FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Global Food Security Strategy Technical Guidance
Increased Sustainable Agricultural Productivity

This is one of 18 technical guidance documents for implementing the U.S. Government's Global Food Security Strategy. The entire set of documents can be found at www.feedthefuture.gov and www.agrilinks.org.

Increased agricultural productivity is a key driver of wider agriculture-led economic growth and resilience in many regions heavily burdened by food insecurity, malnutrition, and poverty, and it's essential to achieving Feed the Future's objectives, which are guided by the U.S. Government's Global Food Security Strategy (GFSS). Greater agricultural productivity can increase food availability and affordability, improve profitability on the farm and across the food system, and build household and ecological assets to bolster resilience against market and environmental shocks. It also spurs economic growth, particularly of the local economy, and creates new on- and off-farm employment opportunities, including for women and young people.[1] 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*: Sustainably increasing the value of agricultural outputs relative to inputs by increasing efficiencies throughout the food system. Determinants of productivity gains include yields (production per unit area or animal), production (quantity of harvest or livestock or fish off-take 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), market efficiency, postharvest loss reductions, and value addition.*

Sustainable agricultural productivity encompasses a broad set of components and principles. Agricultural productivity, broadly considered, is the value or quantity of outputs relative to inputs. Measuring the range of components, which span sales price, cost of labor, and inputs relative to quantity of harvest can be difficult. Yield measurements (e.g., kilograms of production per unit area) often serve as reasonable proxies because producers generally balance input costs that support improved crop and livestock and fish yields with market access and overall economic returns. Yields, however, are only one component of productivity. Increasing crop or animal yields should balance the yield gain with the cost to achieve it. 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. In general, increases in one component of agricultural productivity lead to impacts on other components of productivity and can thereby affect sustainability (Figure 1). The term "sustainability" in this example 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).[2] Nitrogen use efficiency, for example, is a measurement of the effectiveness of the nitrogen fertilizer farmers apply, often measured as 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. Improving labor components of productivity through, for example, gender-appropriate mechanization, can deliver important benefits for women by reducing drudgery and freeing up time.

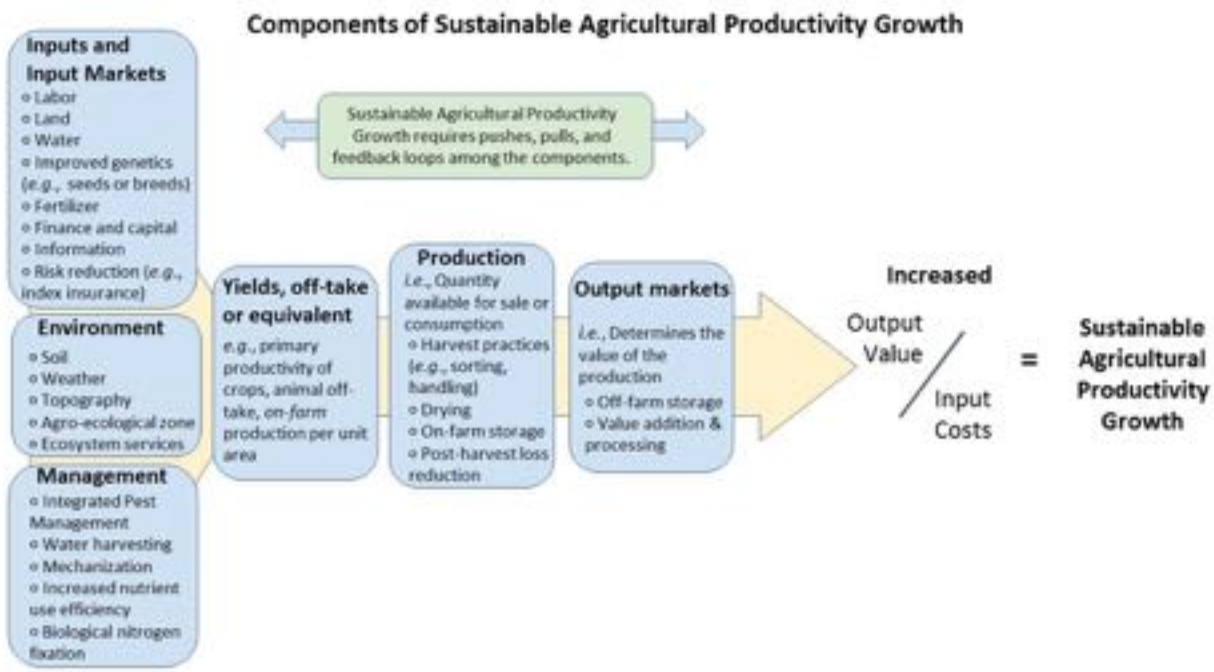

Figure 1. Components of Sustainable Agricultural Productivity Growth. The components are interdependent. For example, increases in yields without markets could lead to reductions in productivity growth. Similarly, markets require production to support them. The enabling environment, including policies,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

A few general principles indicate approaches to increasing sustainable agricultural productivity:[3]

- **Prudent**, in the use of purchased inputs and impact on environment;
- **Efficient**, in seeking returns to investments and in reducing waste and environmental impact;
- **Resilient**, to market 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 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 critical to achieving the Feed the Future objectives through the GFSS and is highlighted in the Intermediary Results of *Increased sustainable productivity* (IR 4) and *Strengthened inclusive agricultural systems that are profitable and productive* (IR 1). Increasing potential and decreasing risks associated with primary productivity[4] is mutually reinforcing with enhancing market efficiency; these two IRs are integrally linked 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*, because poor communities are most vulnerable to extreme weather events that increase risks within the global food system,[5] human conflict, and abrupt market changes. Women's empowerment is an important foundation for resilience. See the GFSS Technical Guidance on Strengthened Resilience Among People and Systems for more information.[6]

Sustainable agricultural productivity also indirectly supports 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.

Livestock, aquaculture and fisheries, and horticultural and legume crops can play important roles in improving nutrition. See the GFSS Technical Guidance on Livestock for more information.[7]

Designing interventions

Design consideration #1: Designing interventions requires a system-wide assessment of the environmental conditions (including the state of soil and water conditions), availability of improved technologies and practices, inputs, delivery pathways for those inputs, access to finance (including credit, savings, and insurance), markets, traders, and relevant information (Figure 2). In the areas where Feed the Future works, crop, livestock, and fish yields, important components of primary agricultural productivity, are often low. Improving yields is often critical but, if achieved through economically or environmentally unsustainable practices, will not lead to lasting outcomes that drive reduction of extreme poverty and hunger, or that improve nutrition. Project design must address the pushes and pulls along input and output value chains, taking into account opportunities for low-income individuals, women, youth, and marginalized groups. Project design teams must consider the multiple components of sustainable productivity and ensure that technical analyses, based on current best innovative technologies and resource management practices, identify the best approaches. Long term sustainability and continuing impact depend on stakeholders having continued access to research outputs, produced through consistent agricultural research investments. Thus designs should intentionally link public and private sector partners to sources of most appropriate technologies and best practices emerging from research.

Design consideration #2: **Look for multiple opportunities, synergies, and tradeoffs beyond a single activity or value chain.** Farms 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 trade-offs between farm enterprises. 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 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. Legumes, which can improve soil fertility, offer one important opportunity since they can be grown with cereals in rotation or intercrops and may be viewed as a valuable system input as well as a focal grain and fodder crop. To achieve environmental and socio-economic sustainability, and to maximize agricultural productivity, it is often critical to look at the multiple interactions a focal enterprise has with the whole farming system, including women's roles, nutritional benefits, and activities that occur during fallow or dry seasons. Crop rotations, and even single crops, often provide multiple values (e.g., for food and fodder) that can be simultaneously increased; good examples include legume crops that provide high-quality fodder as well as nutritious food for human consumption. They also lead to higher yields of cereal or other crops that follow in the rotation by adding biologically fixed nitrogen and soil organic matter. Improving conditions beyond production, including for input dealers, processors, and retailers, can drive productivity growth by increasing the value of agricultural products or decreasing the price of their production, processing, and delivery. Refer to the GFSS Technical Guidance on Market Systems and Value Chain Programming for more information.[9]

Design consideration #3: **Ensure that technologies, practices, and information used in development projects are appropriate to the agro-ecological and socio-economic conditions**. This includes, but is not limited to, consideration of gender roles, soil fertility, or other natural resource endowment, 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, often know best 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 towards greater investment and greater returns. In nearly all cases, development projects 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.

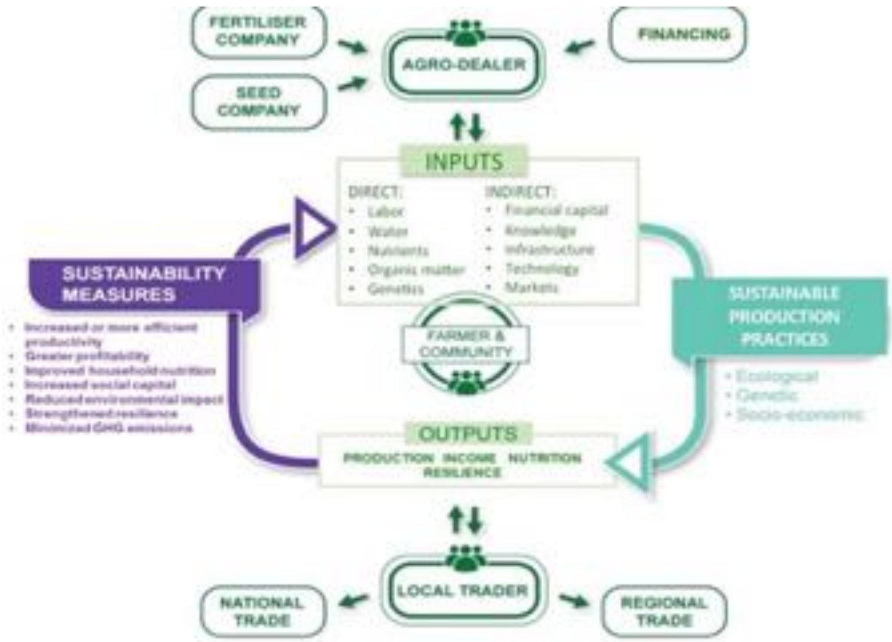

Figure 2: Designing interventions requires a system-wide assessment of the availability of needed inputs, markets and traders, and financial and knowledge capacity. Monitoring of measurable results based on desired outputs allows for mid-course corrections (Adapted from The Montpellier Panel, 2013).

Design consideration #4: Prioritize productivity enhancing interventions likely to significantly benefit livelihoods at the household-level and that can reach large numbers of households. The size and distribution of the potential beneficiary population over time can be estimated using modelling and geospatial tools but the adoption potential and scalability of the proposed interventions must be considered. Since most households in the areas where Feed the Future works are agricultural producers achieving relatively low crop, livestock and fish off-take, a focus on increasing productivity through improved management practices, on-farm diversification, or reducing post-harvest losses often achieves high levels of impact. This is a crucial step for food security and economic growth when markets exist or can be sufficiently enhanced as part of the intervention. Gains in primary productivity can incentivize market actors to invest more, just as enhanced market opportunities can provide encouragement to producers. Increasing yields is not the only consideration. 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.

Design consideration #5: Projects should not provide critical inputs or serve as markets unless those responsibilities can be transferred to others by the end of the project. While smart subsidies may encourage learning and uptake in certain contexts, there are many ways of buying down risk without direct subsidies or transaction support. Development efforts should facilitate, rather than serve as, the delivery pathway of the improved technologies and practices, to achieve sustainability over time and promote diffusion of adoption. For example, if a desirable goal is the widespread adoption of improved legume varieties but the Feed the Future-supported project is the only source of seeds it is unlikely that the use of improved varieties will continue beyond the project. This applies to other inputs such as fertilizer, information, and repair services and is a critical design criteria for scalability.

Programming in practice

Zambia: Integrating productivity, nutrition, and environmental sustainability. The Feed the Future Zambia multi-year strategic framework aimed to improve productivity, nutrition, resilience, natural resource management, and market efficiency through multiple, linked activities working in overlapping locations. The activities supported: 1) development of seed markets for improved legume varieties; 2) inclusion of community-based agro-dealer systems, focused on reaching a higher proportion of women, which ensured input availability and organized output markets. A significant gender component in all projects further supported the integrated programming and involved traditional leaders, community gender facilitators, and women leadership in the agro-dealer systems. **Key results**: 1) Legume production and sales doubled over three years — more than the national level; 2) Poverty in the zone of influence fell by eight percent in the first three years; 3) Women's empowerment increased significantly; 4) The Zambian government adopted a policy on gender, nutrition, and agriculture based on these project outcomes.

Guatemala: Increasing high value horticulture profitability through better crop management and strengthening civil society organizations. The Feed the Future Guatemala Rural Value Chains Project taught farmers to employ integrated pest management techniques to reduce the direct cost to the farmers and their exposure to dangerous chemicals. Farmers increased their yields, and growers associations negotiated better prices with exporters as produce quality increased. Produce sellers, primarily exporting fresh produce to the U.S., increased profits by decreasing numbers of shipments impounded and destroyed at U.S. customs facilities due to excessive pesticide residue. Some associations use their profits to purchase long-haul trucks to reduce operating costs and product "skimming" by unscrupulous drivers and ensure the quality delivery of produce. The private sector now views the Western Highlands as a good investment opportunity, increasing employment choices for youth and thereby decreasing the pressure to send them on dangerous migratory journeys.

For further assistance related to topics discussed in this Technical Guidance, please contact ftfguidance@usaid.gov.

References

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[3] The Montpellier Panel, 2013, Sustainable Intensification: A New Paradigm for African Agriculture, London
[4] Primary productivity is the rate at which plants and other organisms produce biomass through photosynthesis (*e.g*., kg of yield per hectare over a growing season)
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