



OVERCOMING WATER LIMITATIONS THROUGH CONSERVATION AGRICULTURE IN KENYA'S RIFT VALLEY

FARMER-CENTERED, MARKET-LED CROP DIVERSIFICATION

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CSRA SNAPSHOT

This case study showcases holistic, context-specific innovation to build climate-smart dryland farming systems in Kenya.

Farmer-owned Agventure Ltd has advanced knowledge and practice of rainfed conservation agriculture over the last decade, with early evidence of higher land, water, and input use efficiency. To support soil-building through crop diversification, Agventure has developed processing capacity and created Pure Mountain, a marketing brand for pulse and oilseed rotation crops. To increase production volumes and promote a 'post-irrigation' agricultural economy in this water-stressed region, Agventure established two Centers of Excellence and engaged smaller-scale farmers in producing rotation crops. Combining multiple interventions within a long-term strategy has increased resilience and profitability of participating farmers.

Market-led crop diversification

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In the semi-arid region north of Mount Kenya, decades of continuous monocropping with dryland cereals have degraded soils, increased pest and disease pressure, and lowered productivity and resilience.

Agventure's CSRA challenge:
Build profitability by increasing farming system resilience to disease and water constraints.

With extensive in-migration and pressure to expand irrigation, inefficient land and water use has resulted in fragmented landscapes, low farm productivity, and over-exploitation of water resources, leading to water scarcity in downstream communities and ecosystems. With climate change, more extreme weather (longer dry spells and more intense rain) is predicted in coming decades, exacerbating existing challenges.

Kenya's protected domestic market creates upward pressure on farm prices, disincentivizing improved farm management, especially in the absence of a supportive ecosystem for agricultural innovation. Adoption of improved practices and technologies by smallholders is inhibited by poorly structured value chains, unconsolidated agronomic knowledge, and unsupportive policies. In the region's complex, heterogenous farming communities, many people are part-time farmers and ranchers, which may reduce capacity for innovation. As a result of all these factors, average yields of major crops have plateaued or decreased in recent decades (Figure 1).

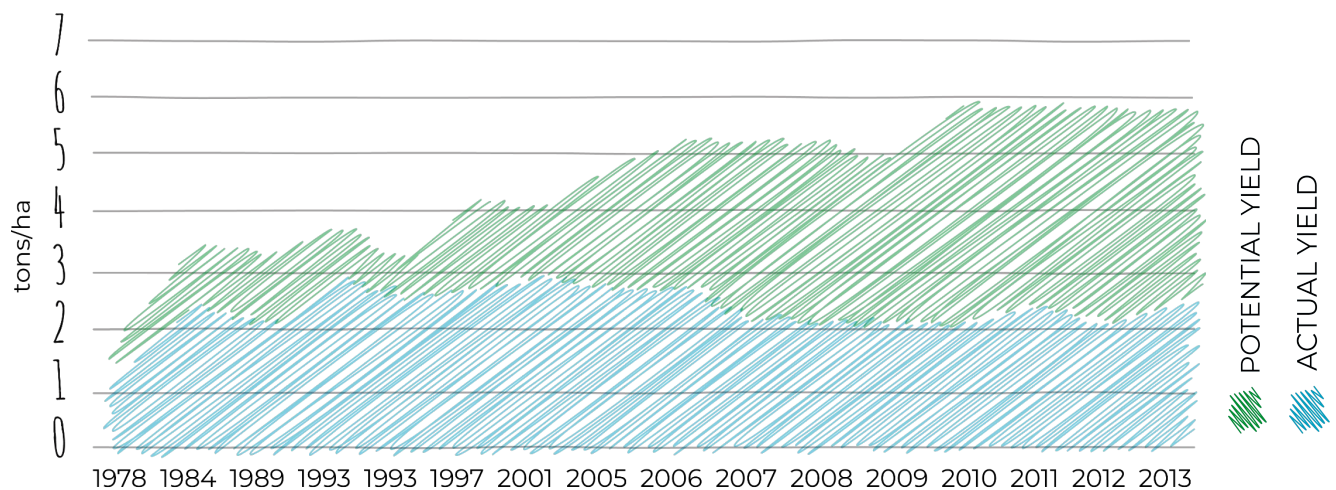
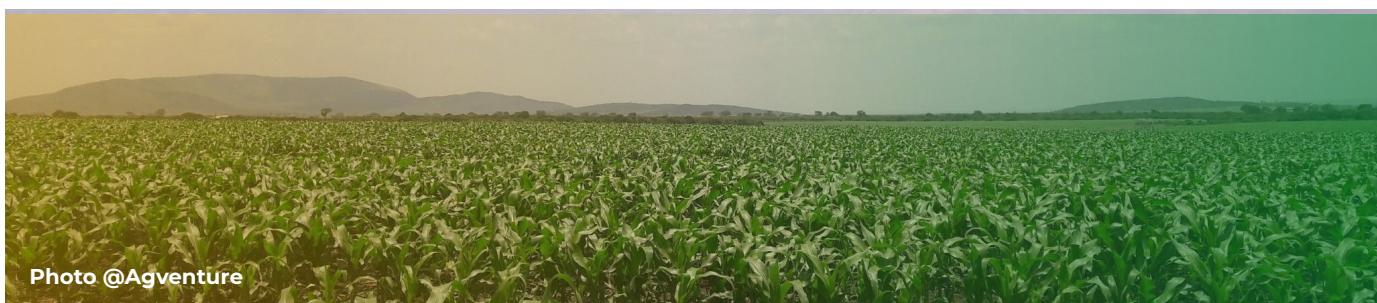


Figure 1. Before 2013, average barley yields in East Africa remained static despite varietal improvements. Decreasing soil health and pest and disease pressure prevent closing of yield gaps. (Source: East African Breweries)



PROJECT DESIGN

Seeking a more future-proof model of dryland agriculture, a group of farmers in Laikipia, Meru and Isiolo counties absorbed lessons from other regions, particularly Australia where farmers adapt to challenging growing conditions without substantial price supports.

Agventure's CSRA objective:

Create healthy soils through crop diversification supported by field trials, value chain development, and expansion of rotation crop growers.

In 2010, they established Agventure Ltd as a farmer-owned organization to test and promote improved farming practices. They have since undergone a major evolution toward sustainable production and value chain development. The major objective of Agventure today is to improve the long-term resilience and productivity of farming systems by promoting market-led crop diversification (Table 1).

PROBLEM DEFINITION

- **Low productivity and resilience** due to disease pressure, soil erosion, nutrient depletion, and low organic matter
- **Weak access** to inputs and markets for rotation crops
- **Inadequate production** of rotation crops to support new markets
- **Gaps** in agronomic knowledge, assets, finance, and markets among smallholders

OBJECTIVES

- **Soil building through crop diversification**
- **Crop diversification** supported by market development
- **Market demand met** through enlarged pool of farmer-suppliers

ACTIVITIES

1. Testing and introduction of new rotation crops and varieties
2. Building reliable, remunerative off-take markets for high-performing rotation crops
3. Enabling and incentivizing smallholders to grow rotation crops (training, input supply, off-take guarantees)



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RESULTS TO DATE

RAINFED CONSERVATION AGRICULTURE AND ROTATION CROPS

- PROFITABILITY 
- MITIGATION 
- RESILIENCE 

Despite conventional wisdom that rainfall is the limiting factor for Rift Valley agriculture, **rainfed conservation agriculture (CA)** has increased productivity, efficiency, resilience, and profitability on Agventure farms.

To build soil fertility and structure, increase rooting depth, and reduce pest and disease pressure, AgVenture farmers integrated CA strategies including enhancing on-farm agrobiodiversity through **rotation crops, reducing tillage, and controlling machinery traffic**. Lacking local experience in CA, Agventure farmers tested the in-region agronomic potential of rotation crops (e.g. canola; pulses) and new varieties (e.g. wheat; barley). Structured trials at Agventure Center of Excellence (CoE) sites, on member farms, and on CoE-participating farms benefitted from dedicated support by an expert agronomist.

After 3-4 challenging transition years, **early CA-adopting farms saw improved yields** – especially in seasons hit by drought – in both cereals and rotation crops, catalyzing wider interest. Over time, a 4-way rotation (wheat, barley, canola, pea) with fallows proved most successful.

'IN-HOUSE' INNOVATION: BUILDING MARKETS TO SUPPORT DIVERSIFICATION

- PROFITABILITY 
- RESILIENCE 

Recognizing the need for new markets to generate income from beneficial rotation crops, in 2011, Agventure farmers created a separate company, Pure Mountain, to process and sell branded pulses and oilseeds. These crops perform well on-farm and do not directly compete with wheat millers, Agventure's primary customers. As yet, production volumes have not been sufficient for building partnerships with large off-takers and processors. However, compared to working through larger value chain companies, sales revenue and cash flow for value-added products were higher at Pure Mountain branded shops located in small towns.

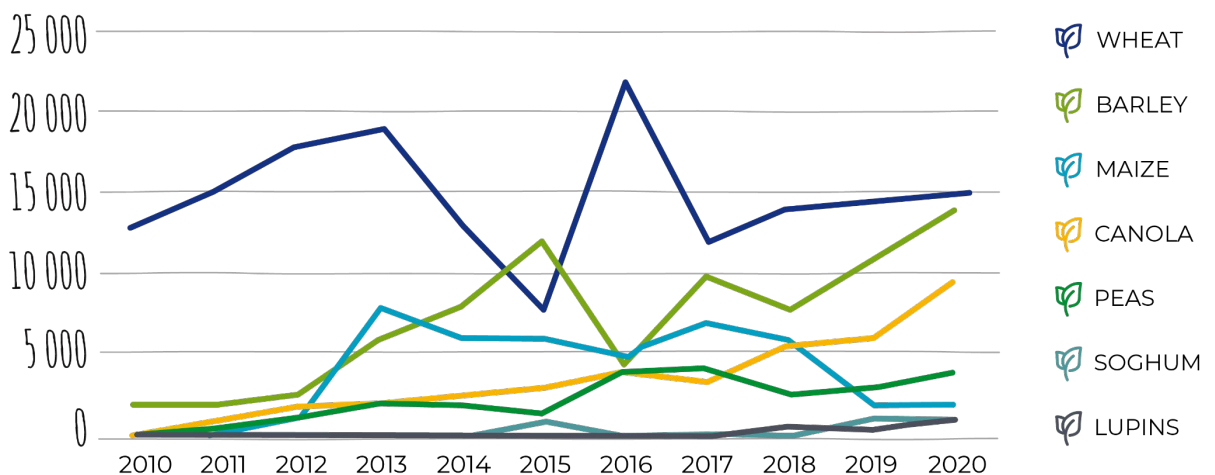


Figure 2. Crops traded or processed by AgVenture (in metric tons) have diversified, providing new income streams while maintaining cereal yields.

BOOSTING SUPPLY OF ROTATION CROPS

PROFITABILITY



MITIGATION



RESILIENCE



To achieve economies of scale for newly established rotation crop markets, Agventure cultivated additional farmer-suppliers in the region. An off-take guarantee by Unilever enabled Agventure to offer canola crop contracts to smallholders, accompanied by a robust educational program.

At first, consistent delivery of high-quality grain in adequate volumes proved elusive given low trust in the off-take market, gaps in available seed and machinery, and lower immediate financial return compared to a cereal crop. Agventure adapted its smallholder engagement strategy and, by 2018, over 400 contracted farmers delivered 927 tons of canola, representing 18% of the total annual volume of an Agventure processing facility.

As demand for Pure Mountain products continues to exceed supply, further strong growth of the smallholder engagement program is anticipated (Figure 3).

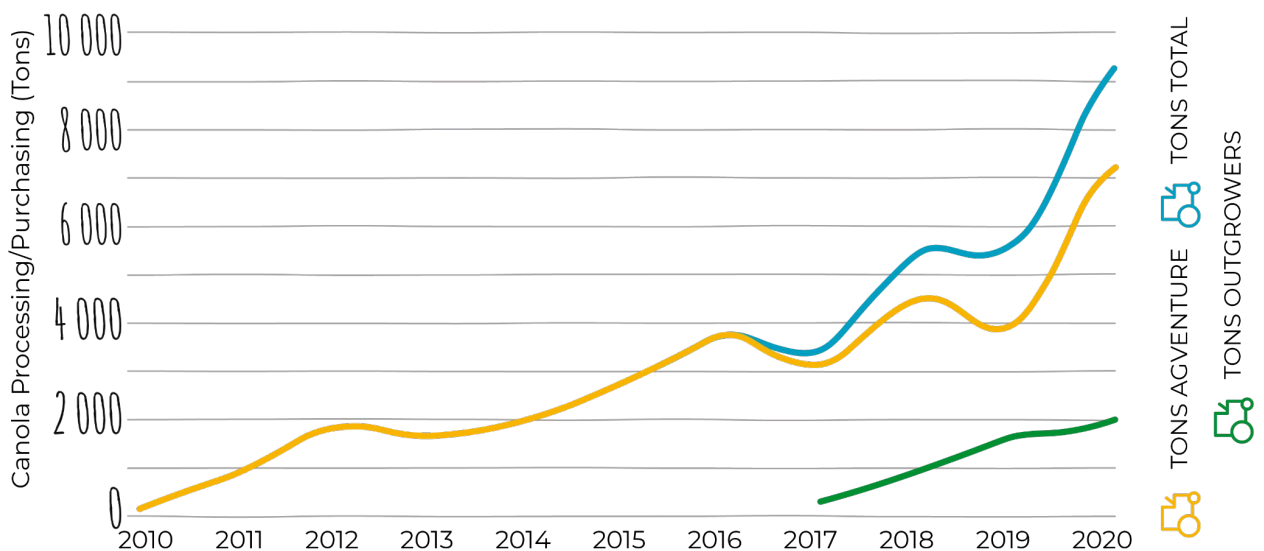


Figure 3. Canola production, by AgVenture farms and by outgrowers, has greatly increased in recent years.



Photo @Agventure

CSRA LENS



PROFITABILITY



MITIGATION



RESILIENCE

Objectives	Create remunerative & productive farming systems	Reduce negative impact of farming systems on the environment	Increase capacity of farming systems to deal with shocks/extreme weather
Testing and introduction of rotation crops/varieties; reduced tillage and machinery traffic	<ul style="list-style-type: none"> + Improved yields of cereal and rotation crops - Slow process of soil rehabilitation 	<ul style="list-style-type: none"> + Increased nutrient use efficiency / N-fixation + Reduced soil erosion + Soil C sequestration + Greater per-area yield + Reduced on-farm energy use 	<ul style="list-style-type: none"> + More stable yields and better performance during drought + Increased water use efficiency + Enhanced soil biological activity observed
Processing & marketing capacity for high-performing rotation crops	<ul style="list-style-type: none"> + Increased profitability of rotation crops 	<ul style="list-style-type: none"> + Potential for reduced waste through local processing 	<ul style="list-style-type: none"> + Diversified income streams (rotation crops)
Training, inputs & off-take guarantees for small-scale-farmer-suppliers of rotation crops	<ul style="list-style-type: none"> + Progress toward economy of scale 	<ul style="list-style-type: none"> + Smallholders adopt climate-smart practices 	<ul style="list-style-type: none"> + Smallholders gain additional income stream - Cost-/time-intensive smallholder engagement

Decision making by Agventure farmers has been driven by indicators of farming system resilience, especially increasing soil health and reducing disease pressure.

For example, pulses increased soil rooting depth and traffic control strategies reduced soil compaction. Canola merited investment in a new value chain because it effectively interrupted fusarium disease on-farm. Changes in yield are evaluated against previous seasons with similar weather conditions. Farms with crop rotations have shown higher profitability compared to monocropping systems. Agventure's crop rotation assessment matrix contains indicators for compatibility with the existing farming system (e.g. equipment; disease tolerance), agronomic benefits, market potential (e.g. potential supply and demand), and overall business case (e.g. unit cost of production, off-take, and marketing).

Agventure's CSRA indicators: Assess technologies based on potential for resilience and scaling and alignment with existing production systems and end markets.

Agventure's CSRA strategy: Collective investment and long-term commitment to increase resilience and profitability by validating multiple interventions in local farming systems

1. BUILDING RESILIENCE IS ESSENTIAL AS AGRICULTURAL RISKS INCREASE

AgVenture farmers have observed **greater water absorption and nutrient retention, enhanced soil biological activity, reduced soil erosion, and greater per-area yield.** Soil moisture is a key determinant of crop success. But, on-farm experience with CA shows that rainfall does not have to be yield-limiting as the greatest gains have occurred in the driest farm sites. The profitability of rotation crops has increased over the past decade and using fewer inputs can lower costs. Yet, Agventure farmers find that the central benefit of CA is building resilience in farm soils.

2. CLIMATE RESILIENCE REQUIRES CONTEXT-SPECIFIC AGRICULTURAL INNOVATION

Kenya's extreme agro-climatic variation makes identification of high-performing crops challenging. Individual farm experience has varied considerably. Despite growing knowledge and experience, Agventure farmers find that the prescription for CA success is not easily reduced to singular practices or technologies. To overcome existing and emerging challenges to crop production, **agricultural regions need 'engines' of agronomic learning** that effectively identify beneficial practices and technologies and build capacities necessary for resilient farms and remunerative value chains.



Photo @PureMountain

3. THERE'S NO BUSINESS WITHOUT MARKET DEMAND

Lacking existing off-takers for value-creating rotation crops, Agventure successfully exploited untapped market niches. Ultimately, these farmers seek to build value chains around full crop rotations. Making **'pillar' investments** (e.g. processing capacity) will **depend on demonstrated demand** – including trusted off-takers and transparent price information for local, regional, or international markets – as well as efficient supply, which requires reliable access to inputs and services.

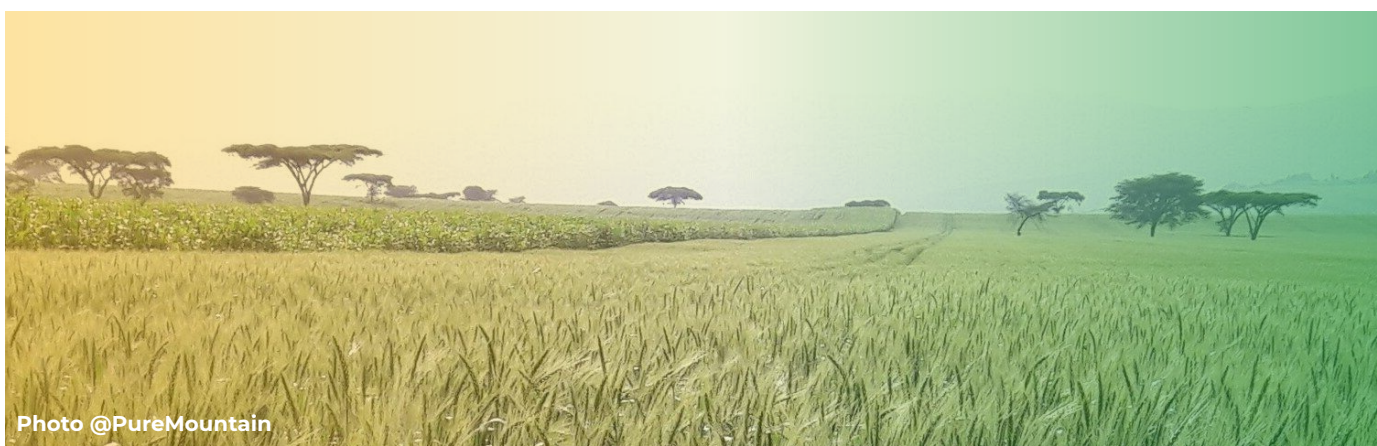
4. COLLECTIVE INVESTMENT PAYS DIVIDENDS

Rather than seizing on 'quick wins' to treat symptoms of unsustainability, Agventure farmers have demonstrated long-term commitment to building economically viable, environmentally sustainable rainfed agriculture through collaborative, whole-system change. Each AgVenture member took a unique approach based on farm characteristics, ownership structure, and management style. Yet they attribute their new trajectory to the **collective investment in CoEs** and the Pure Mountain brand that has **enriched agronomic knowledge** and **expanded off-take options**.

5. CLIMATE RESILIENCE REQUIRES PATIENT INVESTMENT

Investment in farmer training can be slow and relatively expensive. But it provides meaningful returns once on-farm trials demonstrate near-term benefits, overcoming farmers' skepticism. Extension is best delivered by people farmers can identify with and who can effectively communicate the value proposition along with technical training.

Financial inclusion mechanisms are essential for a **supportive agricultural ecosystem** given the constraints of tenant farming, weak collateral, and low risk capacity. Farm credit with reasonable rates and appropriate repayment schedules should be backed by off-take guarantees and evidence of farm-level resilience, which is the ultimate source of profitability and return on investment.



6. TRANSFORMATIONAL INNOVATION RELIES ON AN 'ECOSYSTEM OF SERVICES'

Successful introduction of new rotation crops goes beyond providing seed and agronomic advice to a full suite of products and services. Farmers need to be **confident** that they can **sell** what they grow as well as **being able** to grow it.

Input and off-take market linkages, financial safety nets, reliable information sources, and extension support are core elements of an **'ecosystem of services'** needed to introduce rotation crops (Figure 4).



Figure 4. Components of an agricultural ecosystem that can incentivize and support transition to climate-smart, resilient farming systems.



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NEXT STEPS

Progress toward climate-smart, resilient agriculture in Kenya's dryland farming systems requires further innovation in production and value chains.

To build a 'deeper bench' of beneficial rotation crops, Agventure farmers can refine their model for testing, introducing, and promoting varieties with suitable characteristics for rainfed agriculture. Agventure can provide more tailored support to smallholders for market-oriented production of rotation crops, based on near-term financial return. While expanding processing and marketing capacity for rotation crops, Agventure can cultivate agri-entrepreneurs to provide last-mile delivery of agri-services and collaborate with regional partners to reduce structural barriers (e.g. insecure land tenure).

In 2019, Agventure and the Syngenta Foundation launched a multi-year partnership focused on:

- Integrating experience from Syngenta Foundation's Seeds2B program into the Agventure model for testing, introducing, and promoting rotation crop varieties with suitable characteristics and business cases for rainfed agriculture in Kenya.
- Leveraging both organizations' capabilities for engaging smallholder farmers in value chains to test holistic approaches for market-oriented production of rotation crops with emphasis on farmer targeting and novel models for Extension, input supply, market access, financing, and risk management.
- Scaling CSRA insights for rainfed, cereal-based farming systems to other parts of East Africa.

Syngenta Foundation's role: Collaboratively test new strategies for linking smallholders and off-takers, for de-risking value chains, and for catalyzing continuous innovation in the context of climate change, especially climate-smart crop diversification.

PROBLEM DEFINITION

- Intensifying risks from climate change, water depletion, and ecological degradation
- Markets needed for multi-crop systems
- Smallholder constraints to rotation crop adoption

OBJECTIVES

- Accelerated testing, seed sourcing, and integration of high-performing rotation crops
- Transparent market information to enable 'pillar' investments
- Rotation crop value proposition and risk management for smallholders

ACTIVITIES

1. More sophisticated analysis of trials data based on proven KPIs
2. Engagement with regulators to facilitate seed registration
3. Training, finance, services, and off-take solutions tailored to smallholders

AgVenture farmers have sustainably improved both resilience and profitability by transforming their farming activities.

Diversifying their cropping systems allowed these farmers to improve biodiversity, organic matter, fertility and water retention in farm soils. Crop rotations also helped to break disease cycles and reduce the prevalence of soil-borne disease, increasing the overall resilience and productivity of these farming systems. Introduction of rotation crops paired with development of market systems and offtake linkages helped to diversify participating farmers and to increase profitability. A decade of success in market-led crop diversification indicates that the strategic, collaborative Agventure model offers important potential for increasing long-term resilience and profitability of farming systems in climate-vulnerable regions.

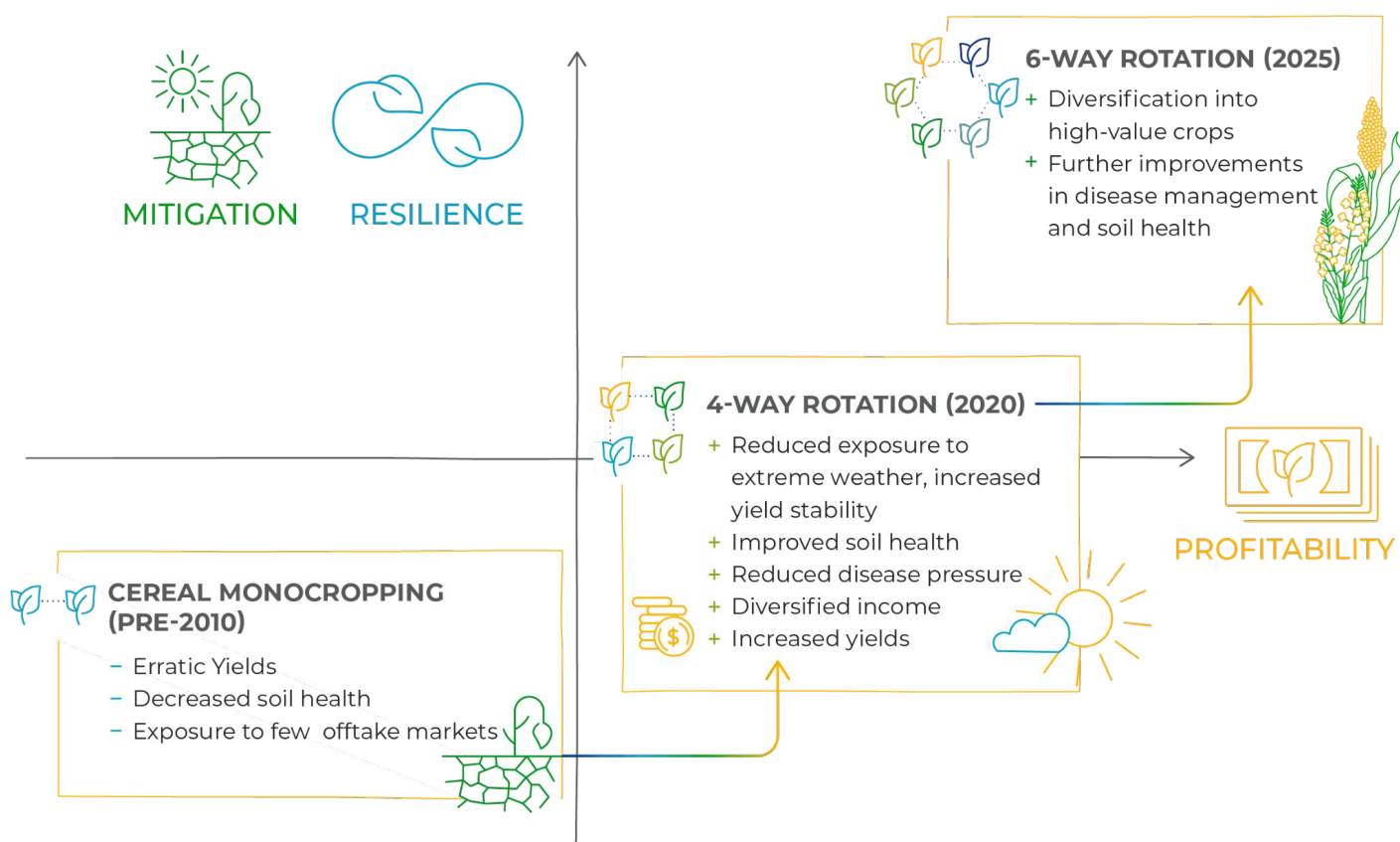




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ACKNOWLEDGEMENT

This case study assesses the decade of achievements by Agventure Ltd and lays the foundation for a strategic SFSA contribution in the early stages of a new partnership. The Agventure experience provides insights into effective systems-level problem definition, continuous innovation, and holistic approaches to building productive, resilient, low-carbon value chains. *NOTE: Agventure has approved this case study for internal Syngenta Foundation use only.*