Vulnerability Assessment Methodologies for Adapting African Agriculture to Climate Change

The agriculture sector is one of the most important economic drivers for majority of the countries in Africa, contributing, on average, 30% of the continent's GDP and providing a livelihood to more than 70% of its people. Yet, agriculture in sub-Saharan Africa faces a number of difficult challenges. At a time when population increases require the world's farmers to produce more food, rising income levels lead to higher per capita consumption, and rapid urbanization pushes more fertile arable land out of production, researchers are struggling to identify ways to increase productivity per hectare. These challenges are further compounded by climate-related stresses, as farming becomes less predictable due to increased variability in rains, higher overall temperatures, and storm events that are more frequent and/or more intense.

According to the Intergovernmental Panel on Climate Change (IPCC), the future impacts of climate change on African agriculture include:

- 75-250 million people facing severe water stress by 2020 this number swelling to 350-600 million people by 2050

- Severely compromised agricultural production due to loss of land, shorter growing seasons, and more uncertainty about what and when to plant
- A possible 50% reduction in yields from rain-fed crops by 2020 in some north African countries, and crop net revenues likely to fall by as much as 90% by 2100 in South Africa

These projected impacts, if realized, could lead to the worsening of food insecurity in Africa and an increase in the number of people at risk of hunger, some of them chronically. In other words, vulnerability will increase. In the context of adaptation to climate change, vulnerability depends on the sensitivity of the system to changes in climate and the adaptive capacity of the population.

The way forward

Continental impacts vary significantly due to the diversity of environments across Africa, and there are many places and people with a high degree of adaptability and resilience to a range of climatic conditions. The differing impacts result from a variety of interconnected factors, including socio-economic conditions, agricultural technologies, and the natural resource base. Therefore, a variety of options and opportunities exists for countries to increase their resilience.

Meeting the challenges posed by climate change requires a holistic response comprising assessment, use of appropriate technologies and interventions, diversified livelihoods, and sustainable policies. This response involves a spectrum of activities, including those implemented at these levels:

- Field and farm level—such as protecting existing livelihood systems, diversifying sources of income, changing livelihood strategies, and providing an enabling environment for migration, when all other options are impossible in a particular area
- Extension and research level—including effective use of genetic resources; promotion of integrated farming systems; research and dissemination of crop varieties and breeds adapted to changing climatic conditions; improved infrastructure for small-scale water capture, storage, and use; and improved soil management practices
- Policy level—proactive, fiscal responses that include strategic interventions for high–probability impacts, implementation of insurance schemes where appropriate, and efforts to strengthen governance systems and their ability to facilitate adaptation interventions

A critical step in choosing among response options is to identify areas where constraints may be magnified by climate change and where opportunities lie to reduce these effects. Vulnerability assessments are a useful tool for understanding and effectively responding to the kinds of adjustments and changes required at community, national, and international scales.

Until recently, few assessments offered decisionmakers the information they needed, when they needed it, at relevant spatial and temporal scales. It is even more difficult to conduct these assessments in Africa because of scarcity of data, weak or dysfunctional institutions, limited capacity, and existence of multiple stressors (including those unrelated to climate change, such as HIV and AIDS, weak economic conditions, high population growth rates, etc.). Therefore, more practical approaches to using information gained from vulnerability assessments are necessary.

Vulnerability analysis approaches

Understanding who and what is at risk is the foundation of vulnerability analyses and indicates the strategies and measures that may be taken to reduce risk or to increase capacity to adapt. Choosing an appropriate approach for conducting a vulnerability assessment is important because each approach can reveal different vulnerabilities and identify different courses of actions. Several approaches are presented in the table, classified under five objectives that reflect increasing demands on available data, use of results from climate models, technical expertise, and resource capacity of the analysts.

The examples illustrate that no vulnerability approach can meet the needs of all adaptation activities and that there are advantages and drawbacks to each approach. Planners and program designers must choose the approach that best fits the particular situation. A few concepts that may guide the choice of approaches to vulnerability analysis can help

Comparison of vulnerability assessment approaches, by objective, context, strengths, and weaknesses (Zermoglio 2011).

Objective of assessment	Context for agriculture	Strengths	Weaknesses
Reduce impacts of disasters	Disaster risk reduction and humanitarian assistance	♦ Uses information from various sources and databases ♦ Can be updated as new data become available ♦ Comparability possible where data are available	♦ Spatial and technical expertise required ♦ Differential vulnerability not addressed ♦ Focus solely on disaster hazards
Mainstream adaptation into development activities	Input to development planning and adaptation policy Often part of related strategy documents such as national communications, national adaptation programs of action, and poverty reduction strategies	♦ Highlights processes underlying successful adaptation ♦ Guidance and tools available to facilitate application ♦ Basic data readily available and varies with respect to other inputs ♦ Direct link to options and modifications in activities	♦ Can be data- and time-intensive to implement ♦ Existing guidance and tools may need to be modified based on local needs
Estimate costs of adaptation	Estimate the impacts in terms of costs to agriculture resulting from climate change Can also be used to understand the costs of not adapting and supports resource allocation for adaptation	♦ Only approach that informs financial priority-setting ♦ Useful in adaptation planning by identifying trade-offs ♦ Offers insights on potential costs of inaction	♦ Difficult to conduct - requires significant training and expertise (e.g., economics, integrated assessment modeling) ♦ High uncertainty in projections
Improve effectiveness of responses	Offers insights into the differential impacts on the vulnerable and helps to identify targeted options that respond to risks Inform better interventions by including vulnerable groups as analysis participants	♦ Encourage local agency and ownership ♦ Increases potential success of interventions ♦ Offers insights on potential "maladaptation"	♦ Time- and expertise-intensive ♦ Site-specific and difficult to scale ♦ Provides little detail on the structure of the hazard's causal sequence – including the nested scales of interaction
Prioritize activities and monitor progress	Comparative approaches that specifically address targeting, program monitoring policy needs	♦ Allows comparisons across space and time (where data are available) ♦ Can offer single value of vulnerability based on meaningful criteria, which can be considered by donor countries and organizations when taking decisions regarding the allocation of financial and technical assistance ♦ Easy to update	♦ Requires subjective identification of indicators (no single one) ♦ Are only snapshots in time and may disguise ongoing evolutions of certain dimensions ♦ Scales of available indicators often mismatched and used anyway ♦ Limited data-intensive applications and no site specificity ♦ Difficult to validate by cause-effect processes

ensure that the assessment is appropriate for the given program, including that climate impacts differ and therefore responses must also vary

- for different people (individuals, households, communities)
- for different sectors (health, industry, agriculture fisheries, natural resources)
- in different places (villages, towns, cities, districts, ecosystems)
- at different times (present, next year, next 10 years, several decades on or longer)

because

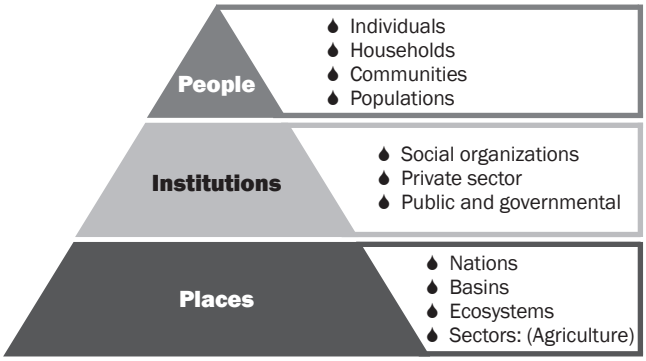
- specific climatic stresses and shocks vary by type, frequency, intensity, predictability, etc.
- environmental, economic and social factors vary (e.g., highland/lowland, coastal/inland, rich/poor, urban/rural, majority/minority religion or ethnicity, etc.
- in a specific area, some livelihoods and systems will be affected while others might not be
- the capacity to adapt differs and responses must incorporate these different capacities.

It is therefore critical that a vulnerability assessment answer questions such as

- Who (or what) is vulnerable → *System*
- To what are they vulnerable → *Exposure*
- Why are they vulnerable → *Sensitivity*
- What can be done to lessen this vulnerability → *Adaptive capacity*

Vulnerability assessment is widely used by organizations and programs involved with environmental change, human health, food insecurity, poverty reduction, conflict, sustainable development, and humanitarian aid. The uses of the information gained from vulnerability assessments for adaptation programming decisions can depend on a wide variety of factors, including:

- Scale of risks, in probability or magnitude
- Unit of analysis (see figure)
- Type of adaptation considered
- Time frame of the assessment;
- Availability of technical capacity to conduct the analysis



General units of analysis for vulnerability assessment.

It is important to note that the approaches themselves are not mutually exclusive and often overlap. Some methods are better placed than others to meet the specific needs of different adaptation projects.

Summary

A number of analytic approaches can inform efforts to understand vulnerability. This document describes vulnerability approaches by categorizing their role in supporting adaptation planning.

No vulnerability approach, regardless of its link to direct/indirect data, scale of analysis, and observed/hypothesized relationships, can meet the needs of all adaptation projects. Clearly, there are advantages and drawbacks to each, and the task is to choose an approach that corresponds best with the objective of the analysis and its intended application, time available for conducting the analysis, the scale and unit of analysis, and the resources and expertise of the team. The relative strengths and weaknesses of each approach need to be carefully considered before deciding on the methodology to be used for evaluating risks and identifying response measures.

Source

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