastructure is focused on efficient local retail and logistics. Most shops have small storage rooms for temperature-sensitive items (vaccines, chemicals) and dry goods. A few regional hubs are used for temporary holding of large volumes during peak seasons (e.g., day-old chick dispatch), but there is no centralized processing activity.

[product omitted] infrastructure is a key consideration due to the nature of some inputs, particularly vaccines. While most shops rely on grid power, solar refrigeration and battery backups are under consideration or have been piloted at select outlets. Transport logistics rely on company-owned and hired vehicles that move stock from [location omitted] to outlying provinces. Delivery schedules are adapted to ensure timely restocking and minimal spoilage.

The company has expressed interest in backward integration into poultry rearing (through [product omitted]) and feed processing, especially to control input costs and quality. However, at present, the model remains lean and demand-responsive, minimizing fixed asset risk.

Product Portfolio and Value Addition

Company D's offerings are designed for the smallholder production model prevalent across Zambia. Its core product categories include:

- Day-old chicks (layers and broilers)
- Livestock and poultry feed
- Veterinary drugs and vaccines
- Crop seeds (maize, soybean, groundnut, vegetables)
- Fertilizers and agrochemicals

The company does not manufacture these inputs but plays a curatorial role — selecting high-quality brands, ensuring product availability, and offering contextual guidance on application. One of its most popular services is the "[product omitted]," which packages day-old chicks with feed, vitamins, and an instruction manual.

Value addition is embedded through advisory services. Shop staff provide dosage guidance, feeding schedules, and treatment plans — enabling better on-farm outcomes. In poultry, this reduces mortality and improves feed conversion ratios. In crops, improved seed and correct fertilizer application boost yields. producers benefit from more predictable results and better market readiness. The business benefits from repeat customers and enhanced brand credibility.

Target Markets and Distribution

Company D's end market is the smallholder producer segment in Zambia — typically those cultivating 1–5 hectares or managing 50–500 chickens. Customers are primarily located in peri-urban districts and rural growth nodes with active agricultural economies.

All sales are domestic. The company does not export inputs nor does it currently supply large institutional clients like cooperatives or NGOs at scale. Its focus is individual producers and micro-enterprises. Each outlet serves a catchment radius of 20–50 kilometers and is designed to operate as a standalone profit center.

Expansion decisions are data-driven, focusing on areas underserved by formal agro-dealers but with proven agricultural activity. Community outreach is part of the roll-out strategy, often involving partnerships with churches, traditional authorities, or producers associations to introduce the brand. The goal is to build trust and embed the outlet in the local production landscape, rather than operate as a transient vendor.

Financial Risk Assessment

1. Revenue Sources and Concentration

Company D's revenue is primarily generated from the sale of agricultural inputs — especially poultry-related products. Its highest-volume items include day-old chicks, poultry feed, vaccines, and other animal health products, followed by crop seeds and fertilizers. Among these, the poultry input segment (chicks and feed) likely accounts for more than half of all revenues, driven by high-frequency purchases and short production cycles.

This creates a concentration risk. The business is heavily exposed to fluctuations in poultry production trends. Any systemic issue that affects poultry production — such as disease outbreaks, input price shocks, or shifts in consumer demand for poultry products — could materially impact Company D's top-line income. Additionally, most sales are made directly to smallholder customers via retail shops. While this model provides a wide base and geographic dispersion, the lack of institutional clients (e.g., processors, government programs, NGOs) reduces income stability during shocks or lean seasons.

2. Cost Structure and Input Volatility

Company D operates a working capital–intensive retail model. Its major cost centers include:

- Inventory procurement: High-quality chicks and branded inputs must be bought in advance. Some vaccines and agrochemicals are sourced internationally and priced in USD, exposing the company to currency risk.
- Logistics and distribution: Fuel and vehicle maintenance are significant cost drivers, particularly as retail shops are spread across remote locations.
- [product omitted] operations: Electricity for refrigerators and freezers (used for vaccine storage) represents a recurring cost. Power instability means some outlets also require backup systems.
- Staffing and training: Shop staff, including veterinarians and extensionists, must be retained and frequently trained to maintain service quality.
- Rent and infrastructure maintenance: Shops are typically leased and outfitted to provide secure storage and customer space.

The cost structure makes the business sensitive to Zambia's macroeconomic environment. Depreciation of the kwacha raises input costs. Fuel price hikes increase logistics expenditures, and general inflation affects producers purchasing power. Because Company D cannot always pass these costs directly to producers, profit margins may compress during volatile periods.

3. Working Capital and Liquidity

Company D's operating cycle involves purchasing large volumes of stock in anticipation of seasonal demand (e.g., pre-rainy season for seeds and fertilizers, or cold months for poultry rearing). Suppliers often demand upfront payment or short payment terms. Meanwhile, some customers — especially loyal poultry producers — purchase on credit or through informal installment schemes. These timing mismatches create recurring cash flow pressure.

Liquidity gaps can constrain shop restocking and delay expansion. During droughts or economic downturns, sales fall while fixed costs (rents, salaries, refrigeration) remain. This adds to the strain on working capital. The company's success depends on its ability to forecast demand accurately and secure bridging finance during seasonal troughs.

Historically, Company D has accessed a loan guarantee facility from [organization omitted] and credit from [organization omitted]. These partnerships have improved inventory availability and allowed for scale, but they may not fully offset growing financing needs — particularly if the company aims to double its footprint.

4. Investment Readiness

Company D has taken key steps toward investment readiness. It has participated in accelerator programs like the [organization omitted] Food Systems Accelerator, which likely enhanced its strategic planning, pitch capabilities, and operational documentation. Its record of accessing commercial or semi-commercial credit is also a positive signal.

However, public data on the company's financial management systems is limited. It is unclear whether it maintains audited financial statements, digital sales records, or real-time stock and credit monitoring across outlets. These systems are critical for investor confidence. Additionally, collateral for larger loans may be limited if the company does not own significant real estate or processing infrastructure.

That said, the company is an attractive prospect for impact investors — especially those focused on rural SME finance, gender-inclusive models, and climate-resilient

food systems. Its social impact is demonstrable, and with improved financial controls and data transparency, it could mobilize blended capital for scale.

4. Climate Risk Assessment

Key Climate Hazards

Company D operates across several agro-ecological zones in Zambia, all of which face increasing exposure to climate variability. The primary hazards include:

- Droughts and dry spells: Reduced rainfall lowers crop output and feedstock availability (especially maize), increases feed prices, and constrains producers' cash flow — reducing demand for inputs.
- Heatwaves: Prolonged high temperatures lead to heat stress and increased mortality in poultry flocks, especially where proper housing and ventilation are lacking.
- Flooding: Heavy rains can disrupt transportation and damage infrastructure, leading to delivery delays and [product omitted] failures.
- Pest and disease outbreaks: Climate shifts are linked to increased frequency and severity of poultry diseases like Newcastle disease, as well as crop pests such as fall armyworm.

These hazards don't affect Company D's physical infrastructure directly but exert indirect pressure through their effects on producers livelihoods, purchasing behavior, and product efficacy.

2. Geographic Exposure

Company D's shops are located in provinces with both high smallholder density and significant climate exposure:

- [location omitted]: Once reliably wet, this region is seeing increasingly erratic rainfall.
- [location omitted] and [location omitted]: More reliant on rain-fed production, with fewer irrigation alternatives and longer transport routes.

All three regions suffer from poor road maintenance, making last-mile delivery and customer access vulnerable to weather conditions. Additionally, most smallholder customers do not irrigate — meaning that their productivity and income rise or fall with the rains.

3. Crop/Livestock Sensitivity

Company D's core commodities — poultry, maize, and vegetables — are all highly climate-sensitive:

- Poultry: Heat stress reduces feed conversion and growth. High temperatures combined with humidity increase disease prevalence and mortality. Water scarcity further worsens conditions.
- Maize and soybean: Drought or rainfall shocks reduce yields, affecting both producers food security and the availability/price of feed ingredients.
- Veterinary products: Vaccines require consistent refrigeration. Power instability during hot seasons can reduce their efficacy or cause spoilage if not managed properly.

The firm's customer base is sensitive to both biophysical impacts (crop and animal losses) and income variability, making climate a key driver of overall sales and repayment risk.

4. Adaptive Capacity

Company D contributes to adaptation through:

- producers training: Staff advise on poultry housing, heat management, and vaccination protocols.
- Product guidance: Information is provided on planting schedules and seed variety selection.
- Bundled input kits: These reduce misuse and ensure correct dosages, improving efficacy under stress.

However, many recommended CSA practices — such as drought-tolerant seed varieties, solar-powered brooders, and water harvesting techniques — are not yet systematically integrated into product offerings or promoted through incentives.

Most climate resilience interventions remain advisory, not embedded in the commercial model. This presents both a gap and an opportunity for deeper impact.

5. Infrastructure and Value Chain Vulnerability

While the company's decentralized model reduces concentration risk, it does introduce challenges:

- Cold chains: Rural shops with unstable power grids face real risk of vaccine spoilage.
- Flooded roads: Rainy-season transport delays affect stock movement and reduce shop-level sales.
- Heat exposure: Shops without proper storage insulation may degrade seed or chemical quality over time.

Lack of infrastructure investments (e.g., solar cooling, warehouse hardening) could reduce input reliability during climate events — undermining customer trust and business continuity.

Behavioral Risk Assessment

1. Internal (Organizational) Risks

Company D's decentralized retail model depends heavily on the performance and consistency of its shop-level teams. While each outlet benefits from trained staff, including veterinarians or livestock officers, the company's success is vulnerable to "key person dependency" — i.e., over-reliance on certain highly skilled or experienced staff, particularly in management or supply chain roles. As the company scales toward its goal of 40+ outlets, internal systems such as HR, logistics, finance, and inventory management will face strain.

Growth also increases the risk of uneven service quality, stock inconsistencies, or lapses in product handling (e.g., [product omitted] mismanagement). Without

strong internal controls, digitized reporting, and supervisory structures, Company D may struggle to maintain its brand promise — especially in remote or newly established outlets.

2. producers-Level Behavioral Risks

Smallholder producers face multiple pressures that affect their purchasing behavior and reliability as customers:

- Side-buying: Even loyal clients may purchase inputs from informal vendors if Company D's prices rise, products are temporarily out of stock, or competitors offer short-term credit.
- Input misuse: Inadequate adherence to recommended vaccine regimens, poor chick housing, or sub-optimal seed application reduces on-farm outcomes. producers may blame the product, rather than usage, undermining trust in Company D.
- Credit default: As Company D expands its input credit scheme, there is an increasing risk of non-repayment, particularly during seasons of poor rainfall or animal losses. Without robust vetting and repayment tracking, defaults could rise.
- Low adoption of new practices: Some producers may resist shifting to new poultry housing, seed varieties, or fertilizer blends — either due to tradition, perceived risk, or lack of visible peer success.

These behaviors can negatively impact the company's repayment rates, repeat sales, and overall reputation.

4. Value Chain and External Behavioral Risks

Company D depends on timely and reliable deliveries from input suppliers, many of whom are larger importers or regional distributors. Any delays, price hikes, or quality issues upstream can impact Company D's ability to serve its markets.

There is also competition from informal or semi-formal agro-dealers, who may offer counterfeit or expired products at lower prices. While these may undermine the

producers's success, they create short-term temptation, especially for cash-constrained buyers.

Downstream, the company is affected by the behavior of poultry buyers and feed processors. If farm-gate poultry prices collapse — due to oversupply, middleman manipulation, or disease outbreaks — smallholders may exit the production cycle or delay restocking, reducing Company D's sales.

Government behavior is another factor. Changes in subsidy regimes, poultry movement bans, or currency restrictions can materially affect Company D's operations, pricing, and supply chains.

5. Social License and Community Relations

Company D enjoys high levels of community trust, thanks to its proximity model, technical advice, and consistent presence. However, as it expands into new regions, the business must take care to replicate this local engagement model. Failure to properly introduce new outlets — for example, by bypassing traditional leadership structures — could reduce uptake and raise resistance.

The company claims to have a strong gender lens, with more than 60% of its clients being women. However, without formal tracking or gender-intentional programming, this inclusion may remain incidental rather than systematic. Youth engagement is also an opportunity area, particularly as many young people turn to poultry rearing or market gardening as entry points to entrepreneurship.

Community reputation is fragile. A single case of expired product, unfair credit enforcement, or miscommunication could quickly erode goodwill. Company D must balance commercial expansion with social license maintenance through transparency, dispute resolution, and inclusive marketing.

Overall Risk Summary

Company D operates in a high-impact, fast-growth segment of the agricultural sector, offering considerable potential to deepen rural market linkages and improve producers access to inputs. Its unique model — blending rural retail distribution, smallholder engagement, and embedded financing — positions it as a critical private-sector player in Zambia's poultry and input markets. However, this same level of market penetration and operational decentralization introduces several layers of systemic risk that require ongoing management and resilience building.

Financial risk is assessed as moderate. The company's operating model is working capital intensive — driven by the need to pre-stock inputs, provide limited informal credit to producers, and manage cash flow across multiple geographically dispersed outlets. While it has some track record with lenders and guarantee-backed facilities, its balance sheet may remain constrained without structured financing products aligned to seasonal cycles. Its product portfolio is relatively concentrated around poultry inputs (chicks, feed, vaccines), making revenue dependent on a single value chain. This sector, while fast-growing, is price-sensitive and subject to biological shocks (e.g. disease outbreaks) that can reduce producers demand. Additionally, the volatility of Zambia's macroeconomic environment — especially exchange rate fluctuations and inflation — introduces pricing pressure for imported inputs, squeezing margins and potentially reducing affordability for customers.

Climate risk is also rated moderate, though its manifestations are indirect. Company D's risk exposure stems from its reliance on smallholder poultry producers and crop producers whose productivity is climate-sensitive. Heatwaves can cause increased poultry mortality, drought reduces feed ingredient availability (raising costs), and erratic rainfall disrupts crop-based income — which ultimately affects customers' ability to buy inputs or repay informal credit. In areas like the [location omitted] and [location omitted] Province, increasing climate unpredictability has reduced the reliability of both poultry and crop cycles. The company does not own productive assets that are directly exposed to climate shocks (like farmland), but it carries commercial exposure to the vulnerabilities of its customer base.

Behavioral risk is rated moderate to high. While Company D benefits from deep community relationships and repeat business, it also depends on informal credit relationships and field-level trust. As the company expands its input lending program, the risk of credit default increases, especially in years when poultry or crop revenues fall. Moreover, the success of its decentralized model hinges on staff performance in remote branches — where turnover, inconsistent technical knowledge, or poor customer engagement can weaken service quality. There is also exposure to producers behaviors such as input misuse (especially vaccines and feed) or side-buying from informal vendors, particularly if Company D experiences stockouts or price shifts. These behaviors can erode product confidence and reduce long-term customer retention.

Operational risk is rated low to moderate. Company D has demonstrated operational maturity by successfully running a lean, decentralized retail network across multiple provinces. Its franchise-like shop model reduces fixed infrastructure costs and allows for adaptive service delivery. However, the rapid expansion of outlets and services introduces pressure on logistics, staff supervision, and inventory control. [product omitted] reliability remains a key operational concern, particularly in shops dealing with vaccines and temperature-sensitive livestock inputs. As Company D scales, investments in digital stock tracking, performance monitoring, and solar backup for refrigeration will be necessary to ensure continued service reliability.

Traffic-Light Justification Summary:

- Financial Risk: Moderate — driven by seasonal cash flow strain, exposure to poultry market cycles, and import-dependent cost structure. Liquidity is a challenge, but solvable with structured capital.
- Climate Risk: Moderate — indirect but meaningful exposure through climate-vulnerable customers; impacts manifest via reduced sales, credit defaults, and demand shocks.
- Behavioral Risk: Moderate to High — due to dependence on informal lending relationships, rural staff execution, and potential side-selling or input misuse by producers.

- Operational Risk: Low to Moderate — efficient rural footprint and adaptable retail model, but logistics, [product omitted], and branch supervision require close attention during scale-up.

Recommended CSA Interventions

To reduce climate-linked revenue volatility and strengthen resilience in its customer base, Company D should prioritize a suite of targeted climate-smart agriculture (CSA) interventions designed for the realities of smallholder poultry and crop producers in Zambia. These measures are aligned with [organization omitted] and [organization omitted]'s strategic goals for climate-smart input delivery, inclusive adaptation, and producers livelihood protection.

1. Poultry Housing and Heat Stress Management

Promote low-cost, heat-resilient poultry housing designs that mitigate chick mortality during hot seasons. Features such as adequate ventilation, reflective roofing, and optimized spacing are critical. Company D can create or disseminate simple housing templates and offer these as part of promotional campaigns or bundled starter kits. Demonstration sites at flagship outlets could increase uptake.

2. Solar-Powered Brooders and [product omitted] Resilience

Introduce [product omitted] to support chick rearing in regions with frequent power outages. This reduces heat stress mortality and supports early-stage chick development. At the shop level, install solar-powered fridges or back-up systems to maintain [product omitted] integrity for vaccines and sensitive inputs, especially in off-grid or peri-urban branches.

3. Climate-Smart Crop Input Bundles

Integrate climate-resilient seeds (e.g., early-maturing maize, groundnut varieties) with technical advice on planting windows, intercropping, and conservation agriculture practices such as mulching or minimum tillage. Bundled packages supported by advisory sessions help producers respond proactively to shifting rainfall and reduce post-planting losses.

4. Integrated Pest and Disease Management (IPM)

Train producers in integrated pest and disease management tailored to poultry and crop systems. This should include a mix of early-warning information (e.g., SMS alerts), preventive health checks, and judicious use of veterinary products. IPM reduces the risk of cascading yield or income losses due to climate-driven disease outbreaks.

5. Water Harvesting and Feed System Diversification

Promote small-scale water harvesting systems (e.g., rain barrels, shallow collection pits) to ensure poultry hydration during dry periods. Simultaneously, provide guidance on resilient feed alternatives — including formulations that use locally available grains and legumes when commercial feed prices spike due to drought or market disruptions.

6. Weather-Indexed Insurance and Contingency Tools

Partner with micro-insurers or development finance actors to test pilot index-based insurance for poultry or input buyers. Coverage could be structured around extreme temperature events or rainfall deviations. On the meso level, Company D could explore portfolio-level business interruption insurance to help buffer sales and operational continuity during regional climate disruptions.

These interventions offer co-benefits beyond risk reduction: they improve smallholder productivity, reduce mortality and waste, build trust in Company D's brand, and differentiate the company as a CSA-aligned service provider. As [organization omitted] and [organization omitted] deepen their investment in CSA dissemination, Company D can serve as a conduit for scaling proven climate-resilient input models in Zambia.

Financing and De-Risking Instruments

Scaling Company D's impact — while managing seasonal liquidity stress and exposure to climate and behavioral risks — requires a customized financing strategy. A blended finance approach combining working capital, risk-sharing tools, and long-term adaptation investment would be optimal.

1. Seasonal Working Capital Facility

Partner with impact lenders or development finance institutions (DFIs) to establish a dedicated line of credit for input pre-procurement, particularly ahead of peak planting or poultry stocking seasons. Risk can be mitigated through credit guarantees from institutions like the [organization omitted] (AGF) or [program omitted]. These facilities should be tailored to Company D's cash flow cycle and repayment patterns.

2. Input Credit De-Risking Mechanisms

Expand the company's producers input credit program, but overlay it with formal credit risk mitigation. Options include inventory-backed working capital, co-lending with rural MFIs or SACCOs, post-dated voucher systems, or partial repayment guarantees from donor partners. Digitizing repayment tracking would further reduce default risk and improve producers targeting.

3. Climate Resilient Infrastructure Finance (CAPEX Grants)

Seek grant co-financing from adaptation funds or development programs to invest in cold storage, [product omitted], and stock hardening infrastructure. These assets reduce business interruption risk and are well-aligned with [organization omitted]/[organization omitted]'s goal of building private-sector channels for CSA technologies. Blended facilities (grants + concessional loans) are ideal for de-risking such long-term investments.

4. Portfolio-Level Climate Insurance

Explore meso-level insurance products that protect Company D's working capital and inventory from large-scale climate shocks. Triggers could be linked to rainfall

variability, poultry disease outbreaks, or significant sales shortfalls. Such coverage ensures operational continuity and investor confidence during bad years.

5. Patient Growth Capital from Impact Investors

Company D is well-positioned to raise equity or quasi-equity from impact funds targeting inclusive agribusiness. Its strong gender footprint, CSA relevance, and decentralized model appeal to funds focused on resilience and rural development. Such capital could support system upgrades (e.g., ERP, field monitoring), branch expansion, and talent acquisition.

6. Integrated Blended Finance Architecture

The ideal path forward involves combining multiple instruments — e.g., a partial guarantee-backed seasonal loan, CSA-aligned capital investment grants, weather-indexed insurance, and catalytic equity — to create a resilient financial structure. This enables Company D to absorb climate and behavior shocks while scaling inclusive service delivery to underserved rural zones.

Company E – Rice processing and irrigation management

Introduction

Company E is a Kenyan agribusiness enterprise founded in 2012 (formally incorporated in 2023) with a mission to transform smallholder agriculture through value addition and inclusive, climate-smart practices. Headquartered in [location omitted], Kenya, the company began as a grain trading and farming operation and is now pivoting into agro-processing, focusing on locally produced staples like [program omitted]. Its vision is to develop sustainable supply chains for Kenyan farm products within Southern Africa (SADC) and East Africa (COMESA), aligning with Kenya's Agenda 2063 goals for agricultural commercialization and food systems transformation. Company E emphasizes "[company slogan omitted]," reflecting a dual focus on delivering high-quality food products to consumers while improving incomes for rural producers.

In recent years, Company E commissioned a [program omitted] processing plant and launched an initiative called the "[program omitted] Initiative for Competitiveness and Economic Empowerment" ([program omitted]) to scale its impact. The enterprise currently works with about 1,000 smallholder farmers across two irrigation schemes as a pilot, providing them with inputs, training, and

a guaranteed market for their [program omitted]. These schemes are farmer-owned irrigation cooperatives that have entered management partnerships with the company. By 2024, Company E aims to scale up to 10 irrigation schemes encompassing over 6,000 farmers within 3 years, dramatically increasing its smallholder reach. This growth is driven by the high local demand for aromatic [program omitted] and the opportunity to substitute imports – Kenya's most popular [program omitted] variety ([product omitted]) has annual demand of ~139,000 tons against less than 67,000 tons supplied, leaving a gap that is partly filled by imports.

By expanding local production and processing, Company E seeks to improve national food security, reduce costly imports, and elevate farmer livelihoods. Equally important, the company's model integrates climate-smart agriculture (CSA) principles: improving water management through irrigation, promoting certified seeds and good agronomic practices, and piloting solar-powered technologies for sustainable farming. The result is an agribusiness poised to deliver both commercial and social returns, making it attractive to impact investors and development partners interested in resilient, inclusive value chains.

Business Overview

Operating Model

Company E operates at the intersection of smallholder farming, irrigation scheme management, and agro-processing. It has pioneered a "Management Partnership Business Model" (MPBM) with smallholder-owned irrigation schemes. Under this model, the company partners with local farmer cooperatives who manage communal irrigation projects. Company E provides professional management support for scheme operations – including agronomic planning, input provision, and marketing – to improve each scheme's productivity and profitability. In practice, this means Company E's team works on-site with the irrigation scheme committees to schedule plantings, introduce better farming techniques, and ensure efficient water use.

The partnership is mutually beneficial: Company E serves as the off-taker for all the farmers' produce, guaranteeing a reliable market, while farmers benefit from improved access to inputs, extension services, credit guarantees, and mechanization. By embedding itself in the management of production (rather than merely buying crops), the company can influence yields and quality from the start, creating a more secure supply of raw material for its processing facility. This

integrated supply chain approach – from farm to processing – is relatively novel in Kenya's [program omitted] sector, which has historically been fragmented among many small producers and traders.

Farmer Engagement

Smallholders are engaged via incentive-based contract farming arrangements. At the start of the season, participating farmers receive certified [program omitted] seed, fertilizers, and technical training from Company E's Farmer Support Unit (FSU) – a dedicated extension team being established by the company. The company often facilitates input credit or advance provision of these inputs, with repayment in kind at harvest, backed by credit guarantees or insurance to mitigate defaults. Throughout the growing season, field officers provide hands-on training in climate-smart practices, such as proper transplanting techniques, fertilizer application, and pest management.

Notably, Company E is introducing improved agronomic methods like the System of [program omitted] Intensification (SRI) on a pilot basis, as SRI has shown potential to double yields when combined with better seed and weed control. Farmers are motivated through incentive payments for high-quality produce or yield improvements – for example, a premium price or bonus if they meet targets for moisture content and purity. Come harvest, Company E buys back the paddy [program omitted] from its network of growers at pre-agreed floor prices, shielding farmers from volatile market swings. This contracting mechanism builds trust: farmers have assured buyers, and the company secures throughput for its processing plant. Moreover, Company E assists in mechanization services for the schemes, such as arranging tractor ploughing, harvesters, or threshing machines. By promoting labor-saving technology and covering upfront costs (with cost recovery at harvest), the company addresses one of the smallholders' biggest constraints – lack of affordable mechanization.

Overall, Company E's high-touch engagement model aims to turn previously subsistence-oriented farmers into reliable commercial suppliers, while continuously building their capacity.

Processing & Facilities

Company E's physical operations revolve around its newly established [program omitted] mill and associated logistics. The [program omitted] processing plant, commissioned in 2023, is located near the lakeshore production zones to minimize transport distance. It is equipped to mill paddy [program omitted] into polished

white [program omitted] and brown [program omitted], with ancillary equipment for cleaning, de-stoning, and grading the grains. Given [program omitted]'s sensitivity to moisture, the company has invested in drying patios and is improving storage capacity both at the mill and out in the irrigation schemes. Under the [program omitted], Company E is helping rehabilitate on-farm storage sheds and small warehouses in its partner schemes to reduce post-harvest losses. Cold storage is not a major need for [program omitted], but dry, pest-proof storage is critical – especially as climate change can increase aflatoxin risk in poorly dried grains.

Transport infrastructure is basic: the company leases trucks to collect paddy from scheme aggregation points and deliver finished [program omitted] to market. Fuel cost and road conditions (especially in rainy seasons) are ongoing challenges, as rural roads along Lake Kenya can flood or become impassable during heavy rains. To mitigate power interruptions – a known issue in Kenya's grid where droughts have caused blackouts up to 25 hours – Company E has procured a diesel generator so that milling can continue even during load-shedding. In the near future, the company plans to adopt solar energy solutions (e.g. solar [program omitted] dryers or solar irrigation pumps for schemes) to enhance resilience and reduce operating costs. Importantly, the current processing capacity is sized for the pilot scale (servicing ~1,000 farmers' output); as Company E scales to thousands more farmers, it envisions either expanding the existing mill or establishing decentralized processing centers in other regions. This decentralized model is in line with national plans to bring processing closer to production areas, thereby cutting transport costs and engaging more rural youth and women in value addition jobs.

Product Portfolio

Company E adds value to raw crops by producing premium [program omitted] products for local and regional markets. Its flagship products include:

- [product omitted] White [program omitted] – an aromatic long-grain [program omitted], highly sought by Kenyan consumers for its fragrance. [product omitted] is the most preferred local variety, yet annual supply meets less than half of demand. Company E's careful sourcing and processing aims to deliver consistent quality (clean, stone-free, uniform grains) to capitalize on this demand.
- "Faya" [program omitted] – a branded white [program omitted] product (named after a local variety or brand) targeting everyday consumers. It

emphasizes affordability and local origin, competing directly with imported Asian [program omitted] on price and quality.

- Brown [program omitted] – a whole-grain [program omitted] retaining the bran layer, marketed as a healthy option for urban and international customers. By offering brown [program omitted], Company E also caters to niche health-conscious segments and can fetch higher margins through value addition.

In addition to [program omitted], the company's long-term strategy may diversify into other farm products (e.g. legumes or maize grits) as it builds its farmer network, but currently [program omitted] is the core focus. All [program omitted] is packaged in branded bags (5kg, 10kg, etc.), with labeling that emphasizes its Kenyan origin and the social impact of its production (empowering local farmers). Value addition comes not just from milling but also from blending and grading: for example, Company E can create grade-based product lines (premium grade, broken [program omitted] for porridge, etc.), maximizing utilization of the crop. Any by-products like [program omitted] bran are being explored for use as animal feed or for oil extraction, ensuring minimal waste. Through its curated product range, Company E is positioning itself as a leader in Kenya's domestic [program omitted] value chain, able to meet diverse consumer needs while uplifting producers.

Target Markets and Distribution

Company E primarily serves the domestic Kenyan market, which has a strong appetite for locally grown [program omitted]. The company's focus on [product omitted] [program omitted] aligns with local tastes – Malawians prefer this aromatic variety over cheaper imported [program omitted], but supply shortages often force reliance on imports. By increasing local output, Company E aims to capture this unmet demand. Its target customers include urban wholesalers, supermarkets, and institutional buyers (such as schools or hospitals that provide meals). Already, Kenya's government has signaled support for local agribusiness by moving to ban imports of commodities that can be produced locally, including [program omitted]. This policy environment is favorable for Company E, as it reduces foreign [personal achievement omitted] and encourages retailers to stock domestic brands. The company has begun establishing distribution partnerships in major cities like [location omitted], [location omitted], and [location omitted] to ensure its [program omitted] products reach retailers efficiently. It leverages existing grain distribution networks and may utilize agro-dealer shops for rural distribution. Pricing is set to be competitive with imported [program omitted], with a slight premium justified by the quality and freshness of local milling.

In the medium term, Company E also eyes regional export markets. Kenya shares taste preferences with neighboring countries (for instance, [product omitted] [program omitted] could appeal in Zimbabwe, Zambia, or eastern DRC). The company's vision of supplying SADC/COMESA aligns with capturing these regional opportunities. However, export ambitions will depend on scaling up production volume and meeting international quality standards. As such, the immediate strategy is import substitution at home – tapping into Kenya's 70,000+ ton [program omitted] market gap – and building a strong national brand. With success domestically, Company E could then expand outward, turning Kenya into a net exporter of specialty [program omitted] in the future. Overall, the business model of Company E is built on an inclusive value chain: integrating smallholder farmers into formal markets, leveraging irrigation to mitigate climate risks, and adding value through processing to meet market demand. This model not only drives the company's profitability but also delivers developmental benefits, making it a candidate for blended finance and public-private support.

Financial Risk Assessment

1. Revenue Drivers and Concentration

Company E's revenues are currently derived almost entirely from the sale of processed [program omitted] (white and brown) and, to a smaller extent, from trading raw agricultural commodities. This represents a relatively undiversified income base. In particular, the company's fortunes are tied to the [program omitted] harvest each season. If farmers produce abundant, good-quality paddy, Company E's processing volumes – and hence sales – increase accordingly. Conversely, any shock to [program omitted] production directly hits the top line. This single-commodity focus creates concentration risk: over 90% of revenue is from one value chain ([program omitted]). While [program omitted] demand is strong and growing, reliance on it means the company is exposed to price and volume volatility in that market. For instance, a drought or pest outbreak that reduces paddy output will leave the processing plant underutilized and sales well below projections. Similarly, if domestic [program omitted] prices drop due to a surplus or government intervention, Company E's margins could shrink significantly. The company does not yet have secondary revenue streams like by-products (e.g. selling [program omitted] bran for feed in volume) or other crops to buffer such shocks.

Diversification opportunities exist – for example, adding a legume crop in rotation or processing other grains – but these are not yet in play. Until then, sales and margins remain very sensitive to the [program omitted] value chain's performance.

On the positive side, the market gap for local [program omitted] provides a cushion: even in moderate harvest years, the company can likely sell all it processes, as Kenya's unmet [program omitted] demand keeps prices firm. Nonetheless, investors will note that Company E's revenue concentration in a single crop and product means higher risk. One mitigating factor is the company's control over its supply chain – by contracting farmers, it secures raw material more reliably than open-market buyers, reducing the risk of not having product to sell (unless a widespread shock occurs). As Company E grows, management recognizes the need to diversify income, whether by value-adding other crops (like possibly [program omitted] bran oil or complementary crops) or expanding into services (e.g. mechanization services to farmers as a paid offering). Currently, however, the financial health of the enterprise is largely tied to one season's [program omitted] harvest at a time, which is a classic concentration risk for an agribusiness.

2. Cost Structure and Input Volatility

Running an integrated production and processing operation is working-capital intensive, and Company E faces multiple cost drivers that can be volatile. Major cost components include:

- Raw material procurement: Purchasing paddy [program omitted] from thousands of farmers is the single largest cost. Company E typically pays farmers promptly at harvest at agreed floor prices. If market prices surge above the contract price, the company may choose to pay bonuses to retain farmer loyalty (effectively raising its cost of goods). Conversely, in a bad season, it might face higher unit costs due to lower volumes. The company is also vulnerable to commodity price spikes – for example, if regional demand drives paddy prices up, Company E must either pay more or risk side-selling by farmers.
- Input financing and farm support: As part of its model, Company E often supplies or advances inputs (seed, fertilizer) to farmers. These outlays can be significant and are exposed to global price trends. Notably, fertilizer is mostly imported in Kenya; global price spikes (as seen in 2022) or currency devaluation can sharply raise fertilizer costs. While farmers ultimately repay in kind, if a farmer's crop fails or if some default, the company may incur losses on these inputs.
- Processing and utilities: Milling [program omitted] is energy-intensive. Electricity and fuel costs are substantial – the mill relies on grid power plus diesel generator backup. Kenya's grid power is almost entirely hydro-based, so drought-related power cuts have forced heavy use of diesel generators. In late

2023, the Kenya kwacha was devalued by 44%, which instantly drove diesel prices up ~45%. Such swings in fuel and electricity costs directly affect processing expenses and can erode profit margins if not passed on in [program omitted] prices.

- Packaging and logistics: The company imports packaging materials (polypropylene bags, labels) and incurs transport costs to distribute finished products. These costs are tied to foreign exchange and oil prices. The recent kwacha devaluation and 27% general inflation have made packaging and transport markedly more expensive. For example, petrol prices jumped ~42% in November 2023 after the currency drop, impacting distribution cost. With fuel constituting a big portion of logistics expenses (moving heavy grain and [program omitted] over long distances), such increases compress margins unless the company adjusts its selling prices.
- Labor and overhead: Company E employs staff for the plant (machine operators, quality controllers) and field extension officers. As a growing enterprise, it keeps a lean team, but as operations expand, salary and training costs are rising. Inflation puts pressure on wages, and skilled agribusiness professionals command competitive pay. The company also spends on maintaining irrigation infrastructure in its scheme partnerships (canal repairs, pump maintenance) – while sometimes subsidized by projects, these can become operational costs.

Given these factors, Company E's cost structure is vulnerable to macroeconomic swings. Kenya's economy has seen high inflation (food inflation ~35% in late 2023) and repeated currency devaluations, which together drive up input costs. Importantly, the company cannot always pass on cost increases to consumers. Local [program omitted] competes with imports and household purchasing power is limited – steep price hikes could reduce sales. Thus, during periods of rising costs (fuel, inputs, packaging), Company E may have to absorb some costs, squeezing profit margins.

Conversely, if a bumper harvest increases supply and pushes farmgate prices down, the company might gain margin but could face pressure to pay farmers more to maintain goodwill. Managing this delicate balance is a key financial challenge. The use of forward contracts with farmers partially insulates against intra-season price volatility, but it transfers risk to the company if market prices move unfavorably. In summary, Company E's profitability is sensitive to input and operating cost volatility, stemming from factors like currency fluctuations, global commodity trends, and domestic inflation. Building financial resilience will require

strategies such as bulk-buying inputs when prices are low, improving energy efficiency (to cut power costs), and possibly hedging currency risk or local fuel prices if instruments exist.

3. Working Capital and Liquidity

As with many agri-processing ventures, Company E experiences a mismatch in cash flow timing. The company must outlay significant cash at harvest time to buy paddy from farmers (and to repay any input advances via crop collection). However, converting that paddy into polished [program omitted] and selling it can take weeks or months. If selling to wholesalers or supermarkets, there may be additional credit terms (e.g. payments 30 days after delivery). This creates a working capital gap where cash is tied up in inventory. For example, right after harvest Company E may spend tens of millions of MWK to procure several hundred tons of paddy, but recouping that money through [program omitted] sales might span the next 3–6 months. During that interval, the company still has to pay salaries, fuel, electricity, and other operating costs. If it lacks sufficient working capital or credit lines, it could face liquidity stress – inability to restock inputs, delayed payments to staff, or, critically, inability to pay farmers on time (which would damage trust).

In the past, Company E has partially relied on [personal achievement omitted] funding and competitions to finance its expansion – for instance, securing funds via the [organization omitted]'s youth agribusiness [personal achievement omitted] to purchase processing equipment. While these injections help capital investment, day-to-day operations still need cash flow financing. Traditional bank credit for working capital in Kenya is expensive (interest rates often above 20%) and hard to obtain without substantial collateral. Company E's collateral is limited (mostly the processing plant and some inventory). Additionally, banks perceive agriculture as high-risk due to weather dependency. Thus, the company's access to short-term loans has been constrained. It often must self-finance through retained earnings (which, as a young firm, are modest) or seek advance payments from buyers. There is some possibility of leveraging warehouse receipt financing in future – i.e. using stored [program omitted] as collateral for a loan – but that system is not well-developed in Kenya's [program omitted] sector yet.

Seasonality exacerbates the issue. Revenues peak after harvest when [program omitted] is milled and sold, then may dip in the lean season. Meanwhile, fixed costs (plant maintenance, scheme support activities) continue year-round. In a poor harvest year, cash inflows might be much lower, but obligations to farmers (for input credit or minimum price) still must be met, potentially causing a cash crunch.

This scenario underscores why liquidity management is a significant risk. For instance, if 50% of expected volume doesn't materialize due to drought, the company could have a major revenue shortfall and struggle to cover overheads or debt service.

To date, Company E has maintained liquidity through cautious scale-up – piloting with 2 schemes and 1,000 farmers before expanding. It has also sought blended finance: the [program omitted] proposal indicates that "GIF funding" (likely Global Innovation Fund or similar) is being sought to support the Farmer Support Unit operations and mechanization for farmers. Such [personal achievement omitted] or concessional funds help cover operating costs that otherwise would strain cash flow. Nonetheless, as the company moves into full commercial expansion, it will need more robust working capital solutions (explored in section 8). The bottom line is that cash flow pressures are inherent in Company E's model – significant upfront seasonal expenditures against delayed revenues. Without adequate financing arrangements, this could slow growth or, in worst case, lead to insolvency if a shock occurs. For now, careful planning (e.g. staggering purchases, using small pilot harvests to build inventory gradually) and external support have kept the company liquid, but working capital remains a moderate-to-high financial risk going forward.

4. Credit Access and Investment Readiness

Company E is an early-growth stage enterprise and is still building its financial track record. It has shown promising progress – for example, successfully installing a processing plant and forming formal contracts with farmer organizations – which makes it a candidate for impact investment. The company has engaged with platforms like [organization omitted] to court investors and has sought partnerships with development prograthe founder However, there are gaps in investment readiness that need addressing. Firstly, it is not clear if the company has audited financial statements or sophisticated accounting systems in place. Many Kenyan SMEs struggle with comprehensive financial record-keeping and management controls. If Company E's financial reporting is still semi-formal (e.g. basic spreadsheets or cash accounting), this could be a concern for investors who require transparency and reliability in financial data. Strengthening bookkeeping and perhaps implementing an ERP system for tracking inventory and sales would enhance credibility.

In summary, investment readiness is emerging but not yet fully realized. The company will benefit from capacity-building in financial management, continued generation of performance data (e.g. yield improvements, repayment rates, profit margins per unit), and securing modest early-stage investments to prove its creditworthiness. Each successful seasonal cycle (with financial results) will bolster its case. For now, Company E can be seen as a high-impact, moderate-risk investment opportunity: it addresses a clear market gap and development goal, but investors must be comfortable with the execution risks of a young enterprise operating in a challenging environment. With improved financial controls and strategic partnerships (such as guarantee schemes or co-investment by development finance institutions), the company's financial risk profile will become more palatable for larger-scale funding.

Climate Risk Assessment

Key Climate Hazards: Kenya is among the world's most climate-vulnerable countries, exposed to increasing temperatures, erratic rainfall patterns, and extreme weather events. For Company E and its network of [program omitted] farmers, the primary climate hazards include:

1. Droughts and Rainfall Variability

Drought is a major threat even for irrigated farming. Most irrigation schemes in Kenya rely on river flows or lake levels that are ultimately rain-fed. Climate change has led to more frequent and intense dry spells. A severe drought can reduce water availability in canals, limiting irrigation and causing crop moisture stress. Droughts in Kenya have increased in frequency, causing on average at least 1% of GDP loss annually and hitting central regions (like [location omitted]) particularly hard. Moreover, late onset or early cessation of rains (in rainfed portions of schemes or in rainfed complementary cropping) can disrupt the [program omitted] growing cycle. [program omitted] is a water-intensive crop – insufficient water at critical growth stages (e.g. flowering) can cut yields dramatically. Even if water for irrigation is available, drought conditions raise temperatures and evaporation rates, demanding more careful water management.

2. Floods and Cyclones

At the opposite extreme, heavy rainfall events and tropical cyclones pose risks of flooding. Kenya has experienced destructive floods (sometimes cyclone-induced) that wash away fields and infrastructure. In the lakeshore districts where Company E operates, intense rain can lead to river overflow or flash floods, damaging irrigation canals, dikes, and roads. Approximately 60,000–100,000 people are affected by river flooding annually in Kenya. For the company, floods could mean

fields waterlogged beyond manageable levels, leading to crop losses, or physical damage to scheme facilities (pumps, canals) and roads that delays harvest collection. In addition, a cyclone event can devastate broader regions – while rare, Cyclone Idai (2019) and Cyclone Freddy (2023) caused extensive agri-sector damage in southern Kenya. Lakeshore schemes in [location omitted]/[location omitted] are somewhat north of the typical cyclone landfall zone, but cannot be ruled out from extreme storm impacts.

3. Heatwaves and Temperature Rise

Gradually rising temperatures and occasional extreme heatwaves also threaten production. [program omitted] is sensitive to high temperatures, especially during the flowering stage when heat stress can cause spikelet sterility (empty grains). Kenya's climate projections indicate increasing hot days; a heatwave during the growing season could reduce yields or grain quality (lower grain weight). Heat stress also increases water demand for crops. If irrigation water is insufficient to cool fields, yields suffer. Additionally, higher temperatures can reduce the milling quality of [program omitted] (grains might chalk or break more). While moderate warmth benefits [program omitted], beyond an upper threshold it's harmful.

4. Pest and Disease Outbreaks

Climate change is contributing to shifting pest and disease patterns. Notably, pest attacks are on the rise in Kenya under climate stress. For [program omitted], this could include surges in insect pests like [program omitted] stem borers or aphids in hot, dry conditions, and fungal diseases like [program omitted] blast in humid, warm conditions. The fall armyworm, a pest known for maize, can also attack [program omitted] seedlings especially if alternative hosts are scarce during drought. Likewise, warmer temperatures and variable humidity could facilitate aflatoxin fungi on grains if harvests are delayed. Farmers in Company E's schemes, if unprepared, might see higher crop losses from such biotic stresses. The company itself could end up processing lower-quality or contaminated grain if these issues are not managed, affecting its product quality and safety.

Together, these hazards form a multi-faceted climate risk environment: droughts threaten to diminish water supply and yields; floods threaten sudden destruction; heat and pests threaten gradual but significant losses. Crucially, these events often do not occur in isolation – for example, a drought year might be followed by pest infestations in weakened crops, compounding the damage. Company E must therefore plan for a range of climate scenarios, from slow-onset stress (drought) to acute shocks (floods).

5. Geographic Exposure and Sensitivity

Company E's current operations are concentrated in Kenya's central lakeshore region ([location omitted], with expansion to [location omitted] and [location omitted]). This geography has a tropical climate moderated by Lake Kenya, generally suitable for [program omitted]. However, it is not immune to climate stress. [location omitted] and [location omitted] receive decent annual rainfall (~800-1200 mm), but rainfall patterns have become less reliable. The lakeshore saw erratic rains in recent years – including both late starts and occasional torrential downpours. Being low-lying, these areas can suffer from flash floods when upstream catchments get heavy rain. At the same time, in years of regional drought, lake levels can drop and rivers feeding the schemes run low (the Lake Kenya/Shire River system has in the past hit critically low levels in drought, affecting irrigation and hydropower).

Most farmers engaged by Company E are smallholders on 0.5-1 hectare plots within these irrigation schemes. While irrigation gives them an edge over purely rain-fed farmers, the infrastructure is often rudimentary and climate-sensitive. For instance, unlined earthen canals can break in floods, and simple earthen dams may not hold in extreme weather. If such infrastructure fails, the entire scheme's crop can be lost. Because the schemes are community-run, maintenance might be under-resourced, making them vulnerable. The company has identified at least 10 schemes with ~6,000 farmers in the region to work with, meaning its exposure spans multiple micro-climates but within the same broader central region. A severe regional drought would likely affect all these schemes simultaneously – a concentrated risk. In contrast, a localized flood might hit one scheme hard but spare others, which somewhat spreads risk if the schemes are geographically separated.

Crop sensitivity is high for [program omitted], despite being in an irrigated system. [program omitted] generally requires abundant water and is sensitive to both deficit and excess. The productivity of Company E's supply chain can drop sharply if climate conditions are suboptimal. For example, drought conditions in 2016 saw Kenya's overall [program omitted] yields decline, and in extreme dry years some schemes couldn't plant a second crop. Conversely, too much rain can reduce yields by causing nutrient leaching and fungal diseases. The yield gap in Kenya's [program omitted] is notable: rain-fed [program omitted] yields only ~1.2 t/ha vs a potential of 4 t/ha, while irrigated [program omitted] averages ~4 t/ha vs a potential of 6 t/ha. Much of this gap is due to suboptimal practices, but climate stress (droughts/floods) also contributes. If Company E's interventions close the management gap (getting yields closer to 6 t/ha under irrigation), that builds some

buffer – yet an extreme climate event could still slash yields by 30-50% in a bad year.

Additionally, because Company E's processing operations are in the same climate zone, they too face risk. A flood or cyclone that hits farms could also damage roads and power lines that the mill depends on. And as noted earlier, Kenya's hydropower-dependent energy system means that droughts translate to power outages, which indirectly affect processing capacity. So, the climate risks extend beyond the fields to the entire value chain infrastructure.

6. Adaptive Capacity and CSA Practices

Company E is proactively integrating Climate-Smart Agriculture (CSA) practices into its model, which enhances resilience for both the company and its farmers. Some of the adaptive measures in place or planned include:

- Irrigation and Water Management: The very basis of Company E's model – partnering with irrigation schemes – is a climate adaptation strategy. Irrigation significantly reduces dependency on rainfall timing and volume. The company is working to improve scheme management efficiency, ensuring water distribution is optimal. Under the [program omitted], one objective is to introduce solar-powered irrigation pumps and rehabilitate canals. Solar pumps can secure water supply in case of erratic grid power and can potentially expand irrigated area using sustainable energy. Training farmers in water-saving techniques, such as timely irrigation scheduling and avoiding over-flooding, is also part of extension advice to conserve water in drought times.
- Improved Seed Varieties: Company E provides certified [program omitted] seed to farmers, often improved varieties with better yield and sometimes stress tolerance. For instance, newer [program omitted] varieties promoted in Kenya can be shorter-duration (escaping late-season drought) or more tolerant of minor drought and pests. By moving farmers away from recycled seed to improved ones, the company helps them achieve more reliable yields even under climate stress. The promotion of short-cycle or drought-tolerant [program omitted] varieties is a key CSA practice that Company E can leverage (in coordination with national programs – Kenya's research stations and [organization omitted] have been advocating such varieties).
- Diversification and Crop Management: Although [program omitted] is the main crop, many scheme farmers also intercrop or rotate with other crops like legumes in the dry season. Company E encourages a rotation with

legumes or horticulture where feasible – legumes (e.g. beans) not only provide extra income but also fix nitrogen, improving soil health for the next [program omitted] crop. Healthy soils retain moisture better, buffering against drought. The company's extension messages include good agricultural practices (GAP) that double as climate adaptations: proper land leveling (for uniform water distribution), timely planting to match rainfall patterns, and maintaining field bunds to capture water.

- Pest/Disease Management and Early Warning: The firm is introducing integrated pest management (IPM) approaches for its farmers. This includes training on regular field scouting, using resistant varieties, and judicious use of pesticides only when needed. By coordinating planting times across the scheme, Company E can help break pest life cycles (all fields not being staggered too widely reduces pest carry-over). In collaboration with partners (like Kenya's ag extension or digital ag services), Company E can disseminate weather forecasts and pest outbreak alerts via SMS or community meetings. For example, if there's a forecast of an armyworm outbreak in the region due to drought, they can mobilize early spraying or use of bio-pesticides. These efforts increase farmers' capacity to respond quickly to climate-exacerbated pest threats.
- Post-harvest and Infrastructure Resilience: Adaptation is also about protecting the harvested produce. Company E is investing in better drying and storage facilities (tarpaulins for drying, improved cribs and warehouses). Proper drying of [program omitted] to safe moisture levels (around 13-14%) before storage prevents mold growth even if humidity fluctuates. Constructing or rehabilitating storage with raised platforms protects grain from flood water or dampness. The company's plan to provide mechanical dryers or additional storage bins under [personal achievement omitted] support would further climate-proof the post-harvest phase. Furthermore, recognizing power reliability issues due to climate, the company's interest in solar energy for processing and cold storage (for any perishable side products) is an adaptive strategy to ensure continuity during climate-induced power outages.

While these measures illustrate a solid start, there is room to systematically integrate CSA into every aspect of the mode

Currently, many climate resilience practices are being introduced (e.g. improved seed, irrigation rehab) but are not yet fully institutionalized or scaled. The [program omitted] explicitly aims to institutionalize such practices by establishing the FSU

and embedding climate-smart extension as a core service. This dedicated unit can increase adoption of innovations like alternate wetting and drying (AWD) irrigation (to save water) or climate-informed cropping calendars (planting slightly earlier or later based on seasonal forecasts). The adaptive capacity of Company E's farmers will grow as the company deepens these efforts. It's also noteworthy that Company E's model inherently diversifies risk across many farmers and locations – which is a resilience factor. Not all farmers will experience micro-climate impacts equally; a flood might hit one scheme but not another, a pest outbreak might be localized, etc. By aggregating from multiple schemes, the company is somewhat insured against total loss from a climate event in one location. However, a large-scale drought or national disaster could still impact everyone simultaneously, which remains a critical risk.

In summary, Company E's adaptive capacity is moderate but improving. The company is aware of climate challenges and actively pursuing solutions (irrigation, improved practices, mechanization, etc.). Continued partnerships with climate-focused organizations (such as [organization omitted]'s [organization omitted] or government climate services) could further boost its capacity – for example, introducing weather-index insurance or providing climate advisories to farmers. The foundation is there: an organized farmer network and an incentive to adopt CSA (since both the farmers and company benefit from stable yields). With incremental improvements, Company E can become a model for climate-resilient smallholder agriculture in Kenya, though it will always face residual climate risks that require contingency planning (see section 8 for financing instruments like insurance to cover these).

Infrastructure and Value Chain Vulnerabilities: Climate risks for Company E extend beyond the crops to the supporting infrastructure and value chain elements that the business relies on. Key vulnerabilities include:

- Irrigation Infrastructure: The canals, pumps, and dams of smallholder irrigation schemes are often not built to withstand extreme weather. A major flood can breach canal embankments or silt up intakes, knocking the scheme out of operation for an entire season until repairs are made. Conversely, during drought, insufficient reservoir storage or pump capacity might lead to water rationing among farmers (reducing yields). The company's model depends on these community-owned assets functioning well. If climate events repeatedly damage them, Company E might incur higher costs to help fix infrastructure or lose production time. Part of the [program omitted]'s plan is to facilitate rehabilitation of irrigation

infrastructure – for example, reinforcing canals or improving drainage – specifically to cope better with climate extremes. This will need continuous attention as climate change advances.

- Roads and Transport Links: Getting inputs in and crops out requires usable roads. Many scheme locations are connected by dirt roads that turn muddy or wash away in heavy rains. Seasonal cut-offs are common. Floods could delay the collection of paddy from schemes, risking spoilage or theft if the crop sits too long. In the worst case, a bridge collapse or road washout could isolate a production area at a critical time. This not only impacts that season's throughput but also farmer morale (if they can't sell because trucks can't reach them). It underscores the importance of the company's logistics flexibility – having access to 4x4 trucks, pre-stocking some inputs ahead of the rainy season, and maybe advocating for local infrastructure improvements.
- Processing Facility Risks: The [program omitted] mill facility faces climate-related operational risks, chiefly from power disruptions and physical storm damage. As noted, drought-induced power shortages are a reality in Kenya, so prolonged outages could slow processing (though backup generators mitigate this, at the cost of higher fuel use). On the flip side, severe storms could physically damage structures – high winds or lightning could harm roofs, and floods could inundate low-lying processing sites. While [location omitted] is not a cyclone hotspot, general storm-proofing (good drainage around the facility, sturdy construction) is important. Additionally, rising temperatures might necessitate improved ventilation at the facility to maintain grain storage quality and worker comfort.
- Value Chain Dependencies: Climate impacts on the wider value chain can trickle down to Company E. For example, if a major regional drought hits and Kenya's government declares a food emergency, there might be policy actions (like export bans or price controls) that affect [program omitted] marketing. Or if regional shortfalls occur, larger buyers might come poach Kenya's [program omitted] at high prices, encouraging side-selling by farmers (a behavioral risk exacerbated by climate-driven scarcity). Upstream, climate events abroad can impact input supplies: global fertilizer prices spiked in 2022 partly due to geopolitical issues and energy costs, but also production issues – a similar spike could occur if climate events hit major fertilizer producers. The cost and availability of imported inputs like fertilizer and fuel thus have a climate dimension and affect Company E's operations.

Overall, the entire chain from "farm to fork" has weak links under climate stress. Company E's decentralized, partnership-based model gives it agility (not all eggs in one basket), but also means it must ensure resilience across many touchpoints. The company's current strategy addresses some of these – e.g. investing in solar for independent energy, building local storage to reduce reliance on transporting everything immediately, and working closely with communities to respond quickly to damages. Nevertheless, in a severe climate scenario, Company E could face simultaneous hits: lower production, harder logistics, and possibly even market disturbances. This calls for not only adaptation (as discussed) but also risk transfer mechanisms and contingency plans, which are covered in later sections. The climate risk, in summary, is moderate to high: moderate in normal variability due to irrigation presence, but high in the face of extreme or compounded events.

Behavioral Risk Assessment

1. Internal (Organizational) Risks

Company E is a small but growing organization, which naturally comes with certain internal behavioral risks. A prominent one is "key person dependency." The founder and Managing Director, the founder, is the driving force behind the company's vision and operations. As a relatively young enterprise, a great deal of institutional knowledge, relationships (with farmers, partners, funders), and decision-making may be concentrated with her and a few core team members. This presents a risk: if any key individual were to leave, become unavailable, or make poor decisions under pressure, the business could struggle. For instance, much of the trust built with community irrigation schemes might hinge on the personal rapport of the founder or FSU manager. To mitigate this, the company will need to build a broader leadership bench – training deputies, formalizing processes, and maybe instituting a board or advisors who can guide the company if leadership changes. At present, the team is lean: roles like Operations Manager, Production Manager, etc., exist (as per the website) but it's unclear how many are filled vs. placeholders. As operations scale to multiple sites, the internal management capacity could be stretched thin. This raises the risk of operational inconsistencies – e.g. one scheme's support might falter if a field officer quits and there's no immediate replacement, or record-keeping at the processing plant might lapse if the small finance team is overwhelmed. In essence, scaling pains are a risk: without strong internal systems, rapid expansion to 6,000 farmers could result in breakdowns (missed pickups, delayed input deliveries, etc.).

Farmer-Level Behavioral Risks: The success of Company E's model hinges on thousands of independent smallholder farmers consistently cooperating – a realm where human behavior can be unpredictable. Key farmer-level behavioral risks include:

2. Side-selling and Contract Default

Even with contracts in place, farmers may be tempted to side-sell their [program omitted] paddy to other buyers, especially if offered a slightly higher price on the spot. This is a common issue in contract farming. For example, if during harvest a trader comes with cash in hand and a price above the contract floor, some farmers might violate agreements to earn immediate income. This risk is heightened in years when market prices spike (perhaps due to a regional shortfall). Side-selling erodes the supply base for Company E and can undermine the viability of providing inputs on credit (if farmers sell outside, the company cannot recover its input costs). Building loyalty through fair pricing and non-monetary benefits (like extension support, community goodwill) is how Company E counters this, but the risk cannot be eliminated. Close monitoring at harvest and involving farmer co-op leadership to enforce agreements can help, yet some leakage may occur.

3. Loan/Input Default

Company E often provides inputs with the expectation of repayment in grain at harvest. If a farmer has a poor yield (due to weather or other issues), they might default on the input loan – either unwilling (feeling the contract failed them) or unable (not enough crop). In group schemes, one farmer's default can be contagious if others see no immediate penalty. This behavioral risk is partly driven by climate (bad harvests) but also by trust: if farmers believe the company will forgive debts or not follow up, they may not prioritize repayment. It's crucial for Company E to set clear expectations and perhaps use group guarantee mechanisms (peer pressure) to maintain high repayment rates. So far, with 1,000 farmers, the default rates are presumably being monitored; as that scales, the company might face pockets of higher default, especially in disaster years. This intersects with financial risk for the company as well.

4. Adoption of New Practices

Another behavioral challenge is farmer uptake of the recommended practices. Changing long-held farming habits is difficult. Some farmers may be hesitant to transplant [program omitted] seedlings at wider spacing as advised (an SRI

practice) or to invest extra labor in water management, unless they tangibly see benefits. A risk is that despite training, a portion of farmers do not implement the climate-smart techniques offered – resulting in suboptimal yields. They might then blame the seeds or the company for not getting expected gains, straining the relationship. Similarly, if mechanization (like using a power tiller) is introduced, some farmers might distrust the new method or worry about costs, thus underutilizing equipment that Company E subsidized. Overcoming this requires continued demonstration plots, farmer field days, and using lead farmers as examples. Behavior change is gradual; in the interim, inconsistent adoption can lead to uneven results (some farmers succeed, others lag), posing a management challenge.

5. Quality Control at Farm Level

Farmers' behavior at harvest and post-harvest can affect the quality of paddy delivered. For instance, if farmers prematurely harvest to get cash early, the [program omitted] may have high moisture or immature grains, which lowers milling recovery. Or if they thresh on bare ground, the paddy can have stones and dirt. Company E relies on farmers to follow quality guidelines, but not all may do so diligently. If quality issues persist, the company might incur higher processing costs (cleaning, drying) or face market issues (e.g. broken [program omitted] percentage high). Farmer habits (like drying for enough days, or storing crops properly) are hard to monitor across thousands of small plots. The company's extension approach tries to instill good practices, yet some lapses will occur. This is a moderate risk to product quality consistency.

In essence, farmers are independent actors and their buy-in, trust, and satisfaction are critical. If farmers feel the partnership is not fair or beneficial, their behavior might shift negatively (e.g. withdrawing from the scheme, or reducing effort on their crop). So far, Company E's inclusive model – offering multiple benefits (inputs, training, guaranteed market) – provides strong incentives for farmers to stick with it. However, the initial 50+ farmers grew to 1,000, and not all 1,000 will behave uniformly. Continued clear communication, honoring purchase commitments, and sharing value (perhaps via bonus payments in good years) will be needed to maintain farmer loyalty and good behavior. A potential mitigation the company might consider is formalizing farmer groups or cooperatives that co-own some aspect of the venture (giving farmers a sense of ownership, maybe profit-sharing or equity in the processing unit, which significantly boosts loyalty). For now, farmer behavioral risks are moderate – manageable, but they could intensify if economic conditions change (e.g. if inflation makes farmers desperate for immediate cash, side-selling could spike).

Value Chain and External Behavioral Risks: Beyond the farmers, Company E's success depends on the behavior of other actors in the value chain – from input suppliers to market players to government agencies. Several risks stand out:

6. Competitors and Middlemen

The presence of informal traders in the market is a reality. These traders might try to undercut Company E's model by offering slightly higher farmgate prices (often because they have lower overhead and perhaps evade taxes). They may also engage in predatory buying tactics like arriving early with cash or exploiting any delay by the company in collecting harvest. This competitive behavior is a risk because it can chip away at Company E's supply base or force the company to pay more than planned to retain volumes. Additionally, informal millers or traders might flood the market with lower-priced [program omitted] (possibly of lower quality) that consumers buy purely on price, pressuring Company E to reduce its prices. The company's strategy to counter this is differentiation – building a brand for quality and origin, and emphasizing formal market channels. But given Kenyan consumers are price-sensitive, [personal achievement omitted] on price can't be ignored. Company E has to behave tactically: during harvest glut, it must remain competitive to prevent farmers turning to traders; during lean periods, it can capitalize on higher prices but should not gouge consumers or it could lose market share. Middlemen behavior often exploits any weakness in the formal chain – e.g. if Company E is late to pay farmers, a trader will seize that opportunity. Hence maintaining operational excellence is key to fending off this behavioral risk.

7. Downstream Market Behavior

On the selling side, how distributors, retailers, and consumers behave also carries risk. Distributors might delay payments or demand consignment stock (only paying after they've sold the [program omitted]), which can hurt Company E's cash flow. Retailers might not give shelf space or marketing push to a new brand like Company E's [program omitted], perhaps favoring established brands or imports. This could slow product uptake in the market. Moreover, consumer behavior is influenced by habits and perceptions: Kenyan consumers might have biases, for instance some might initially perceive local [program omitted] as inferior to imported Thai [program omitted] in consistency. Changing such perceptions requires marketing, and there's a risk that without sufficient promotion, consumers may not switch as readily as anticipated. If a segment of consumers prefers the appearance of imported polished [program omitted], Company E must either educate them or improve its polish quality to match. These downstream risks mean the company must invest in marketing and relationship-building with wholesalers. It has to be

ready to possibly offer credit or discounts to retailers to stock its product initially, which is a risky but sometimes necessary behavior to induce market acceptance. Any wholesale buyer's opportunism – e.g. squeezing the company for lower prices at last minute – could also happen, especially if the company is seen as eager to sell volume. Being a smaller player, Company E doesn't yet have market power, so it must carefully manage these relationships.

8. Policy and Regulatory Behavior

While not a "behavior" of a single person, the actions of government bodies can be viewed as an external factor that often behaves unpredictably from the business's perspective. Kenya's government has historically intervened in agriculture markets (price controls, export bans, input subsidy programs). There's a risk that a policy change could alter stakeholder behavior overnight. For example, if government launches a subsidized [program omitted] purchase program or sets a minimum farmgate price above what Company E budgeted, farmers might divert sales to that program or demand the higher price. Or if government were to remove import duties on [program omitted] (unlikely given current stance, but hypothetically), a surge of cheap imports could come, and retailers might drop local suppliers. Another scenario: the government might expand a fertilizer subsidy program that gives free inputs to farmers – farmers might then question why they should repay Company E for inputs when the government program gives them free elsewhere. Such misalignment has happened in other crops (e.g. in Kenya's maize sector, frequent political interventions have distorted markets). While these are beyond Company E's control, they represent a behavioral risk at the institutional level. The company needs to stay alert to policy shifts and engage in dialogue (through industry associations or partner NGOs) to advocate for policies that support fair [personal achievement omitted] and value chain development.

9. Community and Social Dynamics

Lastly, we consider the behavior of the broader community. Company E works in rural communities where social license is crucial. So far, by partnering with farmer organizations, the company has a built-in local acceptance; however, community perceptions can change if issues arise. For instance, if one year farmers earn much less (due to climate or price), some community members might blame the company's management or terms, leading to distrust. There could also be dynamics like local leadership wanting a say – if traditional chiefs or cooperative leaders feel bypassed or disrespected in decision-making, they might discourage farmer participation. The company must navigate local politics carefully, ensuring transparency and inclusive engagement (holding meetings with all stakeholders

when introducing new initiatives). Social inclusion is a point of pride – Company E notes that many beneficiaries are poor smallholders, including women and youth. Ensuring that benefits (like training, credit) are equitably distributed and that no group feels left out is important to avoid jealousy or rumors that could undermine the program.

In summary, external behavioral risks span the entire chain: input suppliers, competitors, buyers, regulators, and communities all have their own motivations that may conflict with Company E's interests at times. These risks are complex and intertwined with market conditions. The company's approach to mitigating them includes building strong relationships (e.g. being a trusted partner so input suppliers value the business, being a fair buyer so farmers stick with them, being a reliable vendor so distributors trust them, etc.), and staying agile to respond to unexpected moves by others. This requires more than contracts – it requires ongoing communication and sometimes collective action (like joining a [program omitted] millers association to lobby for certain policies or norms).

Overall, behavioral risks for Company E are moderate to moderately high. The company's close work with farmers gives it a measure of influence over farmer behavior, and its ethical, inclusive image helps maintain community goodwill. However, the real test will come as it expands: keeping hundreds of new farmers satisfied, coordinating multiple stakeholders, and not losing the personal touch that likely contributed to early success. As with many growing agribusinesses, managing human relationships and expectations at scale will be as important as managing crops and finances.

Overall Risk Summary

Risk Profile: Company E operates in a high-potential but high-variability environment. Financially, it faces significant working capital demands and commodity concentration risk, but these are balanced by a large market gap and impact-focused investors likely to support it. Climate risk is an ever-present backdrop – mitigated by irrigation and good practices, yet still capable of delivering shocks to production. Behaviorally, the company must skillfully manage the motivations and actions of farmers, staff, competitors, and partners to keep the model on track. In aggregate, Company E's risk exposure can be characterized as follows:

- Financial Risk: 🔶 Moderate–High. The enterprise is vulnerable to cash flow shortages and relies on one primary revenue source ([program omitted]), making it sensitive to price or volume shocks. Currency volatility and

inflation in Kenya add to cost uncertainties. While prudent management and some [personal achievement omitted] support have sustained operations, scaling will demand stronger financial buffers or external finance to avoid liquidity crises.

- Climate Risk: 🔶 Moderate. Thanks to irrigation and proactive CSA measures, Company E's farmers are better off than purely rain-fed producers. Nonetheless, severe droughts, floods, or pest outbreaks could significantly reduce output and revenue in bad years. The geographic concentration in central Kenya means a regional climate event could impact much of the supply base simultaneously. The climate risk is real but can be managed through adaptive practices and insurance mechanisms (still to be implemented).
- Behavioral Risk: 🔶 Moderate. There are considerable behavior-dependent uncertainties – from farmers possibly side-selling or defaulting, to internal capacity strain, to external partners' reliability. However, none of these are insurmountable, and Company E's emphasis on trust-building and incentives gives it a solid foundation. As it grows, introducing formal structures will be key to keeping behavioral risks at a moderate level rather than escalating.
- Operational/Infrastructure Risk: 🔶 Moderate. The company's operational model (decentralized production, centralized processing) is lean but faces challenges in logistics and infrastructure resilience. Road conditions, power supply, and irrigation maintenance all pose operational risks, especially under climate stress. These are being addressed gradually (e.g. backup power, infrastructure rehab plans). With further investment, operational risks could be lowered, but currently they remain a concern especially in extreme weather scenarios.

In narrative form, Company E's risk profile is one of manageable complexity: financial, climate, and behavioral factors intersect to create a need for vigilant management and strategic support. For instance, a climate-induced poor harvest would not only cut volumes (climate risk) but could strain cash flow (financial risk) and test farmer loyalty if incomes drop (behavioral risk). Similarly, a delay in financing could hamper input delivery, which might lead to farmers planting late and yields suffering. These linkages mean the company must pursue an integrated risk mitigation approach – strengthening financial resilience, embedding climate adaptation, and fostering strong relationships – rather than tackling each risk in silo. The moderate risk ratings indicate that while no single risk is extreme on its

own (the business is not in a warzone or a highly volatile commodity like tobacco, for example), the combination of risks requires careful navigation.

Traffic-Light Summary:

- Financial Risk: 🔶 Moderate–High (substantial working capital pressure, single-crop revenue dependence, exposed to forex and inflation volatility)
- Climate Risk: 🔶 Moderate (exposure to droughts/floods partly offset by irrigation; still significant yield variability in extreme events)
- Behavioral Risk: 🔶 Moderate (requires ongoing management of farmer contracts, key staff reliance, and partner relationships to prevent default or conflict)
- Operational Risk: 🔶 Moderate (logistical and infrastructure challenges present, though mitigated by planning; upgrades needed for long-term resilience)

Overall, Company E is an impact-driven enterprise with moderate risk that can be addressed through deliberate interventions. The next sections outline recommendations for climate-smart practices and financial instruments to de-risk and support the company's growth.

Recommended CSA Interventions

To enhance resilience against climate risks and strengthen its agricultural supply chain, Company E should implement targeted Climate-Smart Agriculture (CSA) interventions. These measures will help farmers adapt to climate variability, stabilize yields, and protect the company's raw material supply. Key recommendations include:

7. Drought-Tolerant Varieties and Improved Seed Systems

Introduce and scale up the use of short-duration and drought-tolerant [program omitted] varieties in the irrigation schemes. For example, varieties developed by [organization omitted] or national research that can mature in slightly less time or withstand brief dry spells should be promoted. Pair this with training on quality seed production/storage so that farmers can save climate-resilient seed for subsequent seasons. Improved varieties, combined with proper management, can significantly lift yields even under stress. Company E can work with research institutes to pilot new lines and multiply seed locally (possibly engaging farmers in seed production under contract). This reduces reliance on rain timing and ensures the crop can escape late-season drought or heat.

8. Water Management Innovations (AWD and Harvesting)

Enhance irrigation efficiency through techniques like Alternate Wetting and Drying (AWD) in [program omitted] paddies. Instead of continuous flooding, farmers can be trained to periodically drain fields at certain growth stages, saving water by up to 30% without yield loss. This makes precious water last longer during drought periods. Concurrently, implement on-farm water harvesting such as small reservoirs or improved canal structures to capture rainy season excess for use in dry spells. Simple interventions like check dams in waterways or communal storage ponds can increase water availability in drought years. The company can seek partnerships (e.g. with government irrigation departments or NGOs) to co-fund such small infrastructure. Efficient water use will allow schemes to cope with erratic rainfall and potentially expand the area under cultivation without requiring proportionally more water.

9. System of [program omitted] Intensification (SRI) Training

Roll out the System of [program omitted] Intensification on a wider scale as part of the extension package. SRI principles – planting single seedlings with wider spacing, using organic matter, controlled water application, and active weed management – have shown yield improvements of 20-50% in trials, even under climate stress. Key is to demonstrate SRI in farmer fields so they can see results. Company E's FSU should establish SRI demonstration plots in each scheme and use farmer field days to spread knowledge. Even partial adoption of SRI (like improved spacing or weeding) can make crops more robust to climate factors. Importantly, SRI reduces seed requirements (by 80-90%) and can improve drought resilience through stronger root systethe founder This intervention directly boosts productivity and climate resilience, aligning with goals to intensify production sustainably.

10. Integrated Pest and Disease Management (IPM)

Develop a community-level IPM program to preempt and manage climate-related pest outbreaks. For instance, train farmers to recognize early signs of emerging pests (armyworms, stem borers, locusts) and diseases ([program omitted] blast). Equip lead farmers with pheromone traps or simple scouting toolkits. The company can partner with digital ag platforms or Kenya's extension service to send SMS alerts if pest infestations are reported in the region. When an outbreak risk is high (often correlated with weather, e.g. armyworms after drought), Company E should coordinate rapid response – such as bulk procurement of appropriate eco-friendly pesticides or biocontrol agents and group application campaigns. By acting as a convener, the company can prevent isolated pest incidents from ballooning into

scheme-wide yield losses. This also includes promoting good field sanitation (destroying crop residues that harbor pests) and crop rotation to break pest cycles. Effective IPM will protect yields in an era of climate-induced pest volatility and reduce the need for expensive reactive spraying.

11. Post-Harvest Loss Reduction and Storage Climate-proofing

Invest in post-harvest technologies to safeguard harvest quality against climatic fluctuations. This entails providing or subsidizing modern drying equipment (e.g. collapsible solar dryers or mechanical dryers) to ensure paddy is dried even if sunshine is erratic due to rains. Additionally, introduce hermetic storage bags or silos for farmers to store their grain safely. Hermetic (airtight) bags prevent moisture ingress and pest infestation without chemicals, and are especially useful as humidity and pest pressures rise with changing climate. Company E could bulk procure these PICs bags or silos and distribute them at cost to farmers, or store paddy centrally on behalf of farmers in improved warehouses. This reduces losses from rot or insects, which tend to be higher in wet years or when delayed pickups occur. By cutting post-harvest losses, the company effectively increases usable production without needing more land or water – a key adaptation and efficiency gain.

12. Climate Information Services and Early Warning

Establish a system to deliver weather forecasts and climate advisories to farmers. Given the increasing variability of rainfall onset and distribution, having advance information can help farmers and the company adjust plans (e.g. shifting planting date if rains are late). Company E can collaborate with Kenya's Department of Climate Change and Meteorological Services or use existing mobile platforms to send localized forecasts and advisories (for example, a message: "Heavy rain expected next week – ensure field drainage is clear"). Seasonal forecasts, when available, can inform whether to plant a drought-tolerant variety or anticipate a longer rainy season. Coupling this with training on interpreting and acting on forecasts will empower farmers to be proactive. Over time, the company can develop "weather-smart" scheduling – aligning input distribution, planting, and harvest timing with forecasted favorable windows, thereby reducing climate risk exposure.

Financing and De-Risking Instruments

To address the financial and risk-related challenges identified, Company E should pursue a tailored set of financing and risk transfer instruments. These tools can provide the capital needed for growth while buffering the company and its farmers against shocks. Key recommendations include:

1. Seasonal Working Capital Facility (Revolving Credit)

Establish a dedicated working capital credit line to finance crop procurement and processing each season. This could be in the form of a revolving loan from a local bank or impact fund that is drawn down at harvest to buy paddy and then repaid after [program omitted] sales. To secure favorable terms, Company E can seek a partial credit guarantee from a development entity (for example, the African Guarantee Fund or a [organization omitted] DCA program). A guarantee covering, say, 50% of the loan principal would reduce the bank's risk and enable a lower interest rate or higher limit. Alternatively, the company could explore invoice discounting or inventory financing: for instance, a financier advances cash against warehouse receipts of stored [program omitted] (collateralizing the inventory). The goal is to inject liquidity right when it's needed (at harvest) and smooth the cash flow. By having this facility in place, Company E can avoid cash crunches that might otherwise force it to limit purchases (thus losing farmer trust) or delay paying farmers.

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