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CLIMATE CHANGE AND AGRICULTURE

Strengthening the Role of Smallholders

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SUMMARY Smallholder farmers have a vital role to play in global food security and nutrition, and in supporting a range of development and climate change goals. Strengthening the resilience and commercial viability of these farmers, particularly women and youth, can increase their capacity to contribute to these global goals.

SMALLHOLDER FARMERS ARE KEY CONTRIBUTORS TO GLOBAL FOOD security and nutrition. The 500 million smallholder farms in the developing world provide an estimated 80 percent of the food produced in Asia and Africa south of the Sahara.¹ Yet smallholders are a vulnerable and often neglected group, who account for most of the world's poor and hungry. Globally, the poor and hungry live predominantly in rural areas, where agriculture is their main source of livelihood.² Smallholders face a mix of interrelated risks and challenges that threaten their livelihoods, food security, and nutrition—among these, climate change looms large. Increasing the resilience and viability of smallholder farming could both reduce rural poverty and food insecurity, and contribute broadly to the Sustainable Development Goals (SDGs).

Evidence is strong that climate change will continue to have negative impacts on agriculture, increasing the vulnerability of smallholder farmers, especially in tropical regions.³ Climate change exacerbates the production challenges faced by smallholders and increases the likelihood of agricultural and income losses, pests and diseases, and asset depletion.⁴ For example, yields of staple crops grown by smallholders, such as maize, rice, and wheat, are expected to decline in the coming years as a result of climate change.⁵

At the United Nations General Assembly in September 2015, world leaders agreed on the SDGs—17 goals with 169 targets—which will anchor the global development agenda for the next 15 years. At the core of the SDG initiative are goals to eliminate extreme poverty, hunger, and malnutrition, and preserve our planet. Smallholders have a unique role to play in this new development agenda and can contribute to several SDGs. Smallholder agriculture, especially if well

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integrated into a diversified rural economy and agri-food value chains, can contribute to more inclusive growth and, critically, to employment generation. Even very poor subsistence farmers can be empowered to manage resources sustainably and can benefit from goals focused on education, peace, and gender equality. Assistance through such measures as safety nets and support through off-farm employment to diversify livelihoods can also help develop rural communities and disrupt cycles of poverty, hunger, and undernutrition. This support can also promote more inclusive patterns of growth and cushion the short-term impact of transitioning into non-farm activities.

Although smallholder agriculture is often recognized as a vital sector for development, it has rarely enjoyed the policy and institutional support necessary to allow smallholders and rural economies to thrive.⁶ A commitment to treat smallholder farms as viable businesses is key to unlocking the sector's potential to contribute to the broader development agenda. Indeed, meeting many of the SDGs will require support to strengthen smallholders' resilience to various shocks, including climate shocks, which put their livelihoods and prosperity at risk. Investing in solutions that offer multiple wins, such as increased productivity or profitability, improved food security and nutrition, and climate change mitigation and adaptation, will foster resilience and facilitate smallholders' integral role in achieving the SDGs.

SMALLHOLDERS' ROLE IN COMBATING CLIMATE CHANGE

Many smallholders earn low incomes and lack access to adequate education, land, credit and financial services, technical assistance, and markets. Such limited resources and capacities leave smallholders extremely vulnerable to the direct impacts of climate change, particularly the higher frequency and intensity of extreme weather events, such as heat waves and severe droughts, extreme rainfall and floods, and tropical cyclones. These same limitations will also make it difficult for smallholders to adapt to the effects of climate change, further constraining their productivity and resilience.⁷ For smallholders to

build resilience to climate shocks, investments must be made in climate change mitigation and adaptation measures. Multiple-win solutions, such as climate-smart agriculture (CSA), can offer opportunities for smallholders to sustainably and efficiently produce more nutritious crops while contributing to positive climate action. These solutions can reap high returns: studies show that multiple-win solutions have large benefits for smallholders and create spillover effects for the rest of society.⁸

Smallholders are highly vulnerable to climate shocks

Smallholders are not all the same—they are a diverse set of households living in different types of economies.⁹ They do, however, share a vulnerability to climate shocks. Smallholder productivity depends on well-functioning ecosystems and ecosystem services. Predictable freshwater delivery is particularly important because smallholders in many developing countries engage in rainfed agriculture. Changes in weather patterns, such as longer dry seasons or extended rains, require farmers to make adjustments to their agricultural activities, which in turn can increase pressure on ecosystems, for example, through overextraction of water or inappropriate use of agrochemicals.¹⁰

Land degradation also compounds the vulnerability of smallholders. The Food and Agriculture Organization of the United Nations (FAO) estimates that 12 million hectares of land are lost annually to drought and desertification, and also predicts that the fertility of arable land will be negatively affected by climate change.¹¹ In Africa south of the Sahara, up to 20 percent of arable land may become much less suitable for agriculture by 2080.¹² The world's drylands, which cover about 40 percent of the world's land surface and are inhabited by about 3 billion people, are also extremely vulnerable to climate change.¹³ This puts smallholders who tend farms in drylands—more than 200 million of whom are in Africa south of the Sahara—at high risk.¹⁴

Smallholders have limited capacity to adapt to climate shocks

Large farms with access to capital and resources may be able to adapt to unpredictable changes.

Smallholders, however, the vast majority of whom are poor, lack access to assets and services that could help them cope with the results of unexpected weather or other unforeseen challenges. In India, for example, where smallholders contribute 70 percent of the country's agricultural production, more than half of the country's agriculture is rainfed and is thus heavily dependent on a predictable monsoon season.¹⁵ When the monsoon arrived late in 2011, small farmers with fewer assets, higher risk aversion, and less access to irrigation and weather information were less able to respond effectively to the delay than farmers with greater assets.¹⁶

Smallholders also face policy-related constraints, such as distortionary price regulation and poor extension services.¹⁷ These barriers make it difficult for smallholders to build the resilience needed to prepare for, cope with, and recover from shocks, and to improve their welfare.¹⁸

Leverage climate-smart agriculture to achieve broader development goals

Strategies to promote climate change mitigation and adaptation should be an integral component of efforts to strengthen the contribution of smallholders to global food security, nutrition, and climate action. Developing and implementing strategies that address these multiple goals requires a holistic assessment of synergies, trade-offs, and opportunities, as well as coordination of support to smallholders by policy-makers, researchers, and practitioners. CSA offers a triple-win strategy—simultaneously improving smallholder productivity for nutritious crops and helping smallholders both adapt to climate change and mitigate agriculture's contribution to climate change.¹⁹ For example, development of climate-ready crops, such as C4 rice, has been found to double water use efficiency, increase yields by almost 50 percent, and increase nitrogen use efficiency by 30 percent.²⁰ Climate-smart approaches to agriculture can have high payoffs. Research suggests that adaptation and mitigation initiatives can have valuable economic, environmental, and social spillover effects for smallholders and their communities.²¹ In Niger, for example, smallholders are promoting regrowth of trees and shrubs on agricultural land using the farmer-managed natural regeneration technique. This

low-cost, simple agroforestry approach protects crops from heat, provides families with firewood, allows farmers to keep livestock, enhances biodiversity, and combats desertification. As one of the poorest countries in the world, Niger is also extremely vulnerable to climate change, particularly drought and desertification. Farmer-managed natural regeneration has been adopted on about 5 million hectares across the country since the 1980s, constituting around 50 percent of total farmland. In many cases, it has halted and reversed desertification.²² By improving crop yields, diversifying livelihoods, and on average, doubling farmers' income, such investments can generate high economic, social, and environmental payoffs for smallholder agriculture. These agroforestry initiatives have spread across Africa south of the Sahara, including to Ghana and Zambia.²³

Zero-tillage agricultural systems are another approach that can offer multiple benefits. One study found that smallholder farms in the Indo-Gangetic Plains of India that adopted zero-tillage systems became almost carbon neutral in the span of three years (from 2009 to 2012), as emissions from farming activities were counterbalanced by carbon sequestration. The same study showed that farmers' incomes increased by almost US\$100 per hectare per year with zero-tillage systems, mainly because of lower input and production costs.²⁴

The potential of CSA initiatives to support economic development, poverty reduction, and food security is attracting global-level attention. The Global Alliance for Climate-Smart Agriculture, for example, was launched in 2014 following the UN Climate Summit in New York. With members from government, civil society, farmer associations, and research organizations, the Global Alliance focuses on scaling up CSA to improve food security and nutrition worldwide. The initiative provides tools and methodologies for assessing stakeholder needs in terms of adopting CSA, and supports regional and country-level action suited to local environments.

The largest global financing source dedicated to supporting the adaptation of poor smallholder farmers to climate change is the Adaptation for Smallholder Agriculture Programme. Launched in 2012 by the International Fund for Agricultural Development (IFAD), the program gives smallholders access

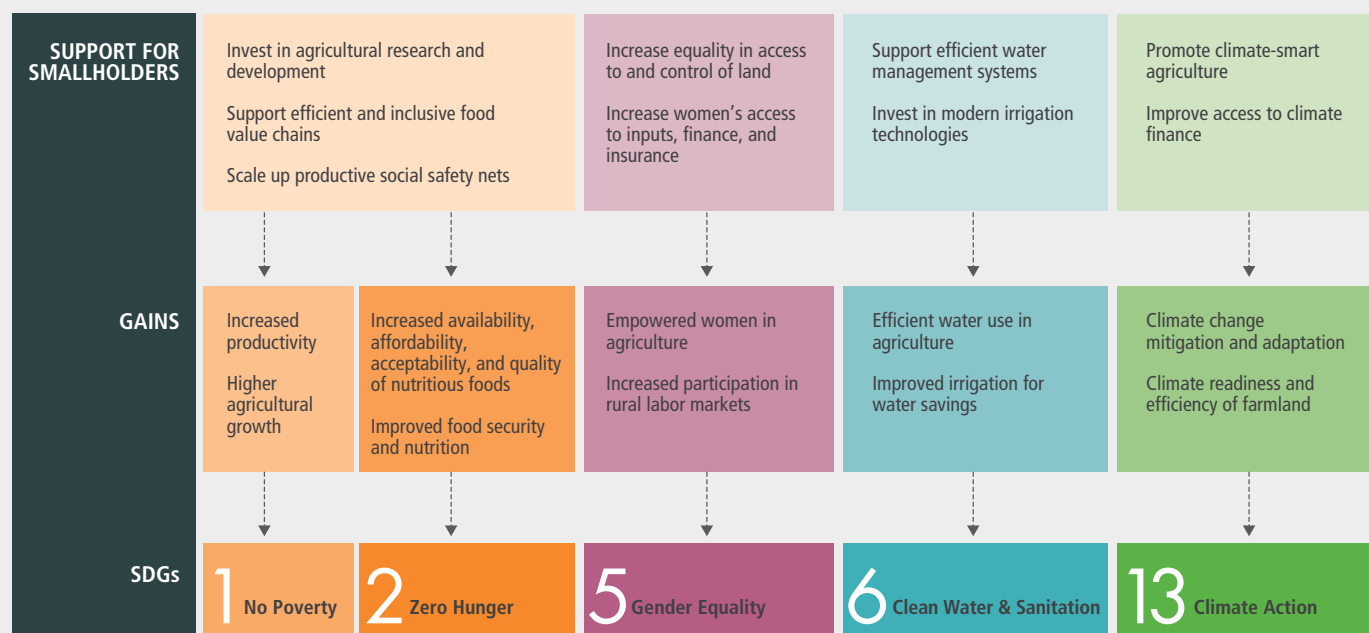
to climate finance that promotes adaptation initiatives by sharing knowledge on CSA, land management, postharvest practices and technologies, and women's empowerment. Eight million smallholder farmers are expected to benefit from this financing by 2020.²⁵

SMALLHOLDERS' ROLE IN ACHIEVING THE SDGs

Smallholders will be critical to achieving many SDGs and targets on time, despite the many challenges they face.²⁶ [Figure 1](#) provides examples of ways in which support to smallholders can help overcome these challenges and strengthen their role in achieving particular SDGs. A more comprehensive summary of the challenges that smallholders face, potential gains from supporting smallholders, and key interventions or investments is provided at the end of this chapter ([Table 1](#)).

Although smallholder agriculture contributes to climate change, it is also a key part of the solution to climate change and the attainment of SDGs. Smallholders have the potential to significantly reduce greenhouse gas (GHG) emissions, maintain ecosystem services, and preserve biodiversity; they also often produce higher output per unit of land than large farms, reducing pressure for agricultural land expansion.²⁷ Because of their size, smallholders can take advantage of labor-intensive CSA techniques that also enhance productivity and support biodiversity. Successful smallholders can also contribute to the attainment of the SDGs related to poverty alleviation, education, gender equality, water use, energy use, economic growth and employment, sustainable consumption and production, and ecosystem management. Ensuring the achievement of the SDGs, therefore, will depend on strengthening smallholder resilience to various shocks, including climate shocks, and investing in successful small farms.

FIGURE 1 Support to smallholders can contribute to multiple SDGs—key examples



Source: Authors' compilation, adapted from Farming First, "The Story of Agriculture and the Sustainable Development Goals" (2015), <http://www.farming-first.org/sdg-toolkit#home>.

Make implementation of the SDGs inclusive of smallholders

In working to achieve the SDGs, countries must adopt context-specific policies that are inclusive of all smallholders, including women and youth. While all smallholders are vulnerable, women and men have different adaptive capacities, in large part because of unequal access to land and technologies, which often leaves women less able than men to cope with shocks. For instance, men are more likely to own farming assets and have access to technologies that could support adaptation to climate change.

A preliminary study in Mali suggests that access to irrigation allowed men to increase their value of production almost enough to offset the negative impact of climatic shocks. Women, however, were less able to adapt because they had only limited access to irrigation and other farm technologies that could be used to increase productivity.²⁸ Another study undertaken in Kenya suggests that when women had equal access to information on climate-smart adaptation practices, they were as likely as men to adopt such practices.²⁹ Empowering women in agriculture not only will improve climate adaptation practices, but also can contribute to other societal gains, such as improved household nutrition. According to an FAO multicountry study, women who have equal access to resources can increase yields by close to 30 percent, improve agricultural outputs, and reduce the number of undernourished people by up to 17 percent.³⁰

SDG implementation must also be inclusive of youth in agriculture. As the world becomes progressively more urban, sustainable cities will depend on greater amounts of food, clean water, and environmental services that only vibrant rural economies can provide.³¹ However, young people are increasingly abandoning agriculture and rural areas in search of employment in cities or abroad.³² Rural youth in impoverished regions do not see employment in agriculture as a viable career. In Africa, for example, there is great potential to increase opportunities on-farm and in value chains, yet these opportunities are unrecognized by or inaccessible to most young people.³³ There is a pressing need to create opportunities for young people to earn a decent living in the agricultural and

nonfarm rural sectors in order to promote thriving rural economies.

Treat smallholder agriculture as a viable business to achieve multiple SDGs

Treating smallholder agriculture as a business when it has potential to become commercially viable will help to leverage its contribution to multiple SDGs. For example, supporting a shift from traditional subsistence farming to high-value, climate-smart, and nutrition-driven agriculture for smallholders can greatly contribute to the attainment of several SDGs. Making this shift will require sustained policy and institutional support, and sufficient investments in key areas, including financial facilities and risk management tools, knowledge and technical skills, market access, and social safety nets for smallholders.

Give smallholders access to financial and risk management tools

To sustain and grow their operations, smallholders require access to financial capital and facilities, including climate finance, and to risk management tools, including insurance. Bundling financial and nonfinancial services, such as credit or savings together with insurance, can provide a comprehensive solution for smallholders.³⁴ Such solutions are especially crucial in the event of unexpected climatic shocks. In Bolivia, IFAD's Adaptation for Smallholder Agriculture Programme provides finance to smallholders that will help communities adapt to climate change and receive climate-risk management training, among other projects. This initiative is expected to improve the resilience of at least 49,000 smallholder farmers.³⁵ Similar investments are being made across Africa south of the Sahara. The lessons learned from these initiatives will provide insight regarding the effectiveness and sustainability of climate finance interventions under various designs and circumstances.

Accessible risk management tools, such as index-based insurance, can help smallholders manage the insecurity inherent in farming livelihoods. Weather index-based insurance provides farmers with a payout during poor and irregular weather, increasing their resilience by protecting them from the worst effects of weather-related shocks.³⁶ In

the past, the high costs associated with measuring losses made agricultural insurance unaffordable for smallholders. Weather index–based insurance, however, does not require costly measurements, making it cost-effective for smallholders. In Ethiopia and Senegal, for example, farmers who were previously considered uninsurable (because of poverty and lack of education, among other reasons) participated in the R4 Rural Resilience Initiative, which provided access to improved climate-risk management tools, such as natural resource rehabilitation. The insurance component of the initiative covered almost one-third of Ethiopian farmers from 2009 to 2012.³⁷ In India, more than 30 million smallholders have adopted weather-indexed insurance in recent years, enabling some farmers to shift toward more profitable farm production systems that may incur higher risk.³⁸ The global Platform for Agricultural Risk Management, managed by IFAD, assesses agricultural risk and facilitates integration of risk management strategies into public policies, agricultural investment programs, and private sector practices. Through this platform, IFAD is strengthening its understanding of agricultural risk and developing better tools to assist smallholders.³⁹

Provide smallholders the knowledge and technical skills needed to build climate resilience

Strengthening the capacity of smallholders to mitigate and adapt to climate change–induced shocks by adjusting farming strategies—particularly by adopting CSA—will be critical to their success. For example, providing farmers with knowledge and training on how to adjust sowing dates and introduce drought- or flood-resilient crops can facilitate adaptation. Initiatives of this type are being supplemented by investments in improved climate information services, a core activity in Adaptation for Smallholder Agriculture–supported programs across Africa and Asia.

Ensure smallholders have access to high-value markets

Linking smallholders to high-value markets can help to increase the profitability of smallholder enterprises and connect rural and urban areas. Strengthening rural-urban linkages allows for

better integration of rural farmers with urban centers and provides expanded market-based agricultural opportunities.⁴⁰ Some farmers, however, face hard constraints—such as marginal lands and long distances to markets—that are likely to impede efforts to increase profits or to participate in high-value markets. Improved road networks can increase access for smallholders, and off-farm employment opportunities should also be promoted for these farmers.⁴¹

An example of a successful rural-urban link is India's dairy grid, popularly known as Operation Flood. Small dairy farmers were linked to urban consumers in a chain of production, procurement, processing, and marketing. The dairy grid involved 13 million participants, including almost 4 million women, in the value chain as of 2008, giving them access to urban markets. Consumers also benefited, gaining access to more and better-quality milk.⁴²

The Strategic Partnership Program supported by IFAD and the International Food Policy Research Institute (IFPRI) aims to provide smallholders with better access to markets for high-value commodities and to opportunities related to climate change mitigation.⁴³ From 2008 to 2011, the program implemented four activities in Morocco related to market access and climate change mitigation, and identified new market opportunities for high-value CSA products and services, such as carbon sequestration.⁴⁴

Provide smallholders social protection

Social protection programs, including social safety nets, provide a critical short-term cushion for coping with livelihood shocks, such as extreme weather, and facilitate investment in long-term productivity-enhancing or exit opportunities.⁴⁵ A preliminary study in Honduras suggests that social protection programs can boost community and smallholder resilience and adaptive capacity while reducing poverty and improving food security. Specifically, social protection measures that focused on enhancing social and human capital are thought to have reduced smallholder and community vulnerability to drought.⁴⁶ Cross-sectoral social protection programs, such as Ethiopia's Productive Safety Net Programme, which is paired with a food security and household asset-building program, are

examples of important forms of social protection. These measures can help support improvements in productivity with multiple benefits for smallholders and other vulnerable groups.⁴⁷ To generate further benefits, social protection programs should also integrate gender considerations and be designed to suit country contexts.

SUPPORTING THE CONTRIBUTION OF SMALLHOLDERS

Smallholders are essential to achieving global food security, nutrition, and positive climate action. Fostering smallholders' resilience is key. In addition, a new outlook on global food security and nutrition that views smallholder agriculture as a business can further promote the role of smallholders in achieving gains in climate change adaptation and mitigation, food security and nutrition, and poverty reduction. With the right tools and strategies, successful smallholders can contribute significantly toward a host of development goals. The SDGs, therefore, must be inclusive of smallholders, especially smallholder women and rural youth—groups extremely vulnerable to shocks but also critical to ensuring global food security and nutrition for all. Additionally, strengthening rural-urban linkages can boost smallholder productivity and profitability, and promote better access to nutritious food for urban consumers.

At the global level, international climate negotiations must recognize the vital role of smallholders. Given the strong link between agriculture and climate change, support for smallholders needs to be a cornerstone of global agreements related to climate change. At the 21st Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in December 2015, a global agreement was signed to combat climate change and unleash actions and investments toward a low-carbon, resilient, and sustainable future. Agriculture, however, was only indirectly recognized in the final agreement as a key component to combat climate change. Against that backdrop, it is critical to ensure that agriculture is integrated in ongoing and follow-up efforts to COP21 and that smallholders are recognized for their potential contribution to climate action.

Finally, global agreements, including COP21 and the SDGs, must translate to local action. The SDGs call for country-level implementation to end poverty, protect the planet, and ensure prosperity for all. Similarly at COP21, 195 countries agreed to submit updated climate plans every five years and define roadmaps for implementation. Such plans must go beyond governments and afford other sectors, including smallholders, the opportunity and means to contribute to their country's economy and overall well-being, and to truly promote inclusive growth. ■

TABLE 1 How smallholders can contribute to the SDGs

Issues/challenges faced by smallholders	Gains from supporting smallholders	Key interventions/ investments needed	Sustainable Development Goals
Smallholders account for most of world's poor	<ul style="list-style-type: none"> ▶ Increased productivity improves smallholders' income and helps them contribute to greater agricultural growth ▶ Agricultural growth is at least twice as effective in reducing poverty as other sectors—however, resource costs must be considered 	<ul style="list-style-type: none"> ▶ Investing in agricultural research and development (R&D) and extension ▶ Scaling-up productive social safety nets ▶ Promoting land rights and efficient land markets ▶ Supporting efficient and inclusive food value chains ▶ Supporting nutrition-sensitive agricultural production 	1 No poverty
Smallholders account for most of world's hungry and many are malnourished	<ul style="list-style-type: none"> ▶ Increases ability of smallholders to produce and purchase more nutritious foods by lowering food prices for poor consumers, and by raising demand for rural labor ▶ Improves food security and nutrition for smallholders 		2 Zero hunger
Many smallholders lack access to high-quality education and technical know-how	<ul style="list-style-type: none"> ▶ Smallholder-friendly agricultural extension services help farmers to access skills, inputs, and technologies ▶ Well-designed extension services can offer high returns on investment 	<ul style="list-style-type: none"> ▶ Creating extension services that provide knowledge and skills for use of new technologies ▶ Strengthening capacity to improve human, organizational, and institutional capacities and knowledge systems for providing in-country solutions 	4 Quality education
Smallholder women have less access to resources than men	<ul style="list-style-type: none"> ▶ Empowering women in agriculture will contribute to reduction of global hunger ▶ Increased participation in flexible, efficient, and fair rural labor markets ▶ Women mediate pathways from agriculture to nutrition 	<ul style="list-style-type: none"> ▶ Increase equality in access to and control of land ▶ Improving women's access to inputs and credit ▶ Expanding women's access to education ▶ Supporting gender-driven agricultural policies for improved nutrition 	5 Gender equality
Smallholders face declining water resources	<ul style="list-style-type: none"> ▶ Better water-use efficiency in agriculture can help to meet future food and nutrition requirements ▶ Adoption of modern irrigation technologies can lead to better irrigation efficiencies and water savings 	<ul style="list-style-type: none"> ▶ Eliminating inefficient subsidies that promote overuse of water ▶ Establishing efficient water management systems ▶ Investing in efficient irrigation technologies 	6 Clean water and sanitation
Smallholders lack access to energy	<ul style="list-style-type: none"> ▶ Improved access to energy can improve living standards and reduce hunger ▶ Greater energy efficiency is needed, as demand is expected to increase, especially in the developing world 	<ul style="list-style-type: none"> ▶ Improving energy efficiency in production, processing, and retail sectors ▶ Eliminating inefficient subsidies to nonfood crops for biofuels ▶ Promoting rural renewable energy use 	7 Affordable and clean energy

Issues/challenges faced by smallholders	Gains from supporting smallholders	Key interventions/ investments needed	Sustainable Development Goals
Smallholders are not always seen as entrepreneurs who contribute to the local and global economies	<ul style="list-style-type: none"> ▶ Spurs economic growth—income multipliers are linked to agricultural growth ▶ Attracts youth to profitable business opportunities and leverages “youth dividend” 	<ul style="list-style-type: none"> ▶ Supporting smallholders with profit potential to move up to more commercial activities through various means, such as improved access to land, markets, infrastructure, and trade ▶ Tailoring agriculture employment interventions to specific needs of young people 	8 Decent work and economic growth
Smallholders lack access to high-value markets that could improve profitability	<ul style="list-style-type: none"> ▶ Rural–urban linkages can help to address both rural and urban hunger and poverty 	<ul style="list-style-type: none"> ▶ Connecting smallholders in rural and peri-urban areas to high-value urban markets ▶ Promoting pro-smallholder value chains through increased access to information and communication technologies 	11 Sustainable cities and communities
Smallholders lack infrastructure to process and store postharvest yields, leading to food loss	<ul style="list-style-type: none"> ▶ Food loss reduction measures can improve food availability and access, and reduce hunger and malnutrition ▶ Increases resource-use efficiency 	<ul style="list-style-type: none"> ▶ Investing in infrastructure and transportation ▶ Promoting research and training on food loss prevention in the packing and processing industries 	12 Responsible consumption and production
Smallholders are vulnerable to climate change threats, such as land degradation and drought	<p>Climate-smart agriculture leads to multiple wins:</p> <ul style="list-style-type: none"> ▶ Increased productivity and profitability ▶ Climate change mitigation and adaptation ▶ Climate readiness and efficiency of farmland 	<ul style="list-style-type: none"> ▶ Promoting climate-smart agriculture technologies and practices ▶ Improving access to climate-related risk management ▶ Expanding agricultural R&D to produce more nutritious foods with fewer resources and reduced GHG emissions 	13 Climate action
Smallholders respond to changing conditions by increasing pressure on ecosystems, such as overextraction of water and use of agrochemicals	<ul style="list-style-type: none"> ▶ Sustainable intensification can help to meet rising food demand, reduce negative environmental effects, and preserve ecosystems 		15 Life on land

Source: Authors’ compilation.

Note: Adapted from Farming First, *The Story of Agriculture and the Sustainable Development Goals* (2015), <http://www.farmingfirst.org/sdg-toolkit#home>.