

A Practical Guide to Sustainable Agricultural Growth:

Success Stories From Around the World





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EXECUTIVE SUMMARY

Agriculture stands at a crossroads. Climate change, land degradation, and resource scarcity are reshaping farming systems worldwide – particularly across the Global South. Farmers are being asked to produce more with fewer resources, while also reducing environmental impact. Yet, across regions and value chains, evidence shows that transformation is not only possible, but already underway. **The challenge is no longer *whether* change can happen, but *how* to scale what already works.**

Across continents, a growing number of initiatives demonstrate that productivity, resilience, and sustainability can advance together. In Latin America, integrated crop–livestock–forestry systems have restored degraded soils and farm profitability without expanding farmland. In Africa, access to innovation, insurance, and agronomic training has strengthened farm incomes and climate resilience. In Asia, water-efficient and soil-regenerative practices have reduced water use and stabilized yields. Similar progress is emerging in Europe, where biodiversity is being embedded into productive farmland, and again in Africa, where professionalized rural services are creating skilled employment and inclusive land reforms are securing tenure. Together, these experiences prove that sustainable, inclusive agricultural growth is achievable when policies, incentives, and knowledge systems align.

Collectively, these cases signal a shift – from isolated interventions to coherent systems of change. The most effective strategies combine three core principles:

- 1. Start small, prove success, and build momentum.** Simple, visible improvements in farm practices can spark transformation when results are tangible and replicable
- 2. Leverage innovation to accelerate impact.** Modern tools and data-driven approaches enable faster, more efficient progress when they are accessible and used effectively
- 3. Invest in people and systems that sustain change.** Practical training, advisory support, and market linkages turn potential into lasting performance at scale.

Agricultural transformation will not come from new discoveries alone, but from scaling practical solutions that already deliver results in the field. When productivity, resilience, and inclusion move in tandem, agriculture can evolve from a source of emissions into a driver of climate action and sustainable growth.

INTRODUCTION

Reimagining Agriculture's Role in Climate Action

Agriculture today faces a dual reality. On one hand, it is a major contributor to climate change, responsible, together with livestock, for around 30% of GHG emissions and it is also a leading cause of deforestation and biodiversity loss.¹ On the other hand, agriculture can be a powerful driver of climate action – restoring soils and ecosystems, reducing emissions, and capturing carbon through more sustainable land use. With the global population expected to reach 10 billion by 2050, food production must increase by 70% compared to 2009 levels, but without expanding into forests or fragile ecosystems.²

The stakes are high. Agriculture produces nearly half of all methane and nitrous oxide emissions, gases far more potent than CO₂ – enough to jeopardize the 1.5 °C target.³ At the same time, land degradation, water scarcity, and unsustainable practices narrowly focused on short-term productivity gains are eroding the potential of existing farmland, especially in the Global South. Over half of global farmland is now moderately or severely degraded, and global agricultural productivity growth is slowing, falling to just 0.7% a year—well below the 2% needed to meet global climate and food security goals.⁴

Yet even as pressures mount, a quiet transformation is taking root. Across the world, success cases are emerging, showing that it is possible to:

- **Increase productivity without expanding agricultural land**
- **Restore soils, reduce input waste, and protect water resources**
- **Improve rural incomes and competitiveness**
- **Build resilience to climate shocks**
- **Reduce environmental impact at farm level.**

These initiatives show that transformation is already happening – not in theory, but in measurable results in the field. Agriculture can drive growth without expansion, higher yields with lower impact, and stronger resilience against climate stress. The challenge now is to learn from what works—and scale it with intent.



What This Guide Offers

This guide is structured around SDG Indicator 2.4.1 – *the proportion of agricultural area under productive and sustainable agriculture*. The indicator examines 11 key dimensions of what makes farming systems both productive and sustainable – from land and soil health to water management, input efficiency, biodiversity, decent employment, and resilience. It provides a globally recognized framework that reflects the realities of agricultural systems and the linkages among productivity, sustainability, and inclusion.

Building on this framework, the report brings together real success stories from around the world – examples of how farmers, the private sector and policymakers are addressing these challenges and driving measurable change.

Each chapter highlights:

- **Challenge** – what limits progress and why it matters
- **Success story** – how those challenges were overcome
- **Takeaways** – lessons and enabling conditions that make success replicable.

The aim is simple: to showcase practical, proven solutions that deliver tangible outcomes – higher productivity, stronger rural economies, healthier landscapes, and more resilient food systems.

Making Land More Productive

Degraded land is limiting agricultural growth

Agriculture does not face a land shortage; it faces a **productivity gap on land that is already in use**. More than half of global farmland is now moderately or severely degraded, and yields are flattening in regions that can least afford it.⁵ As soils lose structure and fertility, each hectare produces less value over time, weakening farm incomes and slowing rural economic growth.

When land stops performing, farmers are pushed to expand their farms to maintain output. The result is rising pressure on forests, savannas, and natural ecosystems, along with higher transport costs as cultivation moves into more fragile or marginal areas. Producing the food the world needs while safeguarding nature ultimately requires restoring productivity on land already in use.

Agricultural transformation becomes possible **when degraded land is treated as a recoverable asset rather than a sunk cost**. Restoring output per hectare reduces pressure to clear new land, strengthens rural economies, and makes growth sustainable over time.

How Brazil rebuilt productivity on exhausted land

Santa Brígida Farm in Goiás faced a common challenge: worn-out soil, weed invasion, and falling yields after years of soybean monocropping followed by exhausted pasture. The land was productive for barely four months a year; during the rest of the season, only thin, poor-quality grass grew, offering little feed for cattle or income for the farm. Though still cultivated, the land's productivity was steadily slipping – the result of a system pushed beyond its limits.

To recover productivity, the farm adopted an integrated crop–livestock–forestry system (ILPF). Instead of monocropping, soybeans were rotated with Brachiaria grass, which rebuilt soil structure and organic matter. Maize was introduced in rotation with soybeans and pasture, improving nutrient cycling and diversifying income streams from multiple crops. Managed grazing was reintroduced so that cattle could convert pasture into income and return nutrients to the soil, accelerating recovery. Eucalyptus tree rows were also added, improving microclimate conditions and creating a revenue stream from timber.

Within four years, the transformation became evident and commercially significant. Maize yields more than doubled, the pasture carrying capacity nearly tripled, and the land became productive again all year-round.⁶ Productivity increased without expanding the land area, proof that exhausted land can be restored through systems designed to regenerate soils while keeping farms commercially viable.



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Integrated crop–livestock systems show that sustainable intensification is possible. By combining crops and cattle, farmers can improve soil health, enhance year-round productivity, and reduce the pressures that drive land expansion.

Dr. Lourival Vilela

Researcher, Embrapa Cerrados, Planaltina, Brazil

Land restoration scales when farmers can recover without losing income

Brazil made restoration commercially viable rather than being a transition cost that **farmers had to absorb**. Adoption accelerated once farmers could restore productivity without interrupting their income stream, because finance and agronomy support were targeted towards restoring land already in use. Progress spread not through promotion, but by lowering the cost of transition.

- **Maintaining farm income during recovery** – Integrating diverse crops, livestock, and trees keeps cash flow through the transition, making restoration financially viable: diversified production maintains short-term income while building soil fertility and adding longer-term value through trees and livestock
- **Pairing finance with agronomy support** – Long-term credit reduces investment risks, but uptake only accelerates when technical guidance ensures measurable productivity gains
- **Making delivery local and practical** – Demonstration farms and cooperatives translate the ILPF model into simple field practices that farmers can replicate.

Restoring productivity per hectare reduces pressure to expand into new land by treating every hectare as a resilient economic asset.

Improving Farm Profitability

Falling margins are eroding farm profitability

Across much of Sub-Saharan Africa, millions of **farmers operate on razor-thin margins**, leaving little capacity to invest in better soil treatments, seed, irrigation or mechanization. Low profitability limits reinvestment, slows productivity growth, and increases exposure to climate, price, or pest-related shocks.⁷ When margins are thin, farmers struggle to move beyond subsistence, and agriculture stalls as a growth engine.

The effects ripple through rural economies: when farmers can't afford innovation, regions become trapped in a low output cycle. Thin margins delay investment, keeping mechanization, diversification, and soil improvement out of reach. In many regions, young people are leaving agriculture not because the sector lacks potential, but because it lacks viable income pathways.⁸

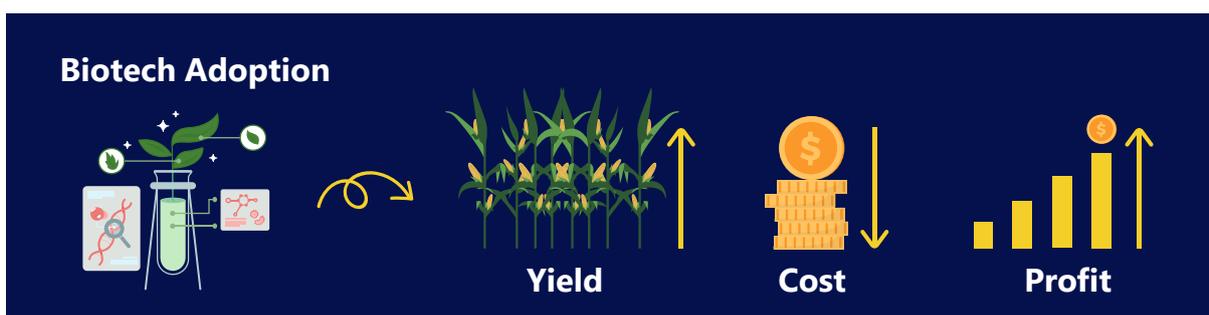
Improving profitability is a precondition for agricultural transformation. Growth follows when farmers can increase productivity and retain enough income to reinvest the next season.

How South Africa improved farm profitability by accelerating access to innovation

In the late 1990s, South Africa faced a clear challenge: it needed to raise agricultural productivity to remain competitive in global markets while meeting growing local demand for food. The government made a **strategic policy decision to adopt plant biotechnology to drive agricultural growth and farm profitability**.

Through the Genetically Modified Organisms (GMO) Act of 1997, South Africa established a transparent regulatory pathway for biotech crops.⁹ This signaled long-term policy direction and gave farmers the confidence to adopt the new technology. Biotechnology proved popular because it offered farmers a solution to stagnating productivity and falling margins.¹⁰

Within a decade, yields in maize, soya, and cotton had increased, crop losses declined, and profit margins improved through lower production costs and more reliable harvests.¹¹ Market participation



also expanded as more farmers were able to invest, scale, and commercialize their production. By 2024, GM crops covered 95% of South Africa's soybean area and 84% of its maize area.

Biotech adoption succeeded because farmers were trained to use it effectively.¹² Provincial agriculture departments, farmer organizations, and extension services provided practical, field-based training – on planting decisions, weed management, and crop rotation to protect long-term productivity. Field demonstrations and performance trials made results visible under real farming conditions, building confidence and accelerating uptake.



The seed was part of the change, but the real difference was learning how to use it properly, how to time planting, manage weeds, test the soil, and plan my fields. That's when my harvest improved, my costs dropped, and my income grew. It gave me the confidence to expand my business.

Anelly Mokwena

Farmer, Bronkhorstspuit, South Africa

Innovation raises farm incomes when farmers are trained to use it effectively

South Africa's decision to introduce plant biotechnology as part of its agricultural growth strategy helped raise farm incomes and strengthen rural economies. Profitability improved because farmers could produce more reliably at lower cost. The difference was not the technology alone; it was the decision to make adoption practical and viable for farmers from the start.

- **Signaling policy commitment encourages adoption** – Clear, predictable regulation gives farmers and investors the confidence to adopt new technology
- **Training drives effective use** – Field-based guidance ensures farmers can apply biotechnology correctly and productively
- **Ensuring profit sustains momentum** – Once farmers see higher returns, adoption expands without subsidies or heavy promotion.

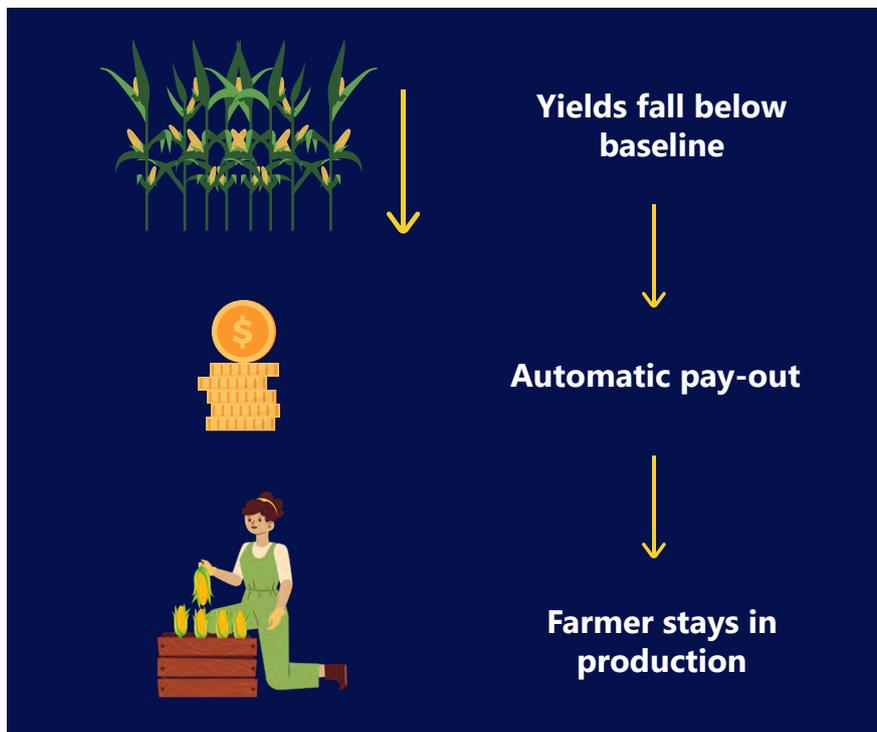
South Africa has turned biotechnology into real profitability gains because it invested not just in access, but in farmer training to unlock its full value.

Building Income Resilience for Farmers

Income fragility is forcing farmers out after shocks

Across much of the Global South, one failed harvest can be catastrophic. A single drought season can wipe out a farmer's life savings, forcing families to sell their assets or fall into debt. Once that happens, it becomes harder to recover and even harder to invest for the next season, creating a downward spiral of low yields and higher vulnerability.

The core constraint is not weather alone; it is income fragility. When cash flow collapses after a shock, farmers cut back precisely when they need to rebuild. **Real resilience means protecting farm income before a disaster hits**, so that a poor season doesn't become an exit from agriculture.¹³



When yields fall, fast pay-outs keep farmers in business

In Kenya's arid and semi-arid lands, most small-scale farmers depend on rain-fed crops, leaving them highly exposed to rainfall variability. After enduring several years of drought, even a short dry spell can now wipe out an entire season of income.¹⁴ Through the INSURED program, farmers accessed area-yield index insurance that triggered pay-outs automatically when average yields fell below an agreed threshold—without waiting for a disaster declaration or lengthy loss verification.¹⁵ The insurance, piloted

under the IFAD-supported KCEP-CRAL program, was designed to protect farm income in drought-prone areas where even normal seasons fall below average yields.

The product was simple and affordable: farmers paid an average premium of KSh 1,200 (USD 11) per season, and pay-outs were issued quickly through mobile money platforms. In one season alone, more than 11,500 Kenyan farmers received compensation after below-average harvests. **Many had initially been skeptical, but public pay-out events built trust by showing that pay-outs arrived when needed.** That confidence kept farmers in business—allowing them to avoid distress sales, stay out of debt, and reinvest for the next season rather than abandoning agriculture altogether.



I am grateful even with the drought I have food in my house. I had joined the insurance and I am glad I will be compensated.

Fatuma Rashid

*Kenyan farmer, who received a pay-out in 2022.
(Courtesy of [IFAD](#))*

Photo: ©IFAD/2022

Resilience scales when protection is built into the production system

Kenya's experience shows that insurance only works when it fits the way farmers actually manage risk on their farms. The goal is not compensation after disaster but protecting income early enough to prevent farmers from falling into crisis.

- **Designing for common losses protected farmers from frequent shocks** – Pay-outs triggered by local yield thresholds protected farmers from seasonal losses, not just rare catastrophes
- **Simplicity built trust** – Clear, automatic pay-out rules and mobile delivery removed the complexity that normally prevents farmers from joining insurance schemes
- **Visible proof drove adoption** – Public pay-out events built confidence that the system worked, increasing uptake far faster than awareness campaigns alone.¹⁶

Resilience becomes investable when farmers can rely on fast, fair pay-outs that protect working capital and keep them in production.

Restoring Soil Health

Declining soil health is driving long-term productivity loss

Soil is the lifeblood of food production – 95% of the world’s food depends on it.¹⁷ Yet **one-third of global soils are already degraded**, and the decline is accelerating due to climate change.¹⁸ When soil loses organic matter, it loses fertility: roots struggle to develop, water drains too quickly, and nutrients escape before crops can use them. The result is simple: yields flatten, and land becomes less productive each year.

For millions of farmers, especially in the Global South, soil degradation is not an environmental issue – it is a direct loss of income and future potential. As productivity per hectare falls, so does profitability, locking farms into declining returns. **Reversing soil decline is now essential to restoring agricultural growth.**



How farmers in Cambodia restored degraded soils using locally made biochar

Years of continuous cropping and residue burning in Kampong Thom and other rice–cassava regions of Cambodia had left soils depleted and fragile. Without organic matter to hold moisture and nutrients, fertilizer became less effective across seasons and crop yields weakened, especially during dry spells. Restoring soil function became essential to stabilize farm income for smallholders operating on already thin margins.

To rebuild soil fertility, many horticultural farmer networks supported by local training partners began producing biochar from rice husks and cassava stems, blending it with compost made from farm waste. This locally produced soil amendment improved soil structure and moisture retention, enabling earlier root establishment in the growing season. By using farm by-products, farmers kept production costs

low, making the practice both affordable and easy to integrate into existing routines. However, producing biochar at farm level was time-consuming and labor-intensive. Recognising the need for a more scalable approach, SNV supported [HUSK Ventures](#) – a biochar start-up that pioneered medium- to large-scale production using rice husks combined with compost and nutrient-enriched fertilizers.

The results were quickly visible. **Farmers reported that soils became darker, looser, and easier to work—signs of organic matter returning** – and they noticed that crops held moisture and survived longer during dry weeks. As their neighbours noticed these results, word spread quickly, and the early-adopting farmers began demonstrating the treatment on nearby plots, helping others to purchase biochar. Over time, fields regained structure, fertilizer efficiency improved, and yields became more reliable despite shifting rainfall patterns.



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Before, the soil was hard and dry. When the rain came, it washed away, and the crops died quickly. After we started improving the soil, it keeps moisture longer and the plants grow stronger.

Srouy

*Farmer, Kampong Thom Province, Cambodia
(Photo: courtesy of [SNV](#))*

Soil health scales when farmers see clear gains in their fields

Cambodia’s experience shows that soil restoration gains traction when it strengthens farm viability and fits the realities of day-to-day production.

- **Visible results built adoption momentum** – Early improvements in soil structure and crop resilience were clear in the field, which gave neighboring farmers the confidence to try the practice themselves
- **Simple delivery enabled uptake** – Farmer-to-farmer demonstrations and locally organized training proved effective for product promotion
- **Storing carbon while improving livelihoods creates multiple wins** – Biochar is a proven method to increase soil organic carbon to depleted soils and contributes to climate mitigation, and boosts farmers yields and profits.

Cambodia’s experience shows that soil health improves when it works in the realities of small farms – visible, manageable, and worth the effort.

Producing More with Less Water

Reducing water stress in agriculture

Water stress is spreading across Asia and Africa, where groundwater was once abundant.¹⁹ Agriculture now consumes about 70% of global freshwater, and in irrigated farming systems, the cost of extraction is rising as wells run deeper and rainfall patterns become less reliable.²⁰ When water becomes scarce, yields flatline, production costs increase, and farm competitiveness declines, turning water from a seasonal to a year-round concern.

Rice lies at the heart of the water challenge. Traditional flooded rice systems consume several thousand litres of water for each kilogram of rice produced, depleting aquifers faster than they can recharge.²¹ In parts of India and Southeast Asia, wells now run dry before planting, and farmers depend on costly pumping just to stay in production. If this trend continues, millions of hectares of otherwise productive land may become uneconomic to farm, putting pressure on food security in some of the world's most populous regions.

How India cut water use in rice without sacrificing yields

In India's Punjab and Haryana states, rice production has been the mainstay of the rural economy for decades, but it has also driven a deepening water crisis.²² Traditional puddled rice requires flooding fields before transplanting seedlings, consuming 3,000–5,000 litres of water for every kilogram of rice produced.²³ As groundwater tables fell, farmers were forced to drill deeper and pump longer, raising production costs and eroding margins.

To reduce irrigation demand, farmers and state agencies began introducing Direct Seeded Rice (DSR), a method that eliminates puddling and transplanting by sowing seed directly into moist soil. Field trials in Punjab and Haryana show that **DSR can reduce irrigation water use by between 12–35% while maintaining comparable yields.**²⁴ Early adopters also report lower labor costs, reduced fuel use from less pumping, and earlier field turnaround, allowing timely planting of the following wheat crop.

12–35%

less irrigation water with
Direct Seeded Rice



Adoption has not been automatic. DSR requires good land leveling and timely weed control, and many farmers struggled initially. But where training and access to laser leveling and seed drills were available, adoption of DSR rose quickly – not because it was promoted heavily, but because it saved farmers time, diesel, and water while keeping yields stable.

DSR shows that **water efficiency scales fastest when it improves farm economics**, not just when it is promoted as a conservation practice.



By adopting DSR on my 100-acre farm, I no longer face the same pressure of water and labor shortages. DSR saves me time and cost, keeps the soil healthier, and gives me extra days to prepare for the wheat season. With DSR, I use 15–40% less water, which is a real advantage in times of scarcity. For farmers like me, it is a practical solution that improves productivity while conserving water.

Pritam Singh

Farmer, Panipat District, Haryana, India (Photo: courtesy of [Bayer](#))

Water efficiency scales when technology and incentives work together

The experience across India and Southeast Asia shows that reducing agricultural water use is possible without sacrificing yield—but only when efficiency is built into the production system rather than treated as a conservation campaign.

- **Making water efficiency practical accelerates adoption** – Technologies like Direct Seeded Rice (DSR) reduce water use by design, and adoption accelerates when farmers see yields remain stable and field operations become easier
- **Linking performance to rewards increases uptake** – Incentive models such as Paani Bachao, Paisa Kamao tied farmer payments to verified water and electricity savings, making efficiency financially meaningful ²⁵
- **Strengthening delivery at farm level enables real adoption** – Mechanization services, agronomy support, and access to finance helped smallholders adopt DSR under real field conditions, not just in demonstration plots.

When farmers can save water, protect yields, and earn more in the process, efficiency stops being a trade-off—and starts to scale.

Using Fertilizer Efficiently

Increasing nutrient use efficiency for farmer prosperity

When managed efficiently, plant nutrients play a vital role in enhancing productivity on arable land, increasing crop yields, and improving soil organic matter. They are essential to sustaining farmer livelihoods and agricultural productivity. Maintaining the right nutrient balance through site-specific management is crucial, as both overuse and underuse can put pressure on the environment – either by causing nutrient losses or depleting soil fertility.

Improving nutrient use efficiency at the farm level is therefore a critical priority to help farmers maintain high crop yields and preserve the long-term health of their soils.

Nutrient efficiency starts with precision

Site-specific nutrient management matches nutrient supply with crop requirements to optimize yield while minimizing nutrient losses to the environment.

The **4R Nutrient Stewardship framework** defines this precision across four decisions: **right source, right rate, right time, and right place.** (Source: [The Fertilizer Institute](#))



The infographic is a dark blue rectangle containing four yellow icons and their corresponding text. From left to right: 1. A fertilizer bag icon with a leaf, labeled 'Right source' with the text 'Matches fertilizer type to crop needs.' 2. A speedometer icon, labeled 'Right rate' with the text 'Matches amount of fertilizer type crop needs.' 3. A calendar icon with a clock, labeled 'Right time' with the text 'Makes nutrients available when crops need them.' 4. A location pin icon, labeled 'Right place' with the text 'Keep nutrients where crops can use them.'

Right source	Right rate	Right time	Right place
Matches fertilizer type to crop needs.	Matches amount of fertilizer type crop needs.	Makes nutrients available when crops need them.	Keep nutrients where crops can use them.

How Manitoba delivered precision at farm level

Lake Winnipeg is one of Canada’s most important freshwater ecosystems, supporting farming families, fishing communities, and towns across Manitoba. But nutrient run-off from surrounding farmland triggered punctual algal blooms, impacting water quality and local livelihoods. The province sought a solution that protected the lake without jeopardizing farm productivity.

It partnered with the fertilizer industry and farmer groups to certify agronomists who help farmers to design tailored fertilizer plans. Each plan begins with soil testing, followed by decisions on optimal source, rate, and timing. Progress was tracked annually, allowing farmers to see efficiency gains, thereby reinforcing adoption through results rather than mandates.



Improving nitrogen use efficiency is vital for reducing greenhouse gas emissions and minimizing nutrient losses, while sustaining high levels of crop production. Through site-specific nutrient management, farmers can optimize uptake and limit environmental pressures, achieving good yields today and maintaining healthy soils for tomorrow.”

The International Fertilizer Association



Nutrient use efficiency scales when policy, agronomy, and farmer support work together

The Manitoba approach shows that nutrient efficiency improves fastest when clear policy frameworks, strong agronomy networks, and simple tools help farmers apply precision practices in the field.²⁶

- **Providing agronomy support enables precision** – Strengthening local advisory and extension systems improves the accuracy of fertilizer application through site-specific recommendations
- **Using simple, affordable methods increases adoption** – Soil testing and practical planning tools make sustainable nutrient management accessible without costly technologies
- **Tracking visible efficiency gains drives uptake** – As farmers see input savings and stable yields, adoption accelerates through peer influence.

When supportive policy, technical advice, and practical tools align, large-scale improvements in nutrient use efficiency become achievable – reinforcing both productivity and environmental goals.

Using Pesticides Responsibly

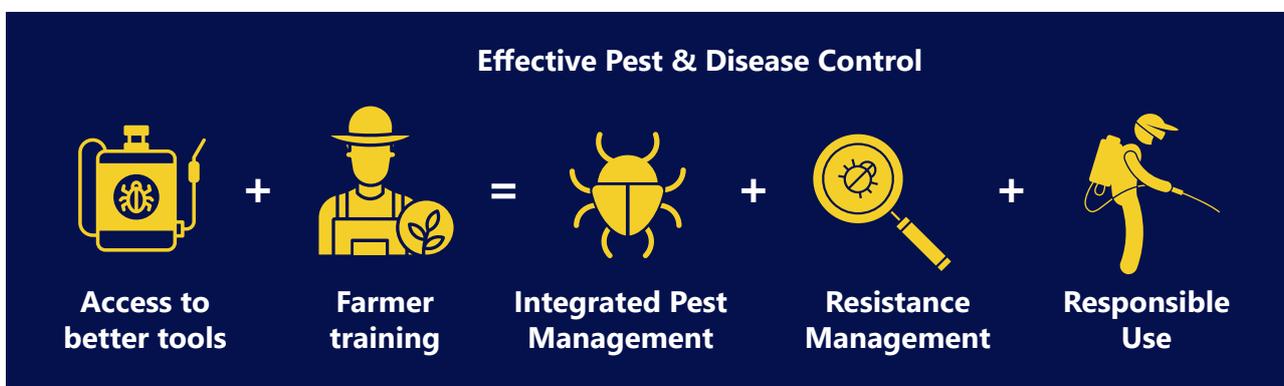
Imprecise pesticide use is eroding effectiveness and profitability

Modern pesticides have transformed global food production, helping humanity preserve 70% of harvests and escape the cycles of crop failure and famine that have defined much of history.²⁷

Yet pests and blights still destroy around 30% of crops each year.²⁸ As the climate changes, pests, fungal infections and bacterial diseases are mounting and spreading faster across borders, intensifying pressure on farmers and food systems globally.

In many farming systems, pest control is limited not only by restricted access to modern pest-control tools but also by how available products are used in practice. When pests or diseases are misdiagnosed, the chosen product may not address the actual problem – wasting financial resources without improving crop health. Even with the correct product, imprecise timing or over-application can reduce effectiveness and accelerate the development of resistance or cause unintended effects on biodiversity.

Modern pesticides remain one of agriculture’s most powerful tools for protecting yields and ensuring food security, but to deliver their full benefit, they must be used precisely and based on sound diagnosis. The challenge today is **helping every farmer use pesticides correctly, efficiently and precisely so that every drop delivers full benefit with minimal environmental impact.**



Kenya – Building a holistic framework for managing pesticides

In Kenya, pests are not a seasonal nuisance, they are a permanent threat: from fall armyworm to desert locust swarms that can destroy a harvest in weeks. Rather than relying on emergency spraying alone, the government moved early to put in place a **national pest management strategy to fight back against pests and blight more effectively.**

A key part of this approach was improving access to better tools. Kenya introduced an online system that digitized its product evaluation and registration process to approve new and more effective pesticide

products quickly. This **made it easier to bring newer products with improved environmental profiles to farmers**, so they are not forced to rely on just a narrow set of older chemistries.

But Kenya did not stop at policy. It also invested heavily in hands-on training for farmers so they can use pesticides more precisely – what to apply, how much, and when, and how to rotate chemical and biological options to stay ahead of pest pressure. More than 17,000 farmers and rural advisors were trained in Integrated Pest Management techniques suited to the local crops and conditions.²⁹ The country is also introducing drone-based precision application systems and scaling up a network of trained spray professionals who know how to apply higher-risk products precisely and safely so that farmers retain access to the strongest protection when needed.

Together, these efforts enabled the country to fight pests effectively while reducing pesticide risk.



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The challenge of climate change is very serious in Kenya. In 2019, we faced a locust attack for the first time in 70 years. Pest species are evolving and are different from what we have seen before.

Collins Marangu

Former Director of Plant Protection and Food Safety Directorate, Ministry of Agriculture, Kenya

Pesticide risk falls when access to solutions and training move together

Kenya's experience shows that reducing pesticide risk requires a comprehensive approach, from a national strategy to real commitment and resources that deliver hands-on training in the field.

- **Precision application reduces risk** – Applying only what was necessary, accurately, allows farmers to control pests effectively while minimizing exposure, resistance development and environmental impact
- **Access to newer tools improves control** – Introducing newer, lower-dose chemistries helps farmers stay ahead of pest resistance and avoid over-reliance on older products
- **Training makes pesticide use safer and more effective** – Field training on what to use, how much, and when improves effectiveness, reducing input costs.

Reducing pesticide risk while protecting crops is possible, but only when policy, innovation and farmer support move together.

Biodiversity: Farming with Nature

Restoring balance between farming and nature is key to sustaining productivity

Agriculture and biodiversity are deeply connected. Productive farms depend on healthy soil organisms, pollinators, and natural pest control, yet decades of expansion have disrupted this balance, weakening the ecological foundations that sustain agriculture.³⁰ The result is not only environmental loss but higher costs and instability for farmers.

Protecting biodiversity therefore starts with producing more on land already in use for agriculture. When yields and soil health improve, pressure to clear forests, grasslands, and wetlands declines, allowing natural ecosystems to recover. Stronger productivity per hectare becomes the most effective form of conservation.

Biodiversity can also be managed within farms to support agriculture. Field margins, cover crops, and crop rotations help maintain pollination, pest control, and soil function – building resilience and productivity from within.



Germany – Integrating biodiversity into productive farming

Germany made boosting on-farm biodiversity a national priority after signs of declining pollinators and soil health began to threaten long-term productivity. The national strategy focused on **restoring ecological balance while keeping farmland productive**.

Incentives were offered through existing farm support programs, rewarding farmers who maintained habitat features or who adopted rotational set-asides, with agronomy support and demonstration farms providing practical guidance and confidence during adoption.

Farmers were encouraged to add **small habitat features such as flower strips, hedgerows, and beetle banks** on the margins of their fields. Crop diversification and rotation introduced ecological variety,

while cover crops kept soils biologically active and provided forage for pollinators between main crop seasons. These measures helped stabilize yields by improving soil condition and reducing pest pressure. Even simple initiatives like these can have a big impact: increased pollinator activity alone has been shown to raise crop yields by up to 25% and expanding organically managed land can significantly increase pollinator populations.³¹

Hans-Heinrich Grünhagen has applied this approach, using floral margins to bring back wildlife to his fields. He views biodiversity as part of building a stronger, more resilient farm system, and for him, the key is testing and refining what works.



“

Biodiversity is also a key part of regenerative agriculture. The edges of the fields are home to partridges, hares and even pheasants, which are not usually seen here.

Hans-Heinrich Grünhagen

Biodiversity-friendly practices scale when it strengthens farm performance

Germany's experience shows that biodiversity measures spread fastest when they are treated as a productive farming strategy – improving yields, soil function, and pest control rather than competing with production goals.

- **Making productivity the entry point** – Farmers adopt biodiversity measures more readily when they see clear performance gains such as improved soil structure and more stable yields
- **Start with simple, low-risk steps** – Field-margin features like flower strips, hedgerows, and cover crops are practical first actions that restore ecological balance without reducing output
- **Provide local, hands-on support** – Demonstration farms and advisory services help farmers test and adapt what works under local conditions, making biodiversity part of everyday management.

When farmers see how biodiversity can be harnessed as a tool for productivity, both nature and farming thrive.

Creating Quality Rural Jobs

Lack of decent rural jobs holds back agricultural growth

Agriculture is the largest source of rural employment across the Global South, but much of this work remains low-skilled and seasonal, offering little stability or opportunity for growth. Most rural workers perform basic tasks tied to short-term demand, with few pathways to acquire skills or move into higher-value roles such as machinery services, agronomy, or post-harvest handling.

This shortage of skilled labor constrains productivity. **Farms cannot modernize without people trained to operate equipment, manage irrigation, deliver crop treatments, or provide advisory services.** Without these capabilities, even the best technologies fail to take root, keeping rural enterprises small and agricultural transformation out of reach.

Decent work is therefore not a welfare issue – it is a foundation of productivity and growth.



Professionalizing farm services to create skilled rural employment

Across the farmlands of Ghana, pests threatened harvests. It wasn't that farmers lacked access to inputs, but rather that they lacked the agronomic expertise to use the tools effectively, leading to poor results.

To close this gap, **Ghana developed a new rural profession; crop service providers** trained to deliver on-farm agronomy support.³³ These professionals offered paid services – diagnosing pest problems, recommending treatments, and applying them with precision when needed.

Local training networks recruited experienced farmers and rural youth, equipping them with the agronomy knowledge and business skills needed to build viable enterprises in their communities. **As farmers saw visible improvements in crop performance, demand surged.** Crop service providers are now embedded across Ghana, raising yields while creating skilled rural professionals and stronger local economies.



“

After completing my training, I started offering professional spraying services. My clients now spend less and harvest more. With the income I've earned, I was able to buy a motorbike, which helps me reach more farmers and grow my business. Being a crop service provider has not only improved my livelihood, but it's also helped me support my community.

Aaron Gadagbui

Kportorgbe, Volta region, Ghana (Source: [CropLife AME](#))

Professionalization transforms rural economies

Ghana's experience shows that skills alone do not create employment – income does. Rural training only scales when it leads directly to paid services that farmers already need, making new professions both viable and visible in the local economy.

- **Linking skills to real demand ensures adoption** – Training succeeds when it closed practical gaps in the farming system, such as pest management and machinery services
- **Creating fast income pathways** – Workers moved from casual labor when there is a bridge to immediate earnings through starter tools and early customers
- **Showing visible results** – Professional service roles spread fastest when early movers saw clear income gains.

When training is tied to real services and real income, rural employment stops being seasonal labor and becomes a driver of agricultural transformation.

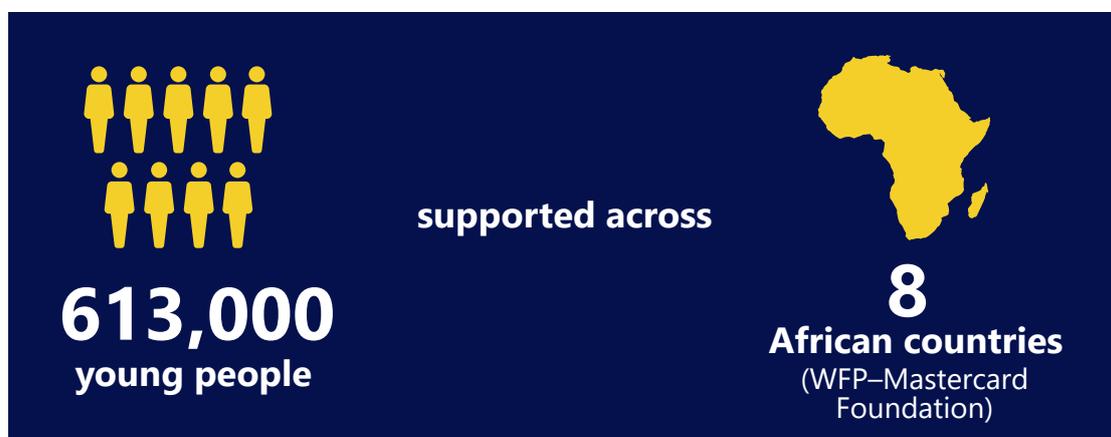
Advancing Food Security

Tackling hunger by investing in the next generation

In 2024, **over 295 million people across 53 countries faced acute food insecurity**, driven by conflict, climate shocks, and economic volatility.³⁴ But behind these numbers lies a deeper challenge: in many parts of the Global South, food systems are failing to create viable futures for young people. Without meaningful opportunities in agriculture, rural youth are leaving the sector, just as food production needs to grow.

Nowhere is this more visible than in sub-Saharan Africa, where recurrent droughts and price shocks have left entire regions dependent on emergency food assistance. A single bad season can determine whether a family eats or goes hungry. At the same time, vast productivity gaps persist. **Many farmers in the region harvest only a fraction of what their land could produce**, with average yields reaching less than a quarter of their potential.³⁵ Food insecurity is no longer just about scarcity, it is about opportunity: who can access the means to produce, distribute, and afford nutritious food.

Governments today face a dual challenge: addressing immediate shortages while reshaping the foundations of agriculture to ensure long-term resilience and sustainability.



WFP–Mastercard Foundation trains Africa’s youth to power up food security

Launched in 2022, a WFP–Mastercard Foundation initiative has supported over 613,000 young people across eight African countries.³⁶ Its approach builds on a powerful and proven formula: equip youth with agribusiness skills, connect them to markets, and provide the tools they need to succeed.

What makes the model work is its focus on both capacity and opportunity. Participants receive hands-on training in climate-smart agriculture, business planning, and digital tools, while also gaining access

to inputs, finance, and buyers. This combination helps **young people move from subsistence to entrepreneurship, turning agriculture into a viable career path.**

The impact of the Foundation’s work is visible in regions such as northern Kenya, where new networks of horticultural producers are shortening supply chains and improving access to fresh, nutritious food.

What began as a youth-skills initiative has evolved into a driver of systemic food security, proving that when young people are empowered, communities become more resilient and self-sufficient.



“

Before I met WFP, I was a small-scale farmer without exposure. Now, I can do large-scale farming and help other farmers with farm inputs, pest management, and market linkages. In the past, fresh produce had to be brought in from distant regions and often arrived in poor condition. Today, thanks to our growing network of horticultural farmers, we can supply the market locally, ensuring consumers receive fresh produce straight from the farm.

Khalid Hassan

24, farmer, northern Kenya (Source: [WFP](#), Photo: WFP / Arete / Edwin Ndeke)

Food security improves when youth are connected to opportunity, not assistance

The WFP–Mastercard Foundation experience shows that **increasing youth participation in agriculture is an economic strategy.** Food security strengthens when young people are given the means to build viable agri-businesses, rather than relying solely on aid-based interventions. Linking skills to markets creates real income opportunities – Training succeeds when it connected youth to buyers, productive assets, or service contracts.

- **Reducing entry barriers enables youth participation** – Access to finance, tools, and inputs helps young people shift from seasonal labor to enterprise
- **Treating youth as producers strengthens local food supply** – When young people enter value chains, they generated rural employment and improved food availability.

Food security is not simply about producing more – it is about who gets the chance to produce and build value in the food system.

Strengthening Land Tenure

Uncertain land rights hold back rural transformation

Across much of the Global South, access to land remains the foundation of rural livelihoods, but for millions of farmers, ownership is uncertain. In many countries, land tenure is governed by overlapping customary systems and incomplete legal frameworks that fail to guarantee security or inclusion.

The consequences are far-reaching. When farmers cannot prove or defend their rights, they hesitate to invest in the soil, adopt sustainable practices, or pass land on to the next generation. The result is a cycle of underinvestment, degraded land, and social inequality that holds back rural transformation.

A global review of 107 countries found that **one in four people feel insecure about their land and/or property rights**, a clear sign that tenure insecurity remains a widespread and unresolved challenge.³⁷



Africa - How inclusive land reform is changing outcomes

In countries such as Sierra Leone, Malawi, and Ghana, multi-stakeholder platforms have helped translate tenure principles into practice.³⁸ Through participatory mapping, legal reviews, and dialogue, **communities have worked to clarify boundaries, register rights, and formalize gender-equal access to land.**

These efforts have fed into new national frameworks that legally recognize customary tenure and promote inclusion. The impact is tangible: women and youth are now represented in land committees, disputes are resolved more quickly, and several farmers report greater confidence to invest in their farms and manage land sustainably. Across rural areas, communities describe a growing awareness of land rights and a stronger sense of ownership and accountability in local governance.

Growing awareness and empowerment within the community

Across rural areas, farmers increasingly report a stronger awareness of their land rights. Training and dialogue programs have helped reinforce the understanding that land belongs equally to all community members, regardless of gender or status. Many farmers highlight that they now feel empowered to claim equal rights, participate in land decisions, and invest in sustainable farming practices. This shift is helping to reduce conflict, build trust in local governance, and create a stronger foundation for long-term agricultural development.

Land rights reform succeeds when it is locally owned and nationally recognized

Experience across Africa shows that legal reform alone does not secure land tenure. Progress is achieved when national frameworks are co-created with local communities, making rights both legitimate and enforceable.

- **Shared ownership of reforms reduces land conflict** – Multi-stakeholder processes that engage traditional authorities and communities build trust and reduced disputes
- **Making rights visible and usable increases security** – Participatory mapping and local land registers help farmers defend and transfer their rights with confidence
- **Inclusive implementation strengthens equity** – Involving women and youth in land committees makes reforms more legitimate and widely adopted.

When land rights move from paper to practice, farmers invest, disputes fall, and rural economies grow.

Conclusions & Recommendations

The success cases outlined in this report show how agriculture can become more productive and resilient while lowering its environmental footprint. The first steps towards sustainable productivity often begin with small adjustments to farming practices, which are amplified by technology and support services.

The following recommendations build on these lessons, outlining how policies can evolve from fragmented interventions to coherent systems of change.

1. Progress starts with small changes to farming practices

Even in resource-limited settings, modest adjustments—rotating crops, planting cover crops or flower margins—can restore productivity without large upfront investments.³⁹ In Cambodia, farmers rebuilt soil health using locally produced biochar, improving yields at minimal cost. Similar, straightforward measures such as planting field edges for pollinators or applying inputs more precisely have raised productivity and reduced environmental pressures in diverse regions. These easy, affordable wins show that progress is possible well before broader reforms or advanced technologies take hold.

2. Climate-smart tools and technologies make real breakthroughs possible

Modern agricultural innovations—from improved seeds and soil tests to next-generation crop-protection products—are essential to meeting rising food demand while lightening agriculture’s environmental impact. Countries such as South Africa show how getting the most innovative products to farmers can boost productivity, strengthen resilience to climate shocks, and enhance the sector’s competitiveness.

3. Farm expertise is the key—but making it a market service multiplies impact

Agronomic expertise is the connective tissue that allows innovations and modern techniques to reach their full potential.⁴⁰ In South Africa and Kenya, demonstration farms and training helped farmers adopt new technologies and practices. Yet most countries cannot expand agricultural training or advisory support to every farmer—but markets can. Ghana’s network of professional crop-service providers and the WFP–MasterCard initiative demonstrate that when farm services and agri-entrepreneurship become viable businesses, they can extend far beyond the limits of public resources, spreading modern know-how across the rural economy.

True system transformation, however, requires coherent policies that **align productivity and sustainability incentives within a holistic framework**. Farmers, companies and governments all perform better when rules, incentives and investments point in the same direction—rewarding efficiency, innovation and responsible resource use. Fragmented measures waste effort; aligned incentives multiply impact.⁴¹ When policies connect and reinforce productivity, sustainability and resilience, agriculture achieves more with less: raising output, protecting natural resources, and embedding climate-smart, nature-positive practices at scale.

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