Sustainable Land Management: Current State

A growing inventory of adapted land-use practices

The World Overview of Conservation Approaches and Technologies (WOCAT) is a global network on sustainable land management (SLM). The network develops, archives, shares and disseminates SLM knowledge to support adaptation, innovation and decision-making. Methods and tools for documenting sustainable land management (SLM) practices are available via a worldwide platform at https://qcat.wocat.net/en/wocat/

Land users lead the way to sustainable solutions for "making the land greener and the water bluer".

WOCAT-documented SLM measures per different land-use class and SLM measures
Most practices are documented for cropland followed by grazing land and other land. Agronomic and vegetative measures individually and in combination make up over 69% of all measures in all land-uses types. These measures are well suited for prevention or reduction of land degradation. The proportion of structural measures is highest on cropland, reflecting the recognition that on cropland the benefits far outweigh the investment costs and inputs.
Source: WOCAT database, 2017 and WAD3-JRC, 2018.

WOCAT documented SLM measures per global change issue (GCI, see page 145 for table)
Most of the documented SLM interventions are in dryland areas (57%). 25% of cases are in areas with water stress and 20% in areas with climate-vegetation trends or drought-affected areas. Decreasing or stressed productivity prevails in about one-sixth of the cases. Socio-economic variables such as population density, population change as well as livestock density and income level are outstanding issues that are common to 74-90% of the cases, (90%, 82%, 78% and 74%, respectively). Fertiliser deficiency is observed in more cases (26%) than overuse of fertilisers (18%). Expansion of built-up areas and irrigation in water-stressed areas occur in 20% and 15% of the cases, respectively. As per the convergence of evidence principle (see page 144), no GCI by itself is sufficient to infer land degradation) but if multiple GCIs were to occur at any location, this suggests the potential for land degradation (at least in some form) and further investigation would be warranted.
Source: WOCAT database, 2017 and WAD3-JRC, 2018.

WOCAT-documented SLM practices and their measures implemented on various land uses.
Source: point data WOCAT (2017); background map: GLC-Share v1.0[*], Aridity Index (see page 72).

WOCAT-documented SLM measures vs coincident global change issues.
WOCAT measures, which are well-suited to recording the prevention or reduction of land degradation, mesh well with the various global change issues. Most WOCAT cases are situated in areas where there are 4 to 7 coinciding GCIs. Most measures are agronomic, followed by vegetative, structural and management. Note that local aspects, such as active soil erosion, are not included as GCIs in the convergence of evidence example in this atlas.
Source: WOCAT database, 2017 and WAD3-JRC, 2018.

SLM measures

- Agronomic
- Agronomic Combined
- Vegetative
- Vegetative Combined
- Structural
- Structural Combined
- Management
- Other

Land Condition

- Non-dryland

Land Use/Cover

- Grassland
- Trees
- Shrubs
- Rainfed cropland
- Irrigated cropland

Agronomic measures: measures that improve soil cover (e.g. green cover, mulch); measures that enhance organic matter/soil fertility (e.g. manuring); soil-surface treatment (e.g. conservation tillage); subsurface treatment (e.g. deep ripping).

Vegetative measures: plantation/reseeding of tree and shrub species (e.g. live fences; tree rows), grasses and perennial herbaceous plants (e.g. grass strips).

Structural measures: terraces (bench, forward/backward sloping); bunds, banks (level, graded); dams, pans; ditches (level, graded); walls, barriers, palisades.

Management measures: change of land use type (e.g. area enclosure); change of management/intensity level; change in timing of activities; control/change of species composition.

+ combinations

Categories of WOCAT measures inventoried in the field
SLM technologies are made up of agronomic, vegetative, structural or management measures, or most often a combination of these.
Source: Liniger and Crichley, WOCAT, 2007[*].

WOCAT-documented measures per land productivity dynamics (see page 114)
80% of the interventions are in areas that now show stable 'not stressed' and even 'improving' land productivity. This might be proof of increasing efforts in investing in SLM and a positive impact of investments made in good land management. Only 5% of the SLM measures reported are in areas with declining land productivity and suggest that efforts are in the initial phase or not yet wide-spread.
Source: WOCAT database, 2017 and WAD3-JRC, 2018.

Human activities involving land use and land-use changes are widespread across the globe and are a major driver of land degradation[1, 2]. While there are many land-use practices associated with land degradation (over-cultivation, overgrazing, etc.), the existence of any these practices alone does not constitute land degradation. For example, based on simple cause-effect logic, overgrazing and primitive farming techniques by peasants and pastoralists were traditionally blamed for causing Sahelian drought and land degradation[3]. A new paradigm exposed the overly simplistic nature of this view by documenting the complex nature of non-equilibrium systems, such as abiotic versus biotic controls, short- versus long-term dynamics, and the value of local stakeholder knowledge in governing coupled human-socio-economic systems[3, 4] (see page 64 on smallholders). This led to a more integrated approach in formulating the social and institutional dimensions of land management, including the development and implementation of the adaptive practices of sustainable land management (SLM).

The World Overview of Conservation Approaches and Technologies (WOCAT) is a network that develops, archives, shares and disseminates SLM knowledge to improve human livelihoods and the environment[6]. As part of its mission, WOCAT strives to support evidence-based decision-making and influence policy making at various levels to promote wider implementation and scaling up of identified good practices, thereby contributing to global efforts to prevent, halt and reverse land degradation. Potential locations of maladapted land use practices are identified by mapping the co-occurrence of key issues related to land degradation and framing them within local contexts and stakeholder knowledge (as per Convergence of Evidence, page 144). Comparing the conditions found in a potential problem area with documented solutions from similar regions in the WOCAT database may yield a list of SLM options. These SLM options can be examined within the context of local economic, social and environmental conditions. The availability of such evidence-based information and knowledge facilitates the uptake and widespread implementation of SLM. The value of systematic collection and cataloging of geographically based SLM knowledge is gaining broad appreciation from research agencies, institutions and the global community. SLM technologies and approaches are not static but are continuously adapted in response to changing environmental conditions and human needs. However, this requires long-term monitoring of instances of implementation, adaptation, and impact of SLM. These efforts are supported and encouraged by significant advancements in information technology (cloud computing, the Internet of Things, social networking, etc.), which supports a wide array of social, economic and environmental contexts.

SLM practices and measures

SLM is defined as the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while ensuring the long-term productive potential of the resources and the maintenance of their environmental functions[5].

Sustainable land-management practice consists of an SLM technology and SLM approach.

An SLM technology is a physical practice on the land that controls land degradation, enhances productivity, and/or other ecosystem services. A technology consists of one or several measures, such as agronomic, vegetative, structural, and management measures (WOCAT 2016). An SLM approach includes the ways and means of support that help introduce, implement, adapt and apply SLM technologies on the ground to foster an enabling environment.