Increased Sustainable Agricultural Productivity

U.S. Government's Global Food Security Strategy Activity Design Guidance

This is one of several Activity Design Guidance documents for implementing the U.S. Government's Global Food Security Strategy. The full set of documents is at www.feedthefuture.gov and www.agrilinks.org.

Introduction

Increased sustainable productivity drives agriculture-led economic growth throughout the global economy, but it is particularly important for the local economy, creating new on- and off-farm employment opportunities, including for women and young people.[1] Accelerating productivity growth and making these gains more efficient is critical to addressing Feed the Future's topline goals of reducing food insecurity, malnutrition, and poverty. Productivity growth is multifaceted, including increased yields, resource-use conservation, reduced postharvest loss, market efficiency, and value addition. Greater agricultural productivity can enhance demand for locally produced goods and services; increase availability and affordability of safe, nutritious foods; and improve profitability throughout the entire agriculture and food system, allowing households to build assets to strengthen resilience to market, climate, and environmental shocks and stresses. Incorporating the concept of sustainability means considering impacts and tradeoffs among productivity, human, social, economic, and environmental outcomes.

While agricultural productivity growth has increased globally, production growth, particularly in sub-Saharan Africa, has been driven by the expansion of cropped land rather than an increase in agricultural production per unit of inputs.[2,3] Agriculture productivity gains need to be characterized by efficiency and intensification to enhance sustainability, reducing the need for additional land and the emissions from production processes. Sustainable and inclusive agricultural productivity requires long-term stewardship of natural resources, human capital (particularly by removing barriers that disadvantage women), and social networks.

Terminology and Context

Sustainable Agricultural Productivity Growth: Increasing the value or quantity of agricultural outputs relative to inputs by increasing efficiencies throughout the agriculture and food system, taking into account the current and future performance of environmental, economic, and social factors. Yields (production per unit area or animal) are only one component of productivity. Other determinants of productivity gains include production (quantity of harvest or livestock or fish offtake available for consumption or sale), production value, input costs (e.g., labor, land, seeds, mechanization, animal health, and other services), resource-use efficiency (water, fertilizer, fuel, etc.), market efficiency, postharvest loss reductions, and value addition. Nitrogen use efficiency, for example, is a measurement of the effectiveness of the nitrogen fertilizer farmers apply, often measured as the value of grain produced per unit of nitrogen applied. Improving the efficiency with which nitrogen fertilizer (or other inputs) is used through better management practices can result in improved yields, profitability, and water quality.

Sustainable Intensification: A technically defined and measurable concept (sitoolkit.com), sustainable intensification is an approach to agriculture that simultaneously maximizes systems benefits and minimizes tradeoffs across productivity, economic, environment, human, and social indicators. For example, agricultural yields are increased through the addition of inputs and practices without adverse environmental impact and without the conversion of additional nonagricultural land. In areas of resource scarcity, improving the ecological foundation, such as reducing soil erosion or improving water quality, can increase crop or animal production per unit of land, water, or fertilizer used. Analysis of interventions (e.g., gender-appropriate mechanization, on labor components, including paid and unpaid labor) can provide insight to differential benefits for different farmers, including women.

Sustainable agricultural productivity encompasses a broad set of components and principles. Increasing crop or animal yields should balance the yield gain with the cost and risks to achieve it. In general, increases in one component of agricultural productivity lead to impacts on other components of productivity and can thereby affect sustainability (Figure 1). "Sustainability" refers to the impacts of productivity growth on not only crop, livestock, or fish productivity, but also on economic, environmental, social, and human factors over time (Figure 2).[4] Measuring the range of components, which span sales price, cost of labor, and inputs relative to quantity of harvest, can be difficult.

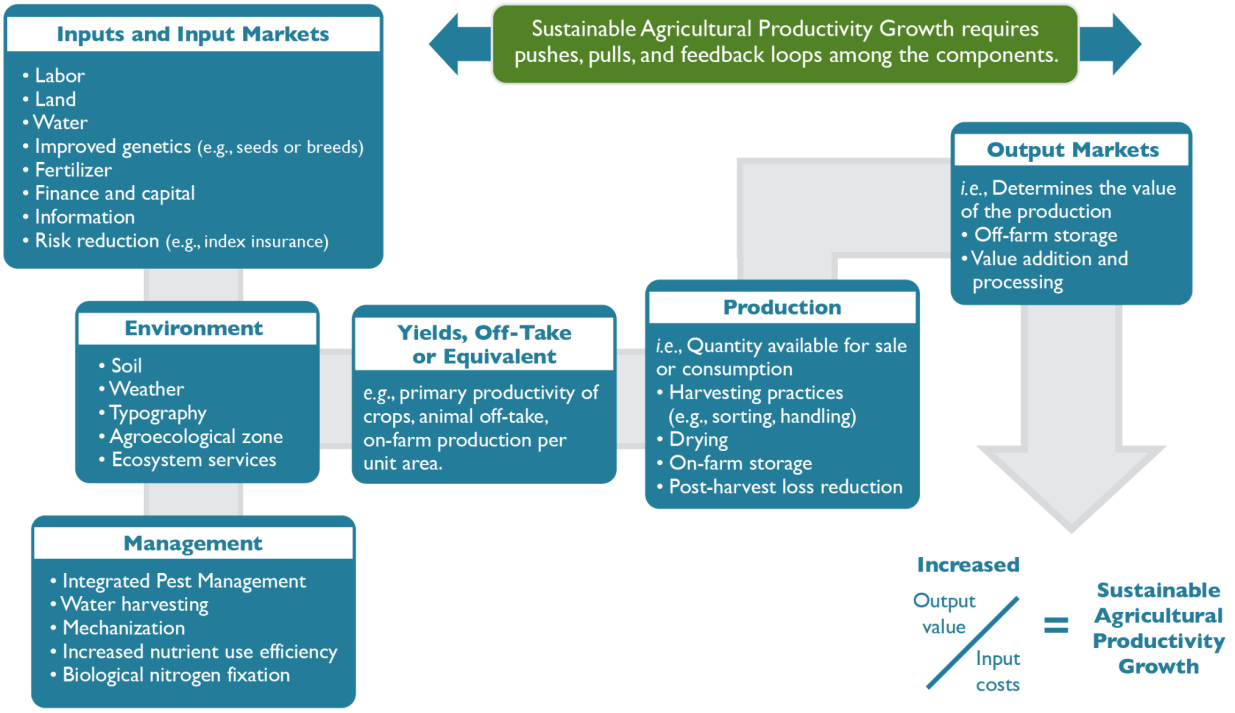

Figure 1. Components of Sustainable Agricultural Productivity Growth. The components are interdependent. For example, increases in yields without markets could lead to reductions in productivity growth. Similarly, markets require production to support them. The enabling environment, including policies, laws, and regulations, is important for all components and especially markets.

A few general principles indicate approaches to increasing sustainable agricultural productivity:[5]

- **Prudent** in the use of purchased inputs and impact on the environment
- **Efficient** in seeking returns on investments and in reducing waste and environmental impact
- **Resilient** to market, climate, and environmental shocks and stresses, such as price shocks, pest outbreaks, extreme rainfall events, and drought
- **Equitable** in that agricultural inputs and outputs are accessible and affordable at the individual, household, village, regional, or national levels, thus improving prospects for low-income producers, workers across value chains, and consumers

Linkages to the GFSS. Increasing sustainable agricultural productivity is an essential determinant to Intermediate Result 4 (IR 4) Increased sustainable productivity and IR 1 Strengthened food and agriculture systems that are productive and profitable and critical to achieving Objective 1: Inclusive and sustainable agricultural-led economic growth. The GFSS results framework also emphasizes the connection between IR 4 and Objective 2: Strengthened resilience among people and systems. For productivity gains to be sustainable, more efficient, ecologically sustainable, and resilient in the face of increasing conflict, climate change, disease-related threats, land degradation, and natural resource overexploitation, an integrated approach expands the focus on outcomes that support the health and nutrition of related systems and populations, as well as building multiple resilience capacities. Inclusiveness is an integral element of sustainable productivity that includes the active participation and empowerment of women and girls, youth, and other marginalized communities, and equitable development, where benefits flow to all members of society. See the GFSS Activity Design Guidance for Advancing Gender Equality and Women's Empowerment.

Sustainable agricultural productivity is essential to Objective 3: A well-nourished population, especially women and children, by making nutritious foods more affordable or accessible through increased rural incomes and greater availability and affordability of diverse foods at lower, real prices. Nutrient-dense foods from livestock, aquaculture and fisheries, and horticultural and legume crops are essential components of quality diets.

See the GFSS Activity Design Guidance for Diets and Food Safety; Sustainable Fisheries Management; Sustainable Aquaculture Production Systems; and Investing in Livestock and Animal Source Food Systems for more information.[6]

Designing Activities

Design consideration 1: Designing interventions requires a system-wide analysis of the economic, social, and environmental conditions in the agriculture and food system.[7] Elements to consider include: an assessment of the state of soil and water conditions; climate change impacts (including shifting agroecological zones); resource availability, accessibility, and competition; existing use and availability of improved technologies, practices, services, and inputs and by whom, including use of existing gender analyses that have identified gendered barriers and gaps; delivery pathways and their strengths and weaknesses for promoted innovations access and use of finance (including credit, savings, and insurance); and output markets, traders, and other relevant information, like loss and waste (Figure 2). In the areas where Feed the Future works, crop, livestock, and fish yields are often low. Improving yields is critical, but, if achieved through economically or environmentally unsustainable practices, will not lead to lasting outcomes that drive improvements in poverty, food security, and nutrition. Activity design must address the opportunities and constraints along input and output value chains, taking into account different opportunities for low-income individuals, women, youth, and marginalized groups. Design teams must consider the multiple components of sustainable productivity and ensure that technical

analyses, based on current best innovative technologies, economic viability, climate change projections, market realities, and resource management practices, identify the best approaches. Long-term sustainability and continuing impact depend on stakeholders having continued access to innovations, produced and delivered through capable public and private sector partners. Thus, designs should intentionally link public and private sector partners to source, develop, and deliver the most appropriate technologies and practices emerging from agricultural research. See the GFSS Activity Design Guidance for Climate-Smart Agriculture and Food Systems for more information.

Design consideration 2: Look for multiple opportunities, synergies, and tradeoffs beyond a single commodity or activity. Production systems are ecological systems typically used to produce a range of goods and services, including the familiar staple food and horticulture crops, livestock, and fish.[8] Evidence-based assessments of a region's major farming systems can reveal anticipated synergies and tradeoffs between farm enterprises, including opportunities to promote resource use efficiency and recycling through the promotion of circular bioeconomies. For example, by increasing maize yields, farmers not only produce more grain but often also more crop residues that can be used to boost livestock productivity or be returned to the soil to improve fertility. Increased and more reliable staple crop yields can also incentivize producers to diversify their investment into higher-value ventures, such as livestock and horticulture, which are often more nutritious. Crop rotations, and even single crops, often provide multiple values (e.g., for food and fodder) that can be simultaneously increased. Legumes, which can improve soil fertility by adding biologically fixed nitrogen and soil organic matter, are an example; they can be grown with cereals in rotation or intercropped and are a nutritious food as well as a fodder crop. Climate-smart agriculture practices and technologies can sustainably increase productivity and incomes, build climate resilience, and reduce or remove greenhouse gas emissions.

To achieve environmental and socioeconomic sustainability, and to maximize agricultural productivity, it is often critical to look at the multiple interactions a focal commodity has with the whole farming system and beyond, including women's roles, nutritional benefits, postharvest processing opportunities, and activities that occur during fallow or dry seasons. The Sustainable Intensification Assessment Framework (sitoolkit.com) can help in considering the different dimensions and potential impacts. Improving conditions beyond production through processing and output markets, including for input dealers, service providers, processors, and retailers, can drive productivity growth by increasing the value of agricultural products or decreasing the price of their production, processing, and delivery. Market system strengthening and linking producers to output markets can directly support more sustainable choices at the farm level. See the GFSS Activity Design Guidance for Integrating a Market Systems Approach in Programming for more information.[9]

Design consideration 3: Ensure that technologies, practices, and information used in development activities are appropriate to the farming system and socioeconomic conditions. This includes, but is not limited to, consideration of gender roles, soil fertility and other natural resource conditions, pest and disease pressures, changes in temperature and rainfall, market availability (inputs) and demand (output), or cultural conditions (Figure 2). Local systems, such as producers and extension services, are often the best source for knowing what is needed to have the greatest impact. In areas of greater production risk, an initial focus on resource use efficiency may be the most effective and sustainable approach; enhancing productivity while reducing risk can open a path toward greater investment and greater returns. In nearly all cases, development activities focused on availability and adoption of improved crop cultivars, livestock breeds, fertilizers, and other inputs should include interventions supporting appropriate soil fertility and water management practices, governmental policies, and regulatory processes. It is important to include consultations with or input from technical experts from the scientific research community, such as those working with national research institutes, international agricultural research centers, and U.S. universities.

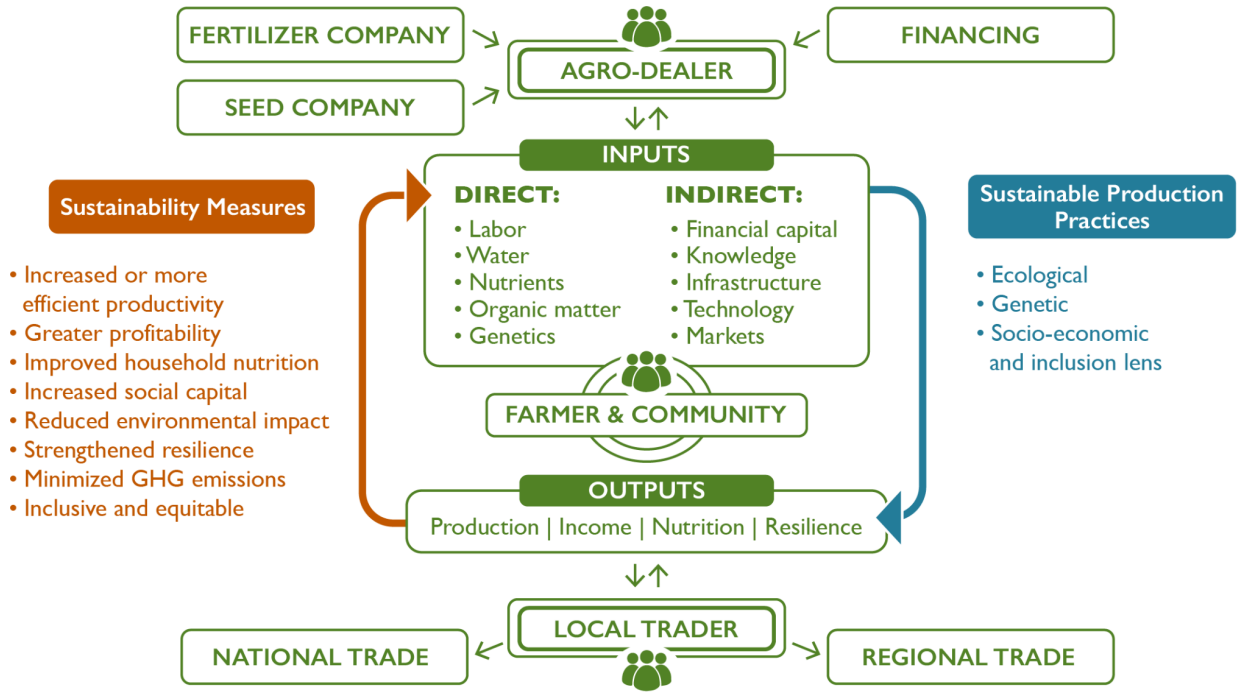

Figure 2. Designing interventions requires a system-wide assessment of the availability of needed inputs, markets and traders, and financial and knowledge capacity. Monitoring of measurable results based on desired outputs allows for mid-course corrections (adapted from The Montpellier Panel, 2013).

Design consideration 4: Prioritize productivity-enhancing innovations, practices, and packages likely to significantly benefit livelihoods that can reach large numbers of households, taking into account the different needs of members within households, and have a potential pathway to scale. Increasing yields is not the only consideration to support increased food security, nutrition, and incomes. Improving access to and optimizing the use of inputs, information, markets, and improved natural resource management can significantly improve productivity and livelihoods across many different households and communities. Agricultural biotechnology provides another powerful, flexible set of tools that offer potential to drive sustainable food security and development gains. The size and distribution of the potential beneficiary population over time can be estimated using modeling, drones, geospatial tools, or consultation with market actors. Since most households in the areas where Feed the Future works are agricultural producers achieving relatively low crop, livestock, and fisheries yields, a focus on increasing productivity through improved management practices, on-farm diversification, or reducing postharvest losses often achieves high levels of impact.

Improved seeds and related inputs, small-scale machinery, and improved management practices all play a role in achieving productivity, but other factors, such as markets and the policy-enabling environment, can prevent innovations from reaching potential users. The adoption potential and scalability of the proposed interventions should also be considered, including market demand (e.g., number of potential consumers, relative importance, etc.). We can gauge this via market analysis that includes consulting relevant public and private market actors, or using a scaling assessment tool (see the Additional Resources and Tools section). Continued uptake or use of the innovation, practice, or package will depend on a number of factors, including technical support, availability, affordability, and ease of use. Considering the scaling pathways for innovations in advance, such as private sector-led, public sector-led, or public-private partnership, helps identify market actor partners to engage. Gains in primary productivity and quality can incentivize market actors to invest more, just as enhanced market opportunities are needed to provide encouragement to producers.

Design consideration 5: Incorporate a market systems approach tailored to the context to support sustainable, locally owned change. To facilitate efficient, sustained, and widespread adoption of technologies, practices, and packages, activities should use market-based approaches and engage system actors from inception through implementation. Activities should not directly provide inputs, services, or otherwise serve as markets, but instead collaborate with and strengthen local market system actors, such as firms, extension services, universities, and community-based organizations. For example, if a desirable goal is the widespread adoption of improved legume varieties, but the Feed the Future activity is the only source of seeds, it is unlikely that the use of improved varieties will continue beyond the activity. By facilitating private sector seed distribution models, we foster locally owned and sustainable systems. This applies to other inputs, such as fertilizer, information, and repair services, and is a critical design criteria for scalability. Where there are constraints or gaps in the local system, activities should facilitate efforts to attract, strengthen, and link actors rather than playing a direct role along the delivery pathway, such as providing inputs, services, credit, manufacturing, distribution, serving as a purchasing intermediary, aggregating outputs from producers, etc. Activities often need to identify market-based incentives and articulate the business case to motivate given actors to engage and invest. The activity context will determine the market systems approach, such as the type and level of support the activity provides (e.g., coinvestment, expertise, and coaching) from inception through the life of the activity. Where activities provide more support and capacity strengthening initially, as we may see in thin markets or conflict-affected areas, there should be a plan to transfer implementation to market actors by the end of the activity. See the GFSS Activity Design Guidance on Integrating a Market Systems Approach in Programming for more information.[10]

Programming in Practice

Malawi: Leveraging partnerships with the private sector, government, and Feed the Future Innovation Labs to ensure marketability and productivity of seeds and input packages. The Malawi Agriculture Diversification (AgDiv) Activity aimed to address the poor quality of groundnut (peanut) and soybean seed available to farmers to increase productivity. AgDiv developed a seed roadmap with the Ministry of Agriculture to introduce better quality seeds into farmers' fields quickly, while employing a process for developing and testing new soybean and groundnut varieties for qualities that are in demand by Malawi farmers and the private sector. Linking the Feed the Future Soybean and Peanut Innovation Labs with commercial seed companies, AgDiv was able to decrease the time to develop, test, and release new varieties by about 60 percent. Four new varieties (one soybean and three peanut) have been released, with more in the pipeline. Additionally, AgDiv collaborated with the Soybean Innovation Lab to test different combinations of soybean inputs (including lime, inoculant, potassium, and phosphorus) to address the most pressing issues affecting farmers. To improve access to these technologies, AgDiv worked with distributors and the financial sector to develop and scale up financial products targeted toward smallholders, specifically addressing issues of gender and equity in access to finance. Key results include: (1) the yield of groundnuts increased by 30 percent above the baseline (2017–-2021), (2) the yield of soybeans increased by 7 percent above the baseline, and (3) average annual sales by farmers for both groundnut and soybean have more than doubled since baseline. This is beginning to yield dividends for female groundnut producers, with female farmers' net incomes during this period increasing 37 percent from $287/hectare (ha) to $394/ha. Additionally, during this time, AgDiv-supported female soybean farmers' net incomes increased from $156/ha to $266/ha, an increase of 70 percent. The percent of women achieving adequacy on group membership, input on productive decisions, and input on credit decisions increased statistically significantly over baseline—representing greater empowerment over decision-making.

Bangladesh: Integrating nutrition and income generation through improving livestock management and primary animal healthcare services. The Feed the Future Bangladesh Livestock Production for Improved Nutrition Activity aimed to increase livestock productivity for improved nutrition and income generation among rural households in eight districts across the Feed the Future zone of influence and zone of resilience. The six-year activity had three key components: (1) livestock productivity; (2) access of rural households to hygienic, diverse, and quality food; and (3) nutrition awareness and practices. As a crosscutting component, the activity addressed gender gaps and increased women's empowerment in livestock households and communities.The activity engaged livestock service providers (LSPs) and networks, leading private animal health, feed, and dairy companies to make livestock services available around farming communities and to increase access to markets for meat and dairy products. The activity promoted improved nutrition behaviors for rural households with proper nutrition education and practices on hygienic, diverse, and quality food for family nutrition. Key results include: (1) over 180,000 farming households increased average milk productivity by 246 percent and meat production by 204 percent; (2) over $1.34 million leveraged from eight private sector partners; and (3) households consuming meat weekly went from 13 percent to 49 percent.

Democratic Republic of the Congo (DRC): Combining sustainable income streams with biodiversity conservation. The Health, Ecosystems, and Agriculture for Resilient, Thriving Societies (HEARTH) Gorilla Coffee Alliance aims to address this challenge by helping local families establish environmentally sustainable ways to earn income, improving access to essential health services, and working with community institutions to become advocates for conserving the Kahuzi-Biega National Park in the DRC's South Kivu province. The Alliance aims to improve total farm productivity to support farmer revenues while protecting long-term soil health, biodiversity, and the vital ecological function of one of the world's largest forests. Over five years, this initiative seeks to partner with 8,500 farming households to improve their coffee production and sales and reduce poaching and deforestation around the park. While still in early stages, this activity provides an example of integrating opportunities related to different agricultural, health, and environmental outcomes while prioritizing household needs.

Additional Resources and Tools

- Agricultural Scalability Assessment Tool (ASAT): The tool aims to help select an appropriate scaling pathway for an innovation through a qualitative appraisal of the scalability.
- Scaling Scan: Successful scaling of innovations relies on a set of nontechnical requirements that form the basis for the Scaling Scan, which is built around 10 "Scaling Ingredients" that each require attention to reach a scaling ambition.
- Sustainable Intensification Assessment Framework: The Sustainable Intensification Toolkit is an interactive method to assess your research in sustainable intensification and adapt your practices to achieve the best possible outcome for all parts of a smallholder farmer's system.

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For further assistance related to these Activity Design Guidance documents, please contact ftfguidance@usaid.gov.