FEED THE FUTURE

M&E Guidance Series

Volume 7: Measuring Natural Resources Management and Climate Change Adaptability under Feed the Future

The Purpose of Measuring NRM and CC Adaptability under Feed the Future (FTF)

World populations are projected to reach 9 billion by 2050[1]. As populations grow and income levels rise, so does absolute demand for food worldwide[2].

In order to account for both the projected future for agricultural landscapes and the needs of a growing world population, food security strategies must address the *sustainable Intensification* of agriculture to help eliminate producers' vulnerability to fluctuating oil prices and extreme weather events due to climate change, increase efficient productivity of agriculture, and help mitigate ecological degradation and global climate change[3].Environmental degradation and climate change are critical cross-cutting issues that can affect the sustainability of FTF investments in agricultural development and food security, impede long-term economic growth, and adversely affect livelihoods and wellbeing.

Sustainable intensification is achieved through the sound management of natural assets – including land, water, forests, and fisheries – which provide multiple benefits to food production, environmental health, and nutrition. Properly managed watersheds, rangelands, agricultural lands, forests, and fisheries enhance ecosystem functions that boost agricultural productivity, replenish aquifers, retain soil nutrients, mitigate damage from storms and floods, and reduce environmental vulnerability to the shocks and stresses associated with climate change. Integrated resource management approaches are the best method to balance demands for resources for agriculture, people, and ecosystems.

FTF integrates environmental and climate change concerns into investments and programs and, therefore, appropriate methodologies for tracking performance in resource management and proactive adaptation to climate change must be integrated into our monitoring, reporting, and impact evaluations. Efforts to address climate risk to food security comes with a commitment by FTF to identify and apply practical performance monitoring tools and rigorous evaluation, which feed into improved implementation in the long term. This process may include cost-benefit analysis of monitoring options and outcomes-oriented measures of effectiveness. With evaluation, reporting, and capturing lessons, programs can be fine-tuned or overhauled as needed in order to maximize the long-term impact of investments in climate change adaptation for food security.

Performance Monitoring and Integration of NRM/GCC indicators into the FTF Results Framework

FTF has consulted with GCC, NRM, and Water experts to incorporate a preliminary set of indicators/definitions into the FTF results framework to assist with tracking the performance of the sustainable and equitable land, water, fisheries, and resource management practices incorporated into FTF investments at the country level.

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[1] United Nations. Department of Economic and Social Affairs. *World Population to Reach 10 Billion by 2100 If Fertility in All Countries Converges to Replacement Level*. *Population Division, Population Estimates, and Projections Section*. 3 May 2011. Web. 20 May 2011. <http://esa.un.org/unpd/wpp/Other-Information/Press_Release_WPP2010.pdf>.

[2] Popkin, Barry. "The Nutrition Transition and Its Health Implications in Lower-Income Countries." *Public Health Nutrition*. Nutrition Society, 08 Sept. 2000. Web. 23 May 2011. <http://journals.cambridge.org/action/displayIssue?jid=PHN&volumeId=1 &seriesId=0&issueId=01>.

[3] "Reaping the Benefits: Science and the Sustainable Intensification of Global Agriculture | Royal Society." The Royal Society. Oct. 2009. Web. 16 May 2011. <http://royalsociety.org/Reapingthebenefits/>.

Missions that are investing in improved agricultural productivity are encouraged to integrate specific actions and indicators into their performance monitoring plan to best assist with tracking progress towards and impact on resource management and climate change adaptation.

(1) Existing FTF indicators with adjusted definitions to incorporate GCC, NRM and Water:

In early 2011, FTF, in consultation with USAID GCC/NRM/Water experts, revised the following three indicator definitions to improve their application in tracking progress and impact of activities supporting natural resources management and climate change adaptation. They are:

4.5-4: Gross margin per unit of land, water, or animal of selected product (crops/animals/fisheries selected varies by country)

4.5.2-2: Number of hectares under improved technologies or management practices as a result of USG assistance

4.5.2-28: Number of private enterprises, producers organizations, water users associations, women's groups, trade and business associations and community-based organizations (CBOs) that have applied new technologies or management practices as a result of USG assistance.

Previously, the definitions did not include detailed explanation and examples of technologies supporting natural resource management and climate change adaptation> As a result, NRM and CC Adaptation technologies and practices were not "counted" nor monitored as important outputs and outcomes contributing to, in most cases, improved agricultural productivity. As such, the most notably changes in the definitions are adjustments to include a broader list of technologies that address climate change adaptation and mitigation in four different categories:

- Mechanical and physical
- Biological
- Chemical
- Management and cultural practices

Please refer to the FTF Indicator Handbook for full definitions and proposed data collection methodologies. Technical questions regarding the changes can be directed to USAID Global Climate Change and Natural Resource management experts, Chris Kosnik (ckosnik@usaid.gov); Hadas Kushir (hkushir@usaid.gov) and Moffatt Ngugi (mngugi@afr-sd.org).

(2) NEW Indicators to Track and Monitor impact on Resource Management and Climate Change Adaptability:

In addition to building on existing indicators, FTF worked with NRM/GCC/Water experts in early 2011 to include NEW indicators that would ensure that FTF could adequately track and monitor FTF investments' impact on natural resource management and climate change adaptability. The following are NEW indicators that have been incorporated into the FTF Handbook of indicators. . As a way of introducing *users* to the indicators, we have gone into more detail in this guidance to describe the definition, rationale and measurement approaches than is found in the FTF indicator handbook.

4.5.2-40: Number of hectares of agricultural land (fields, rangeland, agro-forests) showing improved biophysical conditions as a result of USG assistance

This indicator measures the increase in soil carbon over time of land-based projects including farmland, agroforestry systems, rangelands, livestock, and forests. "Improved biophysical conditions" are demonstrated where there is biophysical monitoring data showing improvement over a baseline measurement or stability, where baseline measurements of soil carbon are at optimal levels over time.

NOTES: Soil carbon contributes to improved fertilizer use efficiency, rainwater infiltration and retention of soil moisture, thereby increasing long-term agricultural productivity and resilience. Increased soil carbon also provides co-benefits in terms of carbon sequestration and possible carbon payments. Soil carbon is directly affected by agricultural and agroforestry crops and is an indirect measure of biophysical condition of rangelands, where livestock, under planned [or managed] grazing, are essential for productive plant cover and improved water infiltration. While there is no globally recognized standard for measuring soil carbon, there are a number of scientifically valid approaches such as: Loss on Ignition; Combustion Method; Diffuse Reflectance; Near-or Mid-range Infrared Spectroscopy. Missions may choose any scientifically valid method for measuring soil carbon. **More information will be coming soon on a recommended methodology for collecting soil carbon levels; please look for updates to this guidance volume coming early Fall 2011.** The indicator will be reported in terms of number of hectares but actual data or values on soil carbon levels should be reported.

One common and easy method of soil analysis is the combustion method. The measurement of soil carbon is based on the difference in weight of a soil sample (taken at a standard 30cm depth) before combustion and after combustion (when all organic matter has been burned off). This type of analysis is sufficiently accurate to show a trend in improvement or degradation of soil carbon content.

Understanding that missions may be working with a large number of producers and that taking enough soil samples from each hectare of farms covered by USAID projects is unfeasible, a randomized and statistically significant sample of hectares covered by USAID projects should be chosen, out of which enough soil samples must be analyzed to reach appropriate levels of accuracy in accordance with the analysis method chosen and the type of soil being tested. Soil carbon content can vary widely depending on time, area, soil type, and activity so it is crucial, regardless of soil analysis method is chosen, that soil samples be taken at the same place and date as baseline samples.

Soil carbon improvement occurs on a steep curve: sharp increases can happen in soils with minimal soil carbon at baseline measurements while a very small increase could be just as meaningful for soils with high carbon content at baseline measurements. The determination of "improved" soil carbon is based on whether or not soil carbon content is higher than the baseline measurement. For soils that have consistently shown a high carbon soil content (determined based on soil type and activity) "stability" is considered an "improvement."

4.5.2-34: Number of stakeholders implementing risk-reducing practices/actions to improve resilience to climate change as a result of USG assistance

This indicator tracks adjustments made to management of resources or implementation of an adaptation action that responds to climate-related stresses and increases resilience. There is strong scientific and evidence-based information that stakeholders (in the case of this indicator defined as "producers") involved in sectors such as agriculture, livestock, fishing, other areas of natural resources can mitigate the effects of climate change by using appropriate new and tested management practices or implement measures that reduce the risks of climate change impacts. Risk-reducing management practices in agriculture and livestock might include:

- changing the exposure or sensitivity of crops (e.g., switching crops, using a greenhouse, or changing the cropping calendar);
- soil management practices that reduce rainwater run-off and increase infiltration;
- changing grazing practices;
- adjusting the management of other aspects of the system;
- applying new technologies like improved seeds or irrigation methods; and
- diversifying into different income-generating activities or into crops that are less susceptible to drought and greater climatic variability.

While many management practices and technologies exist and can be diffused, others may not be well suited to perform under emerging climate stresses. Improved management and new technologies are available and others are being developed to perform better under climate stresses. Resource management experiences from other parts of the world may be useful as climate conditions shift geographically.

4.5.2-32: Number of stakeholders using climate information in their decision making as a result of USG assistance.

This indicator tracks the number of people who use climate data and information in policy decision making. Relevant climate data and information will vary according to the program context, but should be used by stakeholders (in the case of this indicator, defined as policy decision makers) in the process of identification, assessment, and management of climate risks to improve resilience. Climate data may include monitored weather or climate projections (e.g., anticipated temperature, precipitation and sea level rise, changing frost-free dates, changing soil moisture and/or temperature, risk projections for extreme weather events, speed of soil erosion and water availability under future scenarios). Climate information might include the outputs of impact assessments, for example, the consequences of increased temperatures on crops, livestock, invasive species, pests and disease incidents, changes in stream flow due to precipitation shifts, or the number of people likely to be affected by future storm surges.
The use of climate information reflects that access to and quality of data (raw observations or facts) and information (interpreted) are sufficient, and adequate capacity of users to access and appropriately make use of data and information exists. In some cases, data and information as the basis for climate risk identification, assessment, and planning may be lacking, OR, awareness and capacity of decision makers to access and make use of this data may is weak. Where the use of information is lacking, outreach, training, collaboration on pilot activities, and other efforts may be necessary to build capacity for using available data and information in planning and action.

Note: This indicator differs from indicator 4.5.2-34 (number of stakeholders implementing risk reducing practices to improve resilience to climate change) in that the target population is policy/decision makers; defined as anyone involved in the broader context of planning, project design/development, writing policy and regulations, and making development decision, etc. It is understood that the producers targeted by indicator 4.5.2-34 are using climate information by the fact that they are implementing practices to improve resilience to climate change.

4.5.2-43: Number of water resources sustainability assessments undertaken

This indicator tracks the number of *Water Resources Sustainability Assessments* that are conducted to evaluate the water resources availability and use in a country. Water is frequently diverted for different uses without sufficient consideration for the larger impacts of that use. As a result, basin level sustainability is often compromised and conflicts arise between uses and users in different parts of basins. To help mitigate this outcome, water resource sustainability assessments can foster a broader approach to integrated water resources management into food security investments and therefore facilitate more optimal and harmonious outcomes. Attention is specifically devoted to environmental water requirements and sustainability of water use in the face of climate variability and change at the basin level.

Measuring Water Productivity using Gross Margins Data

A critical concern of natural resources management is water productivity. Increasing Agricultural Production per unit of water consumed is an important way to improve food security. When collecting Gross Margins data, water productivity can easily be calculated by measuring a sixth data point -- water consumption in cubic meters. It is strongly recommended that data also be gathered on the m3 of water consumed since the inclusion of this sixth data point in addition to the five data points used for Gross Margin allows for the calculation of water productivity. Provision of data on water consumption should be mandatory for Implementing Partners to report in irrigated areas, and strongly encouraged in rain-fed areas. However, current constraints on collection of data on water consumption in rain-fed areas are acknowledged.

Evaluating FTF's Impacts on NRM and GCC

In addition to including new approaches to track performance and change related to NRM programming, FTF encourages field missions to invest in rigorous impact evaluations to study how programs are impacting issues related to NRM and GCC. The exact development hypotheses to be tested are still being determined, but the following is a list of questions that demonstrate the focus of potential future NRM-related impact evaluations:

- To what extent does improved management of selected ecosystems lead to an increase in agriculture productivity and improved economic opportunities?
- To what extent do the rules and norms of land tenure and property rights system condition the impacts and sustainability of FTF investments in agriculture productivity, especially for small-holders?
- What is the economic impact (reduced input costs, increased productivity, overall profitability) of improved soil and water management investments in FTF?
- To what extent do interventions in the land tenure and property rights area such as land use planning, land certification, etc. increase the benefits of other FTF investments in agricultural productivity? What kinds of land tenure and property rights interventions are most effective in improving agricultural productivity and under what circumstances?
- What kinds of agricultural research and development (R&D) investments have the highest return to agricultural productivity? (Improved seed varieties? Fertilizer and input packages? Soil and water conservation? Post harvest technologies? Identifying and developing markets for crops?)
- What types of land tenure and property rights interventions can successfully support other FTF interventions to increase benefits in terms of technology and management practice adoption? What is known about land titling and other interventions to improve women's land and other property rights? How and under what circumstances? What is the impact of combining land tenure and property rights interventions[4] with other FTF interventions, as opposed to doing the different types of interventions separately?
- Which processes of developing agriculture and natural resource management policy are most effective?
- What agricultural technologies/management practices have the most significant impact on climate resilience? On improved biophysical condition of land and water?
- What land tenure arrangements (e.g. communal vs. individual rights, leasing vs. private ownership, etc.) promote the best outcomes for smallholder farmers?
- How and to what extent have efforts to define, record and secure women's land and resource rights contributed to changes in:
    - Crop yields and in household income?
    - Decision-making authority within the household and community?
    - Increased spending and improved outcomes related to children's health, education, and nutrition?
- What impact does women's secure tenure/access to land have on their health – and that of their children?

Missions are strongly encouraged to consider these and similar questions for developing impact evaluations on their FTF investments. For more information on how FTF will carry out impact evaluations, please see Volume 4 in the FTF M&E Guidance Series.

[4] Land tenure and property rights interventions that could be considered include: policy reforms, land use planning, land certification and titling, land registration and mapping, support for land conflict and dispute resolution, and institutional support for government land administration services.