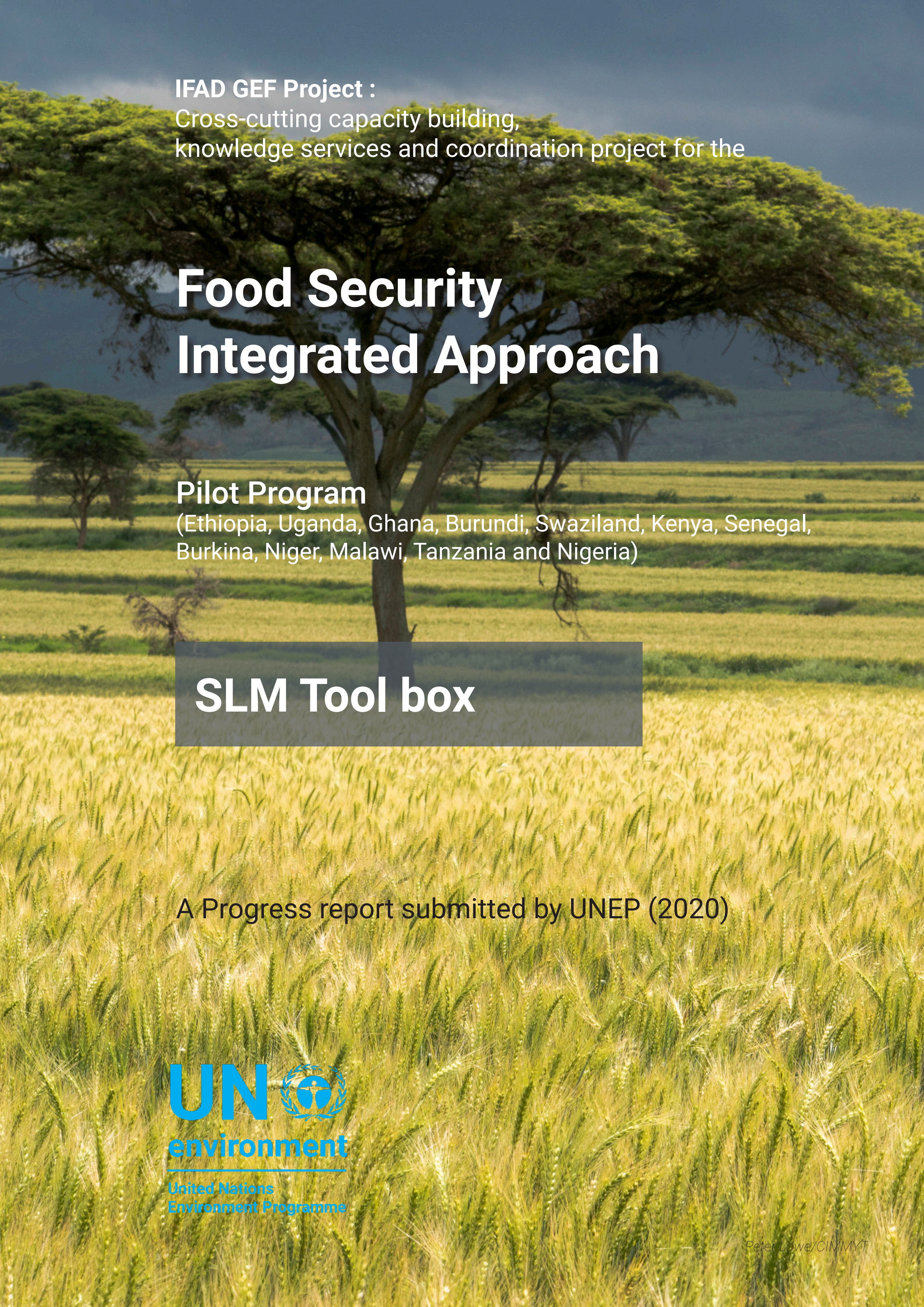

IFAD GEF Project :
Cross-cutting capacity building,
knowledge services and coordination project for the

Food Security Integrated Approach

Pilot Program

(Ethiopia, Uganda, Ghana, Burundi, Swaziland, Kenya, Senegal, Burkina, Niger, Malawi, Tanzania and Nigeria)

SLM Tool box

A Progress report submitted by UNEP (2020)

UN environment
United Nations
Environment Programme

Peter Lowe/CIMMYT

IFAD GEF Project :
Cross-cutting capacity building,
knowledge services and coordination project for the

Food Security Integrated Approach

Pilot Program

(Ethiopia, Uganda, Ghana, Burundi, Swaziland, Kenya, Senegal, Burkina, Niger, Malawi, Tanzania and Nigeria)

SLM Tool box

A Progress report submitted by UNEP (2020)

UN environment
United Nations
Environment Programme

Tool box for Sustainable Land Management


A Melody Lee / World Bank

Table of Contents

Executive Summary

Land is the foundation for human development, so its health is essential for the social and economic security of Earth's population. As demand for food escalates with the global population projected to reach 9.7 billion in 2050 (UN DESA 2019), so will pressure on food production from land resources.

Sustainable Land Management (SLM) is "the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions" (United Nations, 1992). The goal of SLM is to prevent land degradation or, for where it has already occurred, to reverse it, while meeting humanity's socio-economic needs.

SLM tools are technologies designed for managers to adopt options for the use of land resources based on their natural potential. These technologies are mostly IT based and assist users in accessing and / or organising data and information for project management. Commonly used tools are those that support decision making in land evaluation, suitability and similarity analysis, land capability classification, and agro-ecological zoning. These options incorporate the needs of different sectors operating in a landscape while optimizing and sustaining resource use.

SLM tools can be classified as biophysical, socio-economic, integrated, databases, and support tools. A wide range of tools has been developed to support SLM programming and which have been adapted to various contexts and scales of decision making. Although successes have been achieved at the local-to-national scales, countries are reporting increasing constraints, often due to emerging economic, social and environmental challenges. To this end, the International Fund for Agricultural Development (IFAD) developed its Integrated Approach Programme (IFAD IAP) on Food Security (IAP-FS) in sub-Saharan Africa with funding from the Global Environment Facility (GEF), with one of its objectives to improve access and use of SLM tools to support project management. The IAP-FS targets agro-ecological systems in the drylands of Sub Saharan Africa (SSA) where the need to enhance food security through enhanced resilience of the land resource is directly linked to opportunities for generating local and global environmental benefits.

This document is part of UNEP's contribution in collaboration with IFAD to the IAP-FS for sub-Saharan Africa. The purpose is to provide essential information about SLM tools in support of the cross-cutting IAP-FS Hub programme which supports the implementation of 12 country projects in SSA. Entitled, Sustainable Land Management for Food Security in Africa: Tools for SLM implementation, the current compendium presents SLM tools that countries and communities can incorporate in their design of agricultural projects to boost the productivity of land resources.

This report finds that users recognize the need for tools to assist in their work to manage complex projects that balance objectives addressing both socio-economic and environmental needs within their target communities. Moreover, users prefer participatory, community- and stakeholder-led, gender-sensitive planning tools because these reflect the need to negotiate among interests in the real world. It follows that users suggest that tools which are defined by the users themselves should be given more attention rather than just those coming from external sources. In that manner, tools can be adapted to local conditions.

Users are often challenged by the need to integrate tools onto a single platform. In some cases, the problem is simply technical and relates to the software or hardware used. Even more difficult is the integration of both bio-physical vs socio-economic data into a decision support system since scientists and the development practitioners whom they support often think and plan along themes and systems but not necessarily across disciplines. Although additional training in cross-systems planning is useful, experience and wisdom gained through time will always be required.

Finally, this report finds that such tools and knowledge will always be needed for supporting effective SLM that meets competing local, national and global demands for land and water resources while enhancing governance over resources at all scales.

Acronyms

APFS	Agro-Pastoral Field School
C	Carbon
CC	Climate Change
CGIAR	Consortium of International Agricultural Research Centers
CI	Conservation International
DATAR	Diversity Assessment Tool for Agrobiodiversity and Resilience
ESA	European Space Agency
EX-ACT	EX-Ante Carbon Balance Tool
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School
FPIC	Free Prior Informed Consent
GEF	Global Environmental Facility
GHG	Greenhouse Gas
HH	Household
IAP	Integrated Approach Pilot
ICRAF	World Agroforestry Center
IFAD	International Fund for Agricultural Development
LADA	Land Degradation Assessment in Drylands Mapping Tool
LDSF	Landscape Degradation Surveillance Framework
M&E	Monitoring and Evaluation
MPAT	Multidimensional Poverty Assessment Tool
NGO	Non-Government Organization
PAR	Platform for Agrobiodiversity Research
RAPTA	Resilience, Adaptation Pathways and Transformation Assessment
SHARP	Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists
SLM	Sustainable Land Management
SOC	Soil Organic Carbon
VS	Vital Signs
WOCAT	World Overview of Conservation Approaches and Technologies

Section 1: Introduction to SLM

Land is the foundation for human development, so its health is essential for the social and economic security of Earth's population. As demand for food escalates with the global population projected to reach 9.7 billion in 2050 (UN DESA 2019), so will pressure on food production. Almost all of our production comes from land-based enterprises, so humanity's future depends on our capacity to manage land in a sustainable manner.

Sustainable Land Management (SLM) is "the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions" (United Nations, 1992). The goal of SLM is to prevent land degradation or, for where it has already occurred, to reverse it.

SLM combines technologies, policies and activities to integrate socio-economic development with environmental principles. SLM comprises multiple objectives (Sanz, et al., 2017) (FAO, 2017b) which are based on common sense principles such as the Inclusive Circular Economy (Inclusive CE) (Preston el al. 2019) which is based on a simple concept: to keep resources and materials in use within the production cycle for as long as possible while using a minimal amount of external inputs. Application of SLM also requires that its solutions are socially acceptable and economically viable for the communities it targets.

SLM Objectives: A primary SLM objective is to increase crop productivity through combinations of vegetation management, crop diversification, soil fertility and sustainable water management practices. In drylands, these practices positively contribute to climate change adaptation, water management and combatting degradation, which is a priority in these regions. A second objective is to increase food security in grazing lands through combinations of vegetation and animal waste management, using indigenous species, and diversifying and selecting species most resilience to climate change. Dryland resilience is enhanced by managing the timing and severity of grazing to ensure that carrying capacity is not exceeded. A third SLM objective is to protect the potential of natural resources and prevent degradation of soil and water quality through afforestation, reforestation, and reducing deforestation in tropical forests. These practices have a significant potential for climate change mitigation and biodiversity preservation. Enhancing forest carbon stocks and forest cover with the most appropriate mix of species, in combination with watershed management and assisted regeneration, will enable forest ecosystems to adapt to extreme events and improve pest and disease control.

SLM benefits: SLM offers substantial benefits to local agricultural communities and particularly small holder farmers in SSA. For example, land resilience and increased productivity result from application of agroforestry practices such as plantations of crop combinations under multipurpose tree systems and intercropping with green cover in perennial woody crops. The adoption of mixed systems improves carbon sequestration, maintains soil fertility and nutrient cycling and controls soil erosion. Agroforestry provides food and income to local communities.

But SLM can also deliver significant global benefits. Soil carbon sequestration and carbon retention mitigate climate change. Habitat conservation and sustainable use of biodiversity can maintain agroecosystem functions and soil biota, thus reducing the need for expanding agriculture into surrounding savannah, rangeland or forest (GEF, 2005).

SLM mainstreaming: To have maximum impact, SLM should be mainstreamed into agricultural policy at national to local levels which in turn informs investment and land-use strategies for implementation of SLM best practices. Figure 1 depicts the concept for mainstreaming which is based on an understanding of the environmental and socio-economic forces which are acting on the land, and the impacts of the same. As SLM solutions based on best practices are selected, users can then decide which technologies or tools would best support implementation at the management level.

A wide range of tools has been developed to support SLM programming and which have been adapted to various contexts and scales of decision making. Although successes have been achieved at the local-to-national scales, countries are reporting increasing constraints, often due to emerging economic, social and environmental challenges. To this end, the International Fund for Agricultural Development (IFAD) developed its Integrated Approach Programme (IFAD IAP) on Food Security (IAP-FS) in sub-Saharan Africa with funding from the Global Environment Facility (GEF). The IAP-FS targets agro-ecological systems in the drylands of Sub Saharan Africa (SSA) where the need to enhance food security is directly linked to opportunities for generating local and global environmental benefits.

This document is part of UNEP's contribution in collaboration with IFAD to the IAP-FS for sub-Saharan Africa. The purpose is to provide essential information about SLM tools in support of the cross-cutting hub programme which supports the implementation

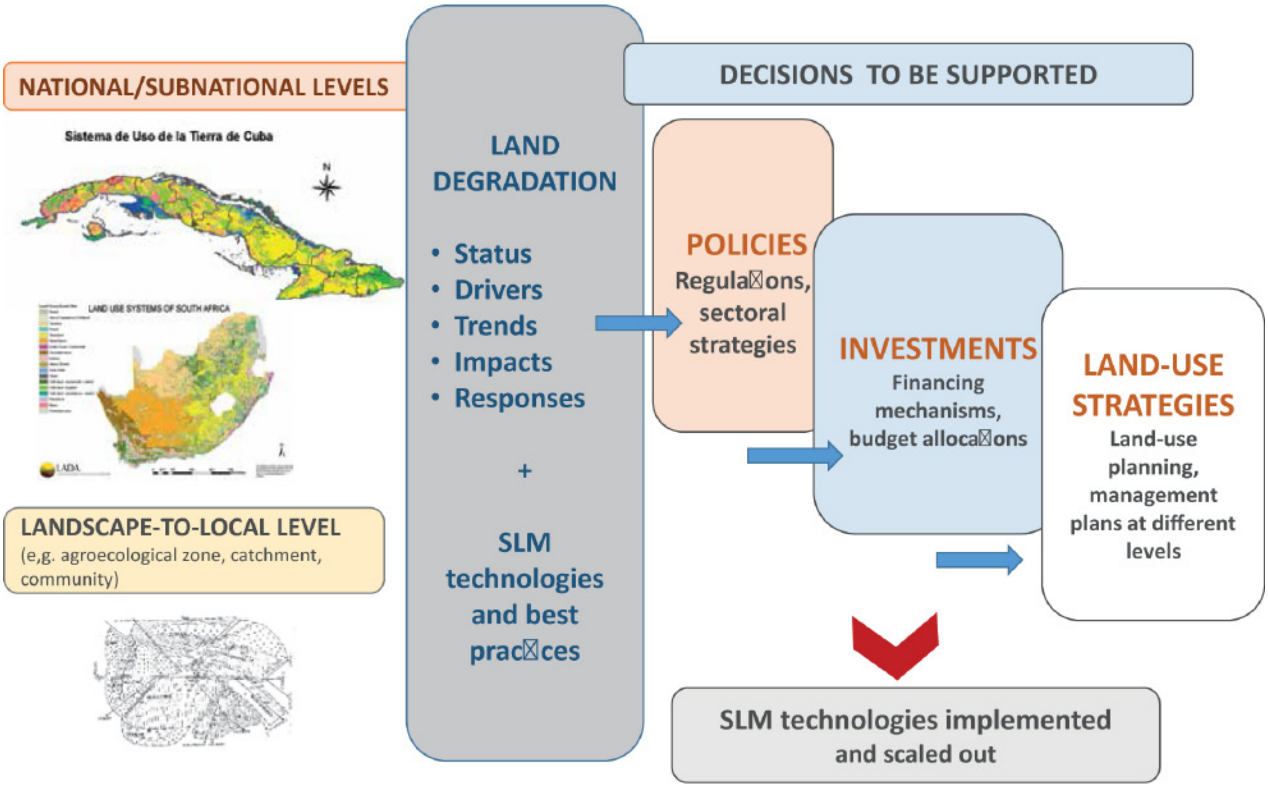

Figure 1: The core concept for mainstreaming SLM (Fegan, 2019)

of 12 country projects in SSA. Entitled, Sustainable Land Management for Food Security in Africa: Tools for SLM implementation, the current compendium presents SLM tools that countries and communities can incorporate in their design of agricultural projects to boost the productivity of land resources.

The toolbox of existing methods that support sustainable land management (SLM) complements best practices that were identified by UNEP in its contribution to the IFAD IAP project. Best practices, in combination with the technologies presented here, have the potential to positively influence SLM project success.

This report comprises Section 2 which gives an overview of SLM tools and their functions. Section 3 provides context on the role of SLM tools in the IFAD IAP project. Section 4 provides Essential Facts for the 9 tools used by the IFAD IAP and a table which summarizes their use. Section 5 concludes with thoughts on the utility of IAP-FS tools and future needs. Annex 1 is an overview of SLM tools within the EbA Navigator Tool which organizes and facilitates tool access.

Section 2: SLM Tools

SLM tools are technologies designed for managers to adopt options for the use of land resources based on their natural potential. These technologies are mostly IT based and assist users in accessing and / or organising data and information for project management. Commonly used tools are those that support decision making in land evaluation, suitability and similarity analysis, land capability classification, and agro-ecological zoning. SLM tools provide decision makers with viable land-use options based on the biophysical potential of resources and socio-economic conditions. These options incorporate the needs of different sectors operating in a landscape while optimizing and sustaining resource use.

The diversity of SLM tools, however, makes it challenging to target them at specific stakeholders that would benefit most from them. This report takes a step to meet this challenge by assembling essential information about those tools in use by the IFAD IAP project and by providing a cursory review of other tools currently available (eg. through the EbA Navigator).

SLM tools can be roughly classified as biophysical, socio-economic, integrated tools, databases, and support tools.

Biophysical tools: This category of tools assists the user to analyse biophysical attributes (climate, soil, terrain, water, etc.) and their interactions in the land evaluation process. The output guides users to identify suitable options for land use alternatives based mainly on these attributes. Land suitability and similarity analyses are typical examples. Documents describing principles, approaches and guidelines for land evaluation are included. Such tools can classify soils based on suitability for a specific use, potential, fertility constraints, management and linkages to yield, productivity, physical and chemical properties. Sophisticated or simplified modelling of crop growth and yield also fall into this category.

Socio-economic tools: The tools in this category characterise social and economic settings required for land use planning. They include approaches and methods of participatory decision-making.

Integrated tools: The tools in this category use as input information both biophysical characteristics and social and economic conditions and generally incorporate principles, approaches and methods of participatory land use planning, with the overall objective of reaching mutually beneficial outcomes for all stakeholders.

Databases: This category includes databases that can facilitate land evaluation and land use planning by providing information that may serve as inputs for the process. These databases provide maps and data on soil and terrain characteristics, land degradation, land cover, land use, climatic data including future projections, crops and yields, food, agriculture, water resources, adaptability/suitability of identified plant species for a given environment, and socio-economic data and statistics on poverty, population, tenure and gender.

Support tools: This category of tools do not produce results that have direct use for land evaluation and land use planning, but has a supporting role by providing various types of data that can be used in land evaluation studies and as input data sets for land use planning.

Section 3: Tools used in the IAP-FS project

The IAP-FS programme comprises 12 country-based projects supported by a cross-cutting or Regional HUB project designed to assist all countries in implementation. The HUB project assesses beneficiary households and their food security using an index developed by FAO. Although the HUB project is not directly involved in project activities, it plays a supporting role through detailing the types of indicators that might be useful to assess changes in ecosystem services, socio-economic benefits, and resilience of food security within each project. The Regional HUB project assists countries in obtaining the necessary datasets to conduct monitoring and assessment using data from Earth Observation (EO), social surveys, and modelled products drawing on both EO and social survey data. The HUB's Technical Advisory Group (TAG) supports the countries in the acquisition of baseline and gender disaggregated statistics at multiple scales and provide an operational framework for measuring changes in indicators.

The Regional HUB project also provides training and capacity building in the application of the tools to ensure consistent quality, reporting and dissemination of new knowledge generated, lessons learnt and best practices.

Section 4: IAP-FS Essential Facts

Basic facts about each of the 9 IAP-FS tools are provided to assist potential users to access them based on their needs. Overall findings are presented at the end of this section. Annex 2 provides the basic tool facts in tabular format.

FACT SHEET: DATAR

Tool name, institution, and access

Diversity Assessment Tool for Agrobiodiversity and Resilience (DATAR) is accessible at:

https://www.bioversityinternational.org/

https://www.agrobiodiversityplatform.org/datar

and is produced by the Consortium of International Agricultural Research Centres (CGIAR) through Biodiversity International and its Platform for Agrobiodiversity Research (PAR).

Tool theme and objective

DATAR analyses agricultural biodiversity and resilience at the landscape level in order to assess the constraints faced by farming communities to benefit from the use of their own local crop and animal biodiversity. The purpose of DATAR is to identify and characterise local crop varieties and breeds, and from this information, to improve access, selection, and sharing of crop and animal genetic diversity at the community and national levels.

DATAR is founded on the premise that intraspecific agro-biodiversity promotes resilience to threats such as climate change or pests and in turn enhances food security.

The DATAR application has three main modules. The first, "Agrobiodiversity data", gives a summary of the state of intra-specific genetic diversity at a given time based on data collection and analysis. The second, "Agrobiodiversity interventions", points DATAR users towards adapted, intra-specific genetic diversity interventions depending on their constraints and priorities. The third module "Agrobiodiversity impact" is under construction and will measure the impacts on agrobiodiversity itself and the resilience of production systems.

Input data requirement and output obtained

The DATAR system includes a participatory research process to collect, analyse, and use data for planning resilience. The main steps include:

1. Initial site selection based on the interest of the local communities, evidence of unique agrobiodiversity or expression of concern over loss of agrobiodiversity.
2. Data collection and analysis.
3. Sharing and validating the data and analysis with the local communities.
4. Using the result for developing action plans to enhance agrobiodiversity through community-based approaches.

Software tools to support data collection and processing include:

- Back Office Web App for Administrators, Scientist, Program Leader, Translators,
- The Android App for Researcher on the field, and
- The Android App for Farmers / End User.

Using the DATAR tool, project managers within the 12 GEF-IFAD national food security projects can match the assessments of available agro-biodiversity with farmer needs and identify constraints that need to be lifted as part of the overall project implementation. Thus, the primary output of DATAR is the production and organization of biophysical and socio-economic data to support all phases of project management.

Comments

Currently, DATAR data collection has been limited to crop genetic resources but will be tested for livestock and aquatic resources in 2020 through the Platform for Agrobiodiversity Research (PAR). As DATAR is still under development, it is too early to fully assess ease of use and the level of training required.

Issues that should receive attention during DATAR development include:

- How farming communities would directly benefit from agro-biodiversity information within their own farm-level, planning processes. How will the scale of the available agro-biodiversity data match well with the socio-economic data collected at the farm level? Will farmers continue to operate the tools when project money dries up? Evidence of benefit could lead to their continued participation.
- What is the time frame for the benefits of identifying and improving intra-specific agro-biodiversity to be seen at farm level?
- Will government agricultural extension systems be adequate to disseminate information in a useful manner?
- How intensive is the training for tool use and data collection and processing? What are the budget implications?

Tool name, institution, and access

EX-Ante Carbon Balance Tool (EX-ACT) is developed by the Food and Agriculture Organization of the United Nations (FAO) and is accessible at:

http://www.fao.org/tc/exact/ex-act-home/en/

Tool theme and objective

EX-ACT's overall objective is Green House Gas (GHG) reduction and climate change mitigation.

EX-ACT is a field survey system to estimate of the impact of agriculture and forestry development projects, programmes and policies on carbon-balance. It is a peer-reviewed, land-based accounting system which estimates emissions or sinks of CO2 as well as GHG emissions per unit of land. It is based on IPCC 2006 Guidelines for National GHG Inventories.

One key objective is to directly support countries in accessing funds from international financial institutions and international mechanisms to support land-use projects, programmes and policies. Use of EX-ACT builds national capacity in estimating and monitoring emissions reductions, while setting the stage for policymakers to integrate climate change mitigation into national policies and international commitments (e.g. nationally determined contributions-NDCs).

EX-ACT operates at various scales from project (local), landscapes, and regional.

Input data requirement and output obtained

GIS input data consist of agroecological conditions and land use and are classified as either Tier 1 or Tier 2. Tier 1 data are part of the standard information available in most project appraisal documents. They concern a wide range of land-use change activities and agricultural management practices, but few geographical, climatic and agro-ecological variables. Tier 2 data consists of location-specific variables and emission factors for selected practices. Tier 2 data are expensive to collect but necessary for site-specific calculations. Examples of Tier 2 data include soil carbon content and rates of soil carbon sequestration on various land uses. Data are required for all areas where change is observed between project initiation and end as well as for areas where change is actively prevented by the project (e.g. reduced deforestation).

EX-ACT is equipped with a set of tables, maps, and other FAO statistical data that help to populate the tool which is a set of eight linked Microsoft Excel sheets.

The main output of the tool is an estimation of the C-balance that is associated with adoption of alternative land management options as compared to a 'business as usual' scenario.

Comments

EX-ACT does not require a full inventory of all land-use types and agricultural practices used within the project area but is instead concerned with all land areas and management activities that could be altered by project implementation. Only modules that are directly impacted by project activities must be filled. Thus, sophisticated data is only required for the project focal areas.

EX-ACT could be a requirement for GHG reduction projects to meet their baseline monitoring and verification tasks.

Integration with other tools (household surveys, etc) may be problematic.

Tier 2 data collection requires well-trained individuals with a university education.

FACT SHEET: LSDF

Tool name, institution, and access

Landscape Degradation Surveillance Framework (LDSF) is produced by World Agroforestry (ICRAF) and is accessible at: http://landscapeportal.org

Tool theme and objective

LDSF is a tool for conducting an integrated field inventory of land degradation and building a biophysical baseline at the landscape scale to support project development and monitoring.

LDSF provides a field protocol for measuring indicators of ecosystem health, including vegetation cover, structure and floristic composition, historic land use, land degradation, soil characteristics, including soil organic carbon stocks for assessing climate change mitigation potential, and infiltration capacity. The data layers provide a monitoring framework to detect changes over time.

Input data requirement and output obtained

LDSF is linked to ICRAF's Landscape Portal, ICRAF's interactive online spatial data storage and visualization platform. It can store and visualize spatial data and maps for management and spatial modelling. The portal consists of multiple data layers and maps, with supporting documentation.

LDSF is designed so that projects can conduct baseline surveys and then subsequently resample and analyze how interventions change landscape health overtime. The output can be used for project monitoring and report.

Mapping outputs are produced at multiple spatial scales depending on need and range from fine-resolution maps at 5 to 10 m to moderate resolution maps at 250 to 500 m.

Comments

LDSF plots are open access. Some of the upcoming features in future releases include:

- Time-series analysis
- Toolkits for interactive modelling
- Mapping of phenology
- Species abundance mapping
- Species diversity mapping (e.g. trees)
- Vegetation analysis
- Soil mapping (e.g. SOC, pH, etc.)

Conducting a LDSF is highly intensive and can take 2-4 weeks. A typical LDSF team consists of 5-10 people and usually includes working closely with local farmers when sampling.

FACT SHEET: MPAT

Tool name, institution, and access

The Multidimensional Poverty Assessment Tool (MPAT) is accessible at:

https://www.ifad.org/documents/38714170/40302999/The+Multidimensional+Poverty+Assessment+Tool+User%27s+guide.pdf/2fa7cc27-343b-4c22-93f2-eeef5b17f1c8 and is developed by the International Fund for Agricultural Development (IFAD).

Tool theme and objective

MPAT is an open source, household survey based, thematic indicator development tool that captures ten dimensions of rural poverty. It is designed to support planning, design, monitoring and evaluation, targeting and prioritising efforts at the household and village scale by capturing baseline data on the socio-economic status of target populations.

Input data requirement and output obtained

MPAT collects and organizes data on (1) food and nutrition security, (2) domestic water supply, (3) health and health care, (4) sanitation and hygiene, (5) housing, clothing and energy, (6) education, (7) farm assets, (8) non-farm assets, (9) exposure and resilience to shocks, (10) gender and social equality. Some combination of such data is usually necessary in food security projects since the target populations' livelihood is the focus.

Comments

Enumerators should have basic high school or 1st university level training, whereas management users would need higher level of training and experience. Two weeks training are required for data collection and entry. The time commitment is not just for executing the survey, but also for using the results in project management, etc. Use of MPAT requires substantial labour investments as average costs are around $14k to survey 480 households.

A training manual offers guidance on how to adapt the tool to specific contexts, for example it might not be necessary to have all 10 variables monitored, or other variables might be more important than these ten depending on context. In any case, managers of food security projects must have access to household level data whether created with MPAT or other similar household survey tools.

MPAT's utility can be increased by using it in conjunction with biophysical data from Inventory tools such as the Land Degradation Surveillance Framework (LDSF). Data on land cover, soil condition, land degradation, and biodiversity enable project stakeholders to explore and understand trends between biophysical and socio-economic indicators.

Tool name, institution, and access

Resilience, Adaptation Pathways and Transformation Assessment (RAPTA) is developed by the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) with funding and guidance from GEF (Science and Technical Advisory Panel – STAP) and is accessible at:

https://acfid.asn.au/sites/site.acfid/files/19-00418_LW_REPORT_RAPTAGuide_WEB_190829.pdf. See also O'Connell et al, 2016).

Tool theme and objective

RAPTA assists project planners by assessing resilience of socio-ecological systems (including agro-ecosystems) to potential future stresses such as from climate change. RAPTA offers practical guidance in how to apply the concepts of resilience, adaptation and transformation in planning projects in the face of high uncertainty and rapid change. One objective is to increase the chances of a sustainable development project's success through a clearer understanding of the factors that control resilience.

This understanding also helps users determine where achieving the desired state is impossible or unrealistic with existing project resources and reduces the probability of unplanned transitions to undesired systems.

RAPTA operates at multiple scale levels depending on project scope and assists users by organizing information for reporting to international conventions.

Input data requirement and output obtained

RAPTA consists of 3 modules: 1. People – dialogue, values, visions; 2. Systems Analysis; and 3. Options and Pathways to Action. It is based on principles of active learning and adaptive governance through coordinating iterative interactions between the modules when designing,

Implementing or evaluating an intervention.

To support the GEF IAP-FS projects, RAPTA entails a participatory, team approach for conducting several tasks in project planning. These components include:

- **Scoping**, to set the project purpose and theme.
- **Multi-Stakeholder Engagement and Governance,** to develop and sustain stakeholder engagement.
- **Theory of Change**, to complement standard Theory of Change methods by systematically considering resilience, adaptation and transformation in planning.
- **System Description,** to provide the baseline for assessing the system's resilience.
- **System Assessment**, to identify risks to meeting project objectives due to future shocks and stressors (ex. climate change) and opportunities for adaptation.
- **Options and Pathways,** to identify and arrange intervention options based on their provisional qualitative and quantitative benefits and costs.
- **Learning,** to inform adaptive management and testing of the Theory of Change through iteration. Learning is captured to inform future phases of the project and identify future programmes to build resilience.

RAPTA provides outputs in indicator format that can be used for project design, management and reporting. Outputs include a platform for recording and updating system understanding and underpinning assumptions and evidence. The platform elements include drivers, shocks, actors, resources and their uses, valued system components and products, controlling influences and linkages.

Comments

RAPTA was reviewed by experts from the GEF, the Rio Conventions, development agencies and research

institutions, including experts in natural and social sciences and economics. Reviewers determined that

the RAPTA approach has the capacity to support the Sustainable Development Goals and capture synergies across the Rio Conventions in areas of common interest in the management of human/ecological systems. It was recognized that co-development and testing with stakeholders in an applied setting is required before the RAPTA framework is ready for implementation and that simple guidelines for use are required.

One of RAPTA's strengths is its participatory process for bringing together key stakeholders to assess the system and to develop a theory of change for improving agro-ecosystem resilience.

Tool name, institution and access website

The Resilience Atlas was developed by Conservation International (CI) and is accessible at:

https://www.resilienceatlas.org/.

The Resilience Atlas is a free and open access online tool that integrates and analyses multiple datasets relevant to resilience assessment and adaptation planning.

Tool theme and objective

The Resilience Atlas is a spatial analysis tool which provides users with a data-driven model for decision-making and funding. The Atlas has 3 components: 1) livelihoods, production systems, and ecosystems; 2) climate stressors and shocks; and 3) factors influencing vulnerability.

The Atlas is structured to guide users through a series of steps to help them understand where particular socio-ecological systems occur, which stressors and shocks affect them, and to then support assessment of how vulnerable particular system components (e.g. specific livelihood strategies, production systems, or ecosystems) might be to these stressors and shocks and which types of assets and capital (e.g., social, natural, financial, human, manufactured) reduce that vulnerability.

Users apply an approach to gain insights into system resilience by: 1) selecting an area and theme of interest, 2) visualizing exposure of the system to stressors and shocks, and 3) modelling how different types of assets (natural capital, human capital, social capital, financial capital and manufactured capital) increase or decrease the resilience of the system to these stressors and shocks. The user may then identify which assets need to be strengthened or managed differently to reduce food insecurity.

The Resilience Atlas operates at the sub-regional and national levels and can provide contextual information for project level management.

Input data requirement and output obtained

The Atlas includes information on climate, land cover, production systems, population distribution, and a range of indicators derived from household survey datasets at regional, national and sub-national scales, depending on availability and resolution. The Atlas includes historical and current data on climate, as well as projections for the future climate, including change in precipitation amount and timing (change in seasonality), and shifts in monthly mean temperatures.

The Atlas also includes information on land cover, land use systems, population distribution, and potential shocks like flooding. ,The Atlas allows users, with a minimum of technical expertise, to overlay and examine datasets and conduct basic analyses within a single interface. With few exceptions, all the data in the Atlas are available for download so they can be accessed and analysed offline if desired.

The user can visualize over 60 different datasets from sectors including Agriculture, Disaster Risk Reduction, Forestry and Land Use, Gender, Health, Oceans and Coasts, Rural, Urban, and Water.

Outputs include custom-made thematic maps that serve multiple purposes – for providing project contextual information during identification and design phases of project development, or for communicating resilience concepts and risks to a larger community of decision makers not necessarily directly involved at the project level.

Comments

Resilience Atlas is easy to use and is designed to meet the needs of generalists.

Tool name, institution and access website

Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) is produced by the UN Food and Agriculture Organization of the United Nations (FAO) and is accessible at:

http://www.fao.org/3/a-i4495e.pdf.

Tool theme and objective

The overall goal of SHARP is to assess and increase the resilience of farmers and pastoralists to climate change.

SHARP is a self-assessment survey for farmers and pastoralists to strengthen their own resilience by measuring their own progress, with technical support provided to evaluate, analyse and link indicators to tools.

SHARP involves three major phases:

- A participatory self-assessment survey of smallholder farmers and pastoralists regarding their climate resilience;
- A gap analysis and assessment of the responses, both at the local level with farmers and with local policy makers to assess agricultural and pastoral policies regarding effectiveness and gaps; and
- Use of this information in conjunction with climate and scientific data to inform and guide farmers' practices as well as curricula and local and national policies.

SHARP is operated at the individual or farm level.

Input data requirement and output obtained

Farmer data is captured by a questionnaire with 54 questions connected to 13 agro-ecosystem resilience indicators.

Outputs from SHARP are specific strategies for the target group of farmers or pastoralists based on geography, practices and expected climatic changes.

Comments

Like many of the IAP-FS Hub project tools, SHARP is powerful for collecting important data from target communities, however data collection and processing (up to Phase 3) is labour intensive.

Tool name, institution and access website

Vital Signs is produced by Conservation International (CI) and is accessible at:

https://www.conservation.org/projects/vital-signs.

Tool theme and objective

Vital Signs is a tool for conducting integrated field inventories of vegetation, soils and household income. The outputs are maps of key resources and spatially explicit indicators of land health and potential threats to resilience and indirectly to food security. The objectives are two-fold:

- To provide a small set of relevant, scientifically valid indicators to assess and manage risk and to support policy, and
- Through operating the tool, to increase local and national capacity for environmental monitoring among scientists, civil society, government leaders and the private sector.

Vital Signs depicts the connection between agriculture, nature, and human well-being and is designed to be used at national, regional, sub-regional scales.

Input data requirement and output obtained

Using nationally based teams, the Vital Signs programme collects or assembles on-the-ground measurements of different indicators of sustainability. The indicators include sustainable agricultural production, water availability and quality, soil health, biodiversity, carbon stocks, climate resilience, household income, nutrition and market access. The intent is to create a picture of the relationships among agriculture, nature and human well-being to inform decision making.

The main output is a monitoring system for ecosystem services for SSA agriculture that allows investors, governments, and NGOs to use interactive visualization tools to help inform agricultural policy and practice.

Comments

While the Resilience Atlas is a tool for integrating existing data from a range of data sources, Vital Signs is a data collection program. Vital Signs regularly collects new data and calculates a range of key indicators, including sustainable agriculture, water availability and quality, soil health, biodiversity, carbon stocks, climate resilience, household income, nutrition and market access.

Vital Signs data allow geospatial linking of household to community level socio-economic data with measures of the local environment and agricultural production data. The output helps create an accurate picture of relationships between agriculture, nature and human well-being. These features make the Vital Signs data unique and important. If collected regularly into the future and focused on the key variables and thresholds, it will enable a very powerful monitoring and assessment program. . If the data are regularly reviewed and assessed, Vital Signs should be able to underpin Learning about the effectiveness of any actions and interventions, which will in turn enable adaptation of the intervention options and implementation pathways to the target communities' needs. Therefore, Vital Signs, if used in combination with RAPTA, is likely to be very important for resilience assessment and developing options.

Access and navigation of the Vital Signs website is easy and intuitive.

Tool Tool name, institution and access website

The Land Degradation Assessment in Drylands Mapping Tool (WOCAT-LADA) is developed by the World Overview of Conservation Approaches and Technologies (WOCAT) in partnership with the UN Food and Agriculture Organization of the United Nations (FAO). LADA is accessible at :

http://www.fao.org/land-water/land/land-assessment/assessment-and-monitoring-impacts/en/.

Tool theme and objective

LADA assesses and maps land degradation at scales from local to global. It was designed initially for dryland degradation (desertification), but its methods can be applied to other ecosystems. At the local level, LADA captures the effects of land management practices and investment plans. As dryland degradation affects resilience, LADA output is useful for planning and monitoring SLM activities. Output is multiscale, however most use cases are at the national level with selected local level applications in some 20 countries worldwide.

Input data requirement and output obtained

Input consists of satellite derived data through the LADA tool and assembled user responses from WOCAT questionnaires. LADA groups information (via maps) according to cropland, grazing land, forest/woodland, mixed use, and other. The WOCAT questionnaires survey a range of important issues ranging from economic benefits vs. costs of land use practices to off-site ecological benefits or disadvantages. The combined output informs users on appropriate SLM techniques best suited for addressing dryland degradation within a given socio-economic context. The output is useful not only for depicting dryland degradation, but also for identifying drivers and areas most at risk.

Comments

LADA's strengths include its practical approach, short time frame to conduct an assessment (3-4 weeks), and the possibility for validation of findings with the target communities. It includes a process for quality control, and it identifies effective response strategies including resources needed to implement them.

LADA's weaknesses are that it is complex to operate and requires training and users with university education, particularly when proposing areas for action. The field assessments are too difficult for farmers or pastoralists to conduct.

Overall observations on IAP-FS tools:

This cursory review shows that a wide variety of useful tools exist but, due to their specificity, they may not often be useful for each of the 12 country projects. Moreover, adaptation of a tool to the users' own situation might take time and budget and must be considered when choosing from the many available. For example, users must invest time to get up to speed on usage.

This summary of IAP-FS tools finds that there is an issue of tool overlap. For example, some tools duplicate tasks of assembling baseline data. Hence, the user would have to opt for one or the other and may miss some of the advantages of the tool not selected.

The trickiest part is that users are often challenged by the need to integrate tools onto a single platform. In some cases, the problem is simply technical and relates to the software or hardware used. Even more difficult is the integration of both bio-physical vs socio-economic data into a decision support system since scientists and the development practitioners who they support often think along themes and systems but not necessarily across disciplines. Although additional training in cross-systems planning is useful, experience and wisdom gained through time is always required. Figure 2 depicts the complexity of bringing such systems together in the planning process, as the contributions to human well-being requires a careful, and often iterative balancing of the capital. Clearly such skills will be increasingly needed in the face of threats to food security such as climate change.

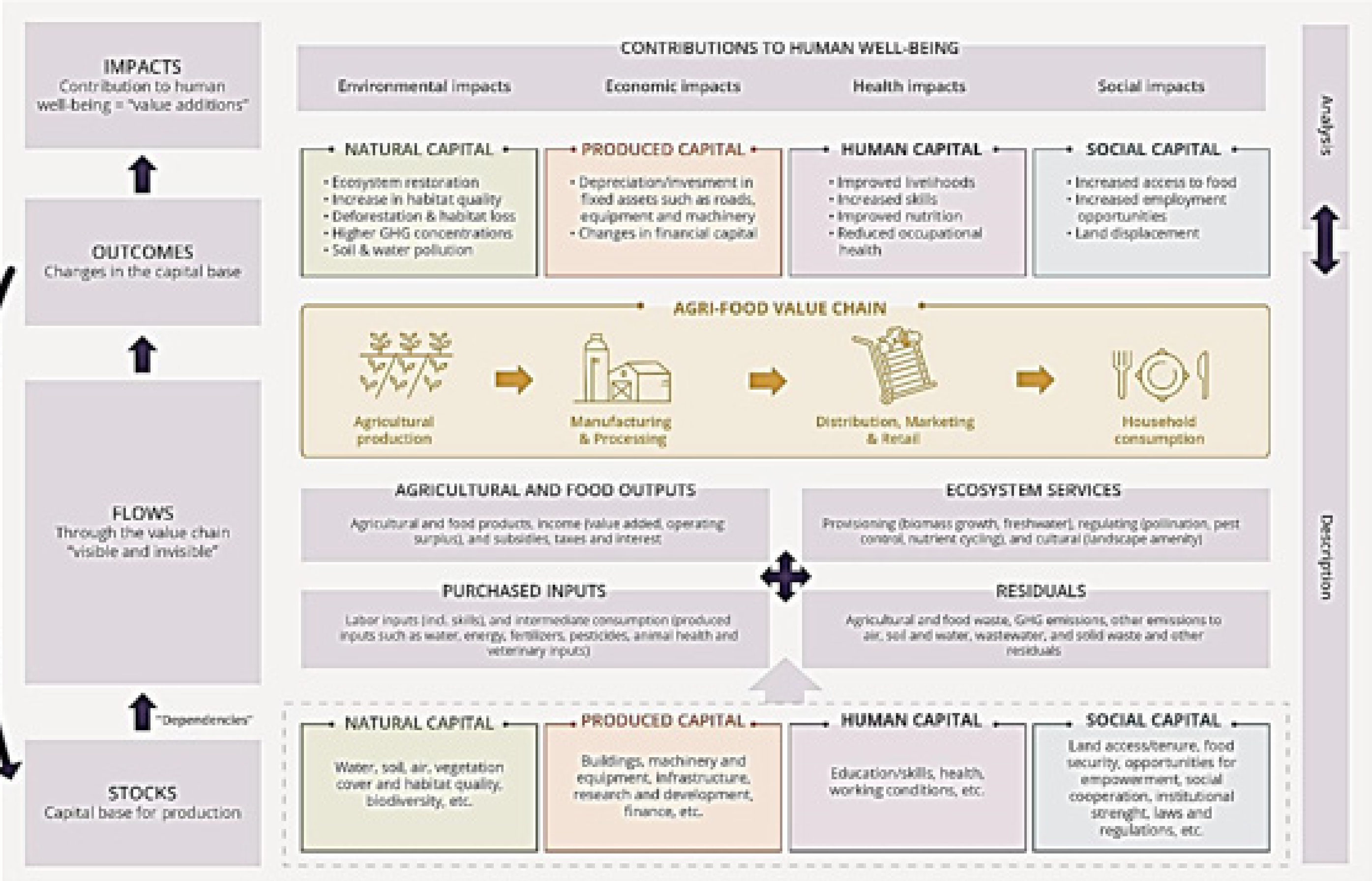

Figure 2: Bringing natural, produced, human and social capital together to benefit human well-being. Source: http://teebweb.org/agrifood/

Table 1: SLM tools quick summary

TOOL	TYPE	LEVEL	THEME	COMMENT
DATAR	Survey	Farm	Agro-biodiversity	Under development (May 2020)
EX-ACT	Survey	Farm/Household	Carbon storage	Designed for climate change projects
LDSF	Inventory	Landscape	Land degradation	Effectively combines satellite and field data
MPAT	Survey	Household	Poverty	Thorough assessment procedures for poverty
RAPTA	Assessment process	Multiscalar	Resilience	Strong participatory component
RESILIENCE ATLAS	GIS/Map	Multiscalar	Land degradation	Maps generated for planning and communication
SHARP	Survey	Farm/Household	Climate resilience	Farmer level survey improves their engagement in resilience planning
VITAL SIGNS	Inventory	Multiscalar	Risk assessment	Useful for capacity building, awareness raising on resilience
WOCAT-LADA	Survey/GIS/ Map	Multiscalar	Land degradation	Primary focus on dryland degradation

Section 5: Conclusion

In summary, users recognize the need for tools to assist in their work to manage complex projects that balance objectives addressing both socio-economic and environmental needs within their target communities. Moreover, users prefer participatory, community- and stakeholder-led, gender-sensitive planning tools because these reflect the need to negotiate among interests in the real world. It follows that users suggest that tools which are defined by the users themselves should be given more attention rather than just those coming from external sources. In that manner, tools can be adapted to local conditions.

The nine tools made available through the IAP-FS project can be very complicated to operate when users would like them to be adapted to local needs. In a recent survey, conducted by FAO (Ziadat, Bunning, & De Pauw, 2017), respondents mentioned the failure of powerful tools in environments for which they were not designed or for which local data had to be generated through inference rather than observation.

On one hand, despite technological advances in Information Technology (IT), remote sensing and GIS, this report supports the finding that tool development in SLM has not kept pace with new challenges in land and water resource management. The most common shortcomings are coarse spatial or temporal resolution, resulting in variable data quality and necessitating more general information than is appropriate for a particular scale of operation. On the other hand, such tools and knowledge will always be needed for supporting effective SLM that meets competing local, national and global demands for land and water resources while enhancing governance over resources at all scales.

In all cases, capacity building in tool development is needed in the use of specialized tools and databases. Although additional training in cross-systems planning is useful, experience and wisdom gained through time will always be required.


Axel Fassio/CIFOR

Annex 1: Summary of Other EBA Tools

Cursory review of SLM tools for ecosystem resilience and food security projects in EbA Navigator

Background: This appendix is intended to complement the findings in the main report with a cursory review from a sample of other EbA tools. The authors took advantage of the efficient organization of EbA tools available through the Navigator and would encourage readers to do so at: *https://www.iied.org/tools-for-ecosystem-based-adaptation-new-navigator-now-available*. The authors reviewed the 244 tools in the EbA Navigator which was produced by IIED, IUCN, UNEP-WCMC, and GTZ. The purpose of the review was NOT to evaluate tools presented in the EbA Navigator, rather the intention was to present a sample of possible tools based on the below use case and to understand overall availability, potential use, and possible constraints related to their uptake.

Use case: The analysis is based on a use case and any assumptions that would flow from it. The users could be agricultural officers working in the context of a country-level project (see list of 12 African countries). They would be concerned with how strengthening ecosystem resilience would assist communities to mitigate and adapt to risks for food security. Users would have responsibilities in project identification, design, implementation, monitoring/evaluation, reporting, etc. Risks to food security that the officers should address include climate change, ecosystem degradation, inappropriate use of technology, population displacement, among others. At a minimum, the users should have access to:

1. A few, general documents on how ecosystem resilience is linked to food security for background / context. These documents are reports / documents / books / reviews written for a global/regional audience and could provide the larger context for the users' project.
2. A few, general tools such as manuals, short courses, etc. for project management (Results Based Management, Logframes, Theory of Change, Adaptive management, etc). These tools will assist the users to ensure that the project is well designed and has outputs that lead to outcomes to enhance project success.
3. Specific tools depending on nature of project. Examples include tools to:
   - process climate data to assess future risk to food security from climate change;
   - use IT platforms to incorporate project data and information, including spatially explicit data, to support project planning, management, execution, monitoring , reporting and evaluation;
   - integrate biophysical data with socio-economic data at a local project scale to understand win-wins, tradeoffs and impacts.

Results/Findings:

The results from the Navigator search group the tools into the above use-case scenarios (3 groups of tools at present). The 3 use categories include:

1. **Overview documents for context on ecosystem resilience / food security.** These are generally global or regional level reports that should be consulted, but which have limited use at a (local) project management scale. Examples of overview documents to provide contextual information include:
   - FAO Assessment on climate change and food systems (2015): (http://www.fao.org/3/a-i4332e.pdf). The assessment provides an overview of how climate change impacts food systems and is useful for understanding opportunities and pitfalls from applying climate model output for food security planning, while offering scenarios for staple crop production in Africa. The users can apply information from such an assessment to orient the background and justification for their project work.
   - FAO Working Paper 14: Land resource planning for sustainable land management (2017a): (http://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/en/). The paper provides a useful overview of land issues, management needs and an entry to its planning toolbox. Users access a typology of the different sets of tools available which can help in pre-selecting a subset of tools for possible use. A summary of how and how often groups of tools are being used and for what purpose further orients the user.
   - FAO Climate-Smart Agriculture (2010): http://www.fao.org/docrep/013/i1881e/i1881e00.pdf provides technical, institutional, policy and financial elements to ensure food security in a changing climate that should be addressed in project work. Working at a local level, the user should consider each of these elements as essential for project success, while understanding that relative importance of each element may vary depending on specific community needs.
2. **Manuals / short courses / handbooks for project management:** A project manager needs to train and/or consult references for effective management whatever the project objectives may be. S/he should have access to tools for:

Project planning, Theory of Change, development of Logframes, Adaptive management, M&E, etc for general project management. There are many such tools available, and some are required by a particular donor for financial and technical reporting. Examples of project management tools include:

- IISD's Community-based Risk Screening Tool - Adaptation and Livelihoods (CRiSTAL)– Food security: https://www.iisd.org/cristaltool/download.aspx#cristal-food-security. CRisTAL is a decision support tool produced by IISD and others for organizing data and information for project design, planning, data entry and reporting. The spreadsheet application requires training – perhaps 2-3 days working with project data. Examples from Uganda and Burkina Faso are relevant to 12 African countries.
- The World Bank's Logframe Handbook: A logical framework approach to project cycle management. http://documents.worldbank.org/curated/en/783001468134383368/pdf/31240b0LFhandbook.pdf. Although dated, it is a basic planning tool for project managers, whether or not they are operating WB projects.
- Magee's "A Field Guide to Community-Based Adaptation" https://www.routledge.com/A-Field-Guide-to-Community-Based-Adaptation/Magee-White/p/book/9780415519298 is designed to help users develop and implement food security projects that are co-managed and sustained by target communities.

3. **Specific tools depending on theme:** The last group of tools include those which are specific to the users' objectives and are often needed to access and/or process socio-economic or biophysical data, for example in data modeling. Examples include:

   - Statistical DownScaling Model (SDSM) http://co-public.lboro.ac.uk/cocwd/SDSM/sdsmmain.html is useful if climate data are required to meet project objectives, for example to explore how future climate change could affect crop production at a local scale. Use of such tools may require expertise in climate modeling – not necessarily those found in food security projects.
   - Participatory Rural Appraisal (PRA) and Participatory Rapid Rural Appraisal (PRRA) (FAO) http://www.fao.org/3/x5996e/x5996e06.htm are useful for those projects having a strong socio-economic component. These tools are commonly used for collecting baseline data on community status and input for land-use planning.
   - The Soil and Water Assessment Tool (SWAT) (USDA, Texas A&M University) http://swatmodel.tamu.edu/ was produced by the US Department of Agriculture and Texas A&M University and is useful for those projects requiring streamflow and surface water runoff information for predicting erosion, non-point source pollution, and monitoring potential risks to food security. It requires a GIS software license, data, and training of technicians.

Annex 2: Tabular summary of tools from IAP-FS

(Tengberg and Valencia, 2017)

Tool Name Weblink	Purpose	Scale of Analysis	Indicators Measured	GEB
Multidimensional Poverty Assessment Tool (MPAT) www. Ifad.org	Household survey that captures the dimensions of rural poverty. A thematic indicator that assists M&E design, targeting, and prioritization.	Household; Village	Food and Nutrition Security Domestic Water Supply Health and Health Care Sanitation and Hygiene Housing, Clothing and Energy Education Farm Assets Non-farm Assets Exposure and Resilience of a Household to Shocks Gender and Social Equality	Food Security
Landscape degradation Surveillance Framework (LDSF) www. http:// landscapeportal.org	To provide a biophysical baseline at the landscape level, and a monitoring framework for assessing land degradation and the effectiveness of rehabilitation	Landscape	Soil Organic Carbon Soil Health (multiple parameters) Soil Hydrology Vegetation Cover Land Cover Classification Land Degradation Land Use Plant Biodiversity Soil and Water Conservation	Land under integrated management; Land cover
Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) www.fao.org	Self-assessment used to access and increase the resilience of farmers and pastoralist to climate change	Individual; farm	Resilience	Food Security
Resilience, Adaptation Pathways and Transformation Assessment (RAPTA) www.stapgef.org	A framework to embed concepts of resilience, adaptation and transformation into project design, implementation, and assessment	Multi-scalar	Resilience	
Diversity Assessment Tool for Agrobiodiversity and Resilience (DATAR) https://www. bioversityinternational. org/	A framework composed of a household survey and participatory mapping activity that measures on farm crop, tree, and livestock genetic diversity	Landscape	Resilience; Biodiversity	Conservation of on farm genetic diversity
EX-Ante Carbon Balance Tool (EX-ACT) http:// www.fao.org/tc/exact/ex-act-home/en/	Estimates the impact of agriculture and forestry development projects on carbon-balances; land-based accounting system	Multi-scalar	GHG mitigation; wide range of development applications	GHG emission avoided or reduced

Land Degradation Assessment in Drylands Mapping Tool (WOCAT-LADA) http://www.fao.org/land-water/land/land-assessment/assessment-and-monitoring-impacts/en/	Information from questionnaires is linked to GIS software to produce maps that has areal calculations on various types of land degradation and SLM/conservation. Can be used to: spatially map land degradation; plan, support and monitor SLM activities; set program priorities	Multi-Scalar	Land degradation	Land cover
Vital Signs https://www.conservation.org/projects/vital-signs	Gathers and spatially orients a number of sustainability indicators. Depicts the connection between agriculture, nature and human well-being.	Regional; Sub regional	Sustainable Agricultural Production Water Availability and Quality Soil Health Biodiversity Carbon Stocks Climate Resilience Household Income Nutrition and Market Access	Land under integrated management; Land cover
Resilience Atlas https://www.resilienceatlas.org/	An interactive analytical tool for building (1) understanding of the extent and severity of some of the key stressors and shocks that are affecting rural livelihoods, production systems, and ecosystems	Regional:Sub regional/country	Over 60 data sets	Ecosystems

Bibliography

FAO. (2010). "Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Rome: Food and Agriculture Organization (FAO) of the United Nations. 49 p. http://www.fao.org/3/i1881e/i1881e00.pdf

FAO. (2015). Climate Change and Food Systems: Global Assessments and Implications for Food Security and Trade. Rome: Food and Agriculture Organization (FAO) of the United Nations. 356 p. http://www.fao.org/3/a-i4332e.pdf

FAO. (2017a). Land resource planning for sustainable land management: Current and emerging needs in land resource planning for food security, sustainable livelihoods, integrated landscape management and restoration. Working Paper 14. Rome: Food and Agriculture Organization (FAO) of the United Nations. 68 p. http://www.fao.org/3/a-i5937e.pdf

FAO. (2017b). Sustainable Land Management (SLM) in practice in the Kagera Basin. Lessons learned for scaling up at landscape level - Results of the Kagera Transboundary Agro-ecosystem Management Project (Kagera TAMP). Rome: Food and Agriculture Organization (FAO) of the United Nations. 452 p. http://www.fao.org/3/a-i6085e.pdf

Fegan, S. (2019). The Sustainable Land Management Mainstreaming Tool - Decision Support for Mainstreaming and Scaling up Sustainable Land Management. Rome: Food and Agriculture Organization (FAO) of the United Nations. 48 p. http://www.fao.org/3/ca3761en/CA3761EN.pdf

GEF. (2005). Scientific and Technical Advisory Panel to the Global Environment Facility: land management and its benefits – the challenge, and the rationale for sustainable management of drylands. Global Environment Facility (GEF) Council. 67 p. https://www.thegef.org/sites/default/files/council-meeting-documents/C.27.Inf_.11.Rev_.1_STAP_4.pdf

IISD. (2014). CRiSTAL Food Security 2.0 User's Manual. International Institute for Sustainable Development. 24 p. https://www.iisd.org/sites/default/files/publications/cristal_food_security_manual_en.pdf. Spreadsheet tool is available at: https://www.iisd.org/cristaltool/download.aspx#cristal-food-security.

Magee T. & White H. (2012). A Field Guide to Community Based Adaptation. Routledge. 232 p. https://csd-i.org/field-guide-to-community-based-adaptation-table-of-contents-and-introduction/

O'Connell, D., Abel, N., Grigg, N., Maru, Y., Butler, J.,. . . Stafford Smith, M. (2016). Designing projects in a rapidly changing world: Guidelines for embedding resilience, adaptation and transformation into sustainable development projects. (Version 1.0)". Global Environment Facility, Washington, D.C. 112 p. https://stapgef.org/sites/default/files/publications/RAPTA%20Guidelines%20-%20High%20Resolution.pdf

Preston, F., Lehne, J., & Wellesley, L. (2019). An inclusive circular economy: priorities for developing countries. Chatham House - The Royal Institute of International Affairs. 82 p. https://reader.chathamhouse.org/inclusive-circular-economy-priorities-developing-countries#

Sanz, M., de Vente, J., Chotte, J.-L., Bernoux, M., Kust, G., Ruiz, I., . . . Akhtar-Schuster, M. (2017). Sustainable Land Management contribution to successful land-based climate change adaptation and mitigation. A Report of the Science-Policy Interface. Bonn: United Nations Convention to Combat Desertification (UNCCD). https://www.unccd.int/sites/default/files/documents/2017-09/UNCCD_Report_SLM_web_v2.pdf

Tengberg, A. & Valencia, S. (2017). "Science of Integrated Approaches to Natural Resources Management", A STAP Information Document. Global Environment Facility, Washington, D.C. 55 p. https://www.thegef.org/sites/default/files/publications/STAP%20paper%20-%20Science%20of%20Integrated%20Approaches%20to%20NRM.pdf

UN. (1992). Agenda 21: the United Nations Programme of Action from Rio. United Nations (UN), New York. 352 p. https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf

UNDESA. (2019). World Population Prospects 2019: Highlights. United Nations, Department of Economic and Social Affairs, Population Division. 46 p. https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf

Wilby R. & Dawson C. (2013). The Statistical DownScaling Model: insights from one decade of application Int. J. Climatol. 33: 1707–1719. https://rmets.onlinelibrary.wiley.com/doi/pdf/10.1002/joc.3544

World Bank. (2005). Logframe Handbook: A logical framework approach to project cycle management. World Bank. 112 p. http://documents.worldbank.org/curated/en/783001468134383368/pdf/31240b0LFhandbook.pdf.

Ziadat, F., Bunning, S., & De Pauw, E. (2017). Land resource planning for sustainable land management- Current and emerging needs in land resource planning for food security, sustainable livelihoods, integrated landscape management and restoration. Rome: Food and Agriculture Organization (FAO) of the United Nations. http://www.fao.org/3/a-i5937e.pdf

Contact for further information:

Charles Sebukeera: charles.sebukeera@un.org

UN environment

United Nations
Environment Programme