

Soil Security – Links to sustainable land management and land capability

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Sustainable Land Management

- Sustainable Land Management and its Relationship to Global Environmental Benefits and Food Security
- Provide input on the following:
 - global benefits of sustainable land management;
 - measures to encourage sustainable land management.

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Sustainable Land Management – Three Pillars

- Biophysical Ecological
- Economic
- Social

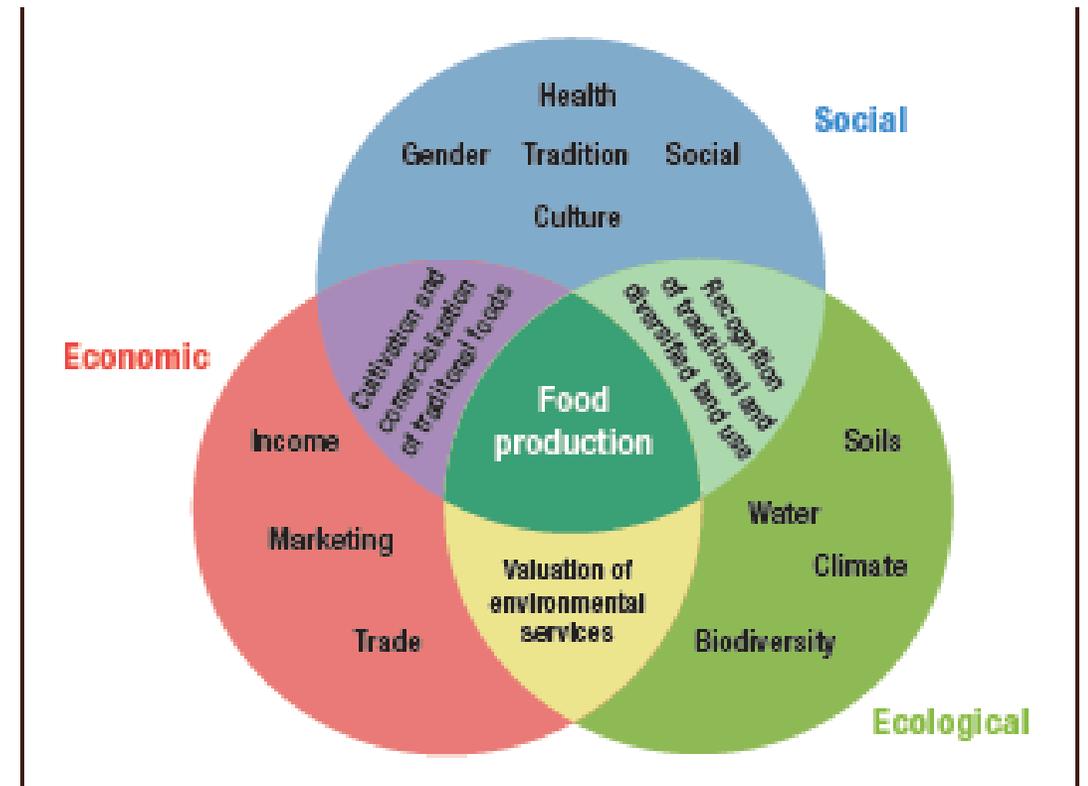
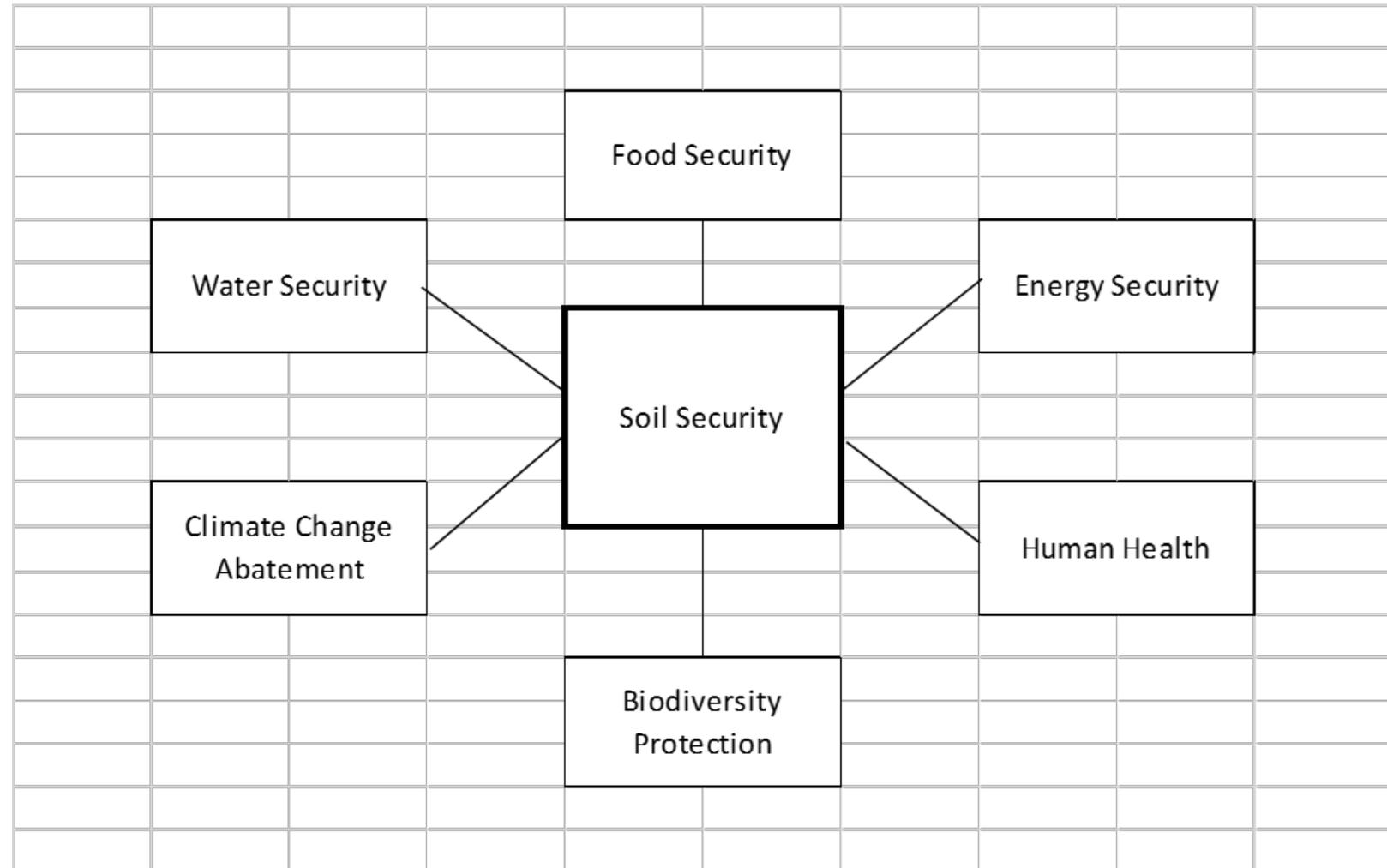


Figure 1: The 3 dimensions of sustainability. (Source: IAASTD, 2009a).

6 Major Challenges for Society - Soil Security -



Five Dimensions to Soil Security

- Capability –
 - reference state , what is the potential of the soil?
- Condition –
 - capacity of the soil to function (= capability x management input?)
 - Land managed within capability
- Capital
 - Monetary value of the capacity of the soil to function
- Connectivity
 - Community knowledge of the soil, its management and overall functionality
- Codification
 - Policy and legislation to guide soil management.

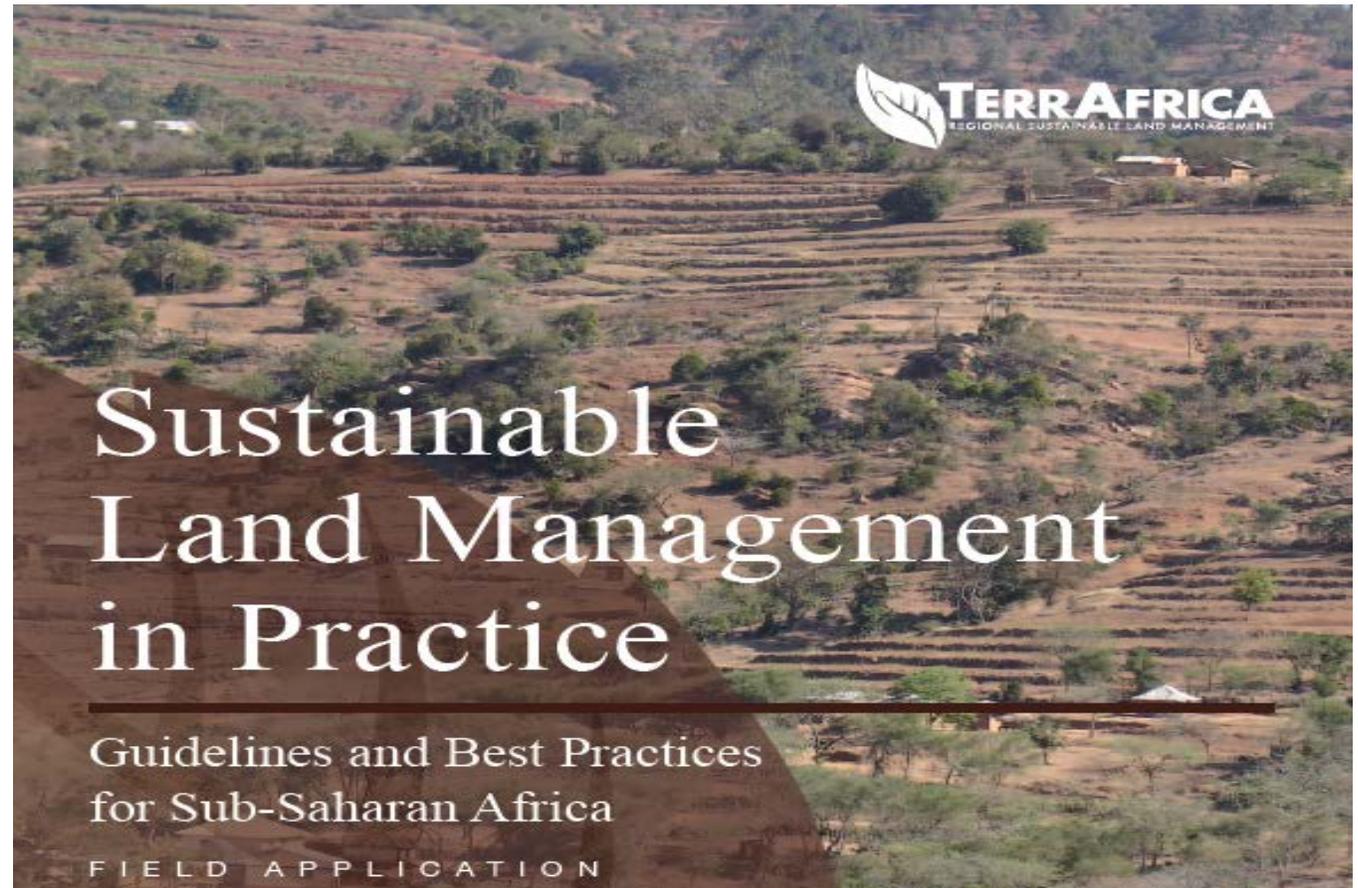
Connection of soil security to sustainable land management and land evaluation

- Soil security, emphasises the value of soils rather than the negative aspects of soils as can happen when the emphasis is on land degradation and soil limitations
- Soil security identifies a wide range of challenges facing society and the dimensions that need to be assessed in order to “secure” a soil. It potentially identifies the needs for sustainable soil management.

To test the concept a matrix is proposed, based on the challenges, and the dimensions.

How well a number of published land evaluation systems or recommended systems of land management is tested

| Soil evaluation System / publication | | | | | |
|--------------------------------------|------------|-----------|---------|--------------|--------------|
| | Capability | Condition | Capital | Connectivity | Codification |
| Food Security | | | | | |
| Water Security | | | | | |
| Climate Change Abatement | | | | | |
| Biodiversity Protection | | | | | |
| Energy Security | | | | | |
| Human Health | | | | | |



Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. 2011. Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa. TerrAfrica, World Overview of Conservation Approaches and Technologies (WOCAT) and Food and Agriculture Organization of the United Nations (FAO)



Water use efficiency and productivity

Soil fertility

Plants and their management

Microclimate

| Aim | Strategies |
|---|--|
| Increase plant water availability in rainfed agriculture | minimise run-off; maximise rainfall infiltration and storage in the soil |
| | reduce non-productive evaporation |
| | harvest & concentrate rainfall through runoff to crop area or for other use |
| Increase plant water availability in irrigated agriculture | minimise water losses from irrigation system |
| | efficient and effective application of water |
| | recharge aquifer / groundwater; water collection to enable off-season irrigation |
| Increase plant water uptake | increase productive transpiration |
| Improve nutrient availability and uptake | reduce nutrient mining and losses |
| | improve soil nutrient holding capacity and plant nutrient uptake capacity |
| Maximise yields | use best suited planting material and optimise management |
| Create favourable growing conditions | reduce evapotranspiration |
| | optimise temperature and radiation |
| | reduce mechanical damage of plants |

Impacts

SCALE

Dimensions of Soil Security?

WOCAT Publication

| | Capability | Condition | Capital | Connectivity | Codification |
|-----------------------|---|---|--|---|---|
| Food Security | <p>Defines land management practices that are “sustainable”</p> | <p>Defines land management practices to maintain soil condition.</p> <p>Land managed within capability</p> <p>Land management links capability and condition Land degradation processes</p> | <p>Need for capital and funds to implement land management practices.</p> <p>Economic sustainability requires maintaining yields and even improving yields but must be balanced to costs, especially of fertiliser. Nutrient management critical.</p> <p>Increased or stabilised farm income</p> | <p>Emphasises need to promote locally practical and applicable land management practices.</p> <p>Need to understand community and family structures in extending information and obtaining adoption of new practices.</p> | <p>Land tenure policies influence management</p> <p>Fertiliser accessibility policies.</p> <p>Incentive orientated legislation to adopt improved land management practices.</p> |
| Water Security | <p>Most of the emphasis on water is to conserve water in the soil for crop growth</p> | | | | |

WOCAT Publication

| | Capability | Condition | Capital | Connectivity | Codification |
|---|------------|--|---------|--|--------------|
| Climate Change Abatement and Mitigation? | | All practices designed to manage climate variability. And some for climate mitigation (soil carbon). | | | |
| Biodiversity Protection | | Emphasis on specific potentially agriculturally valuable species Problems of invasive species Intensification on soils in good condition reduces deforestation | | | |
| Energy Security | | | | | |
| Human Health | | | | Need to maintain human health in order for improved practices to be adopted. | |

Conclusions For WOCAT

- Soil security identifies the challenges that relate to the sustainable land management practices identified in the WOCAT publication and the dimensions to secure the soil. It confirms the value of the WOCAT set of land management practices as they relate to all the dimensions of soil security.
- The one potential deficiency in the soil security concept at present is the lack of development of the effects of land management practices on soil condition yet these will be one of the major drivers of soil security. Much of current information is at the very general level. The land management practices are a key link between capability and condition. (8 page paper v 300 page document).
 - Land management within capability

Conclusions for WOCAT

- All the dimensions can be strongly interactive, especially through the application of land management practices. The development and implementation of desirable land management practices is a unifying theme through all the dimensions.
- Lack of development of the economic dimension to consider importance of farm income or enterprise viability.
- More development needed to incorporate scale (mentioned in conclusion), WOCAT relates to:
 - Local/land user
 - Watershed / landscape
 - National / global

Conclusion for Soil Security

- Useful and valuable framework and checklist for land evaluation systems
- Identifies quickly the context and applicability of land evaluation systems and publications
- Identifies weak links or dimensions that have not been considered in land or soil evaluation systems

MANAGING SOIL ORGANIC CARBON FOR GLOBAL BENEFITS



Govers, G., Merckx, R., Van Oost, K. and van
Wesemael, B. (2013). 'Managing Soil Organic Carbon
for Global Benefits: A STAP Technical Report'. Global
Environment Facility, Washington, D.C.

Scientific and Technical Advisory Panel

An independent group of scientists which advises the Global Environment Facility



Goverts publication on Soil Carbon for Global Benefits

| Soil evaluation System / publication | Goverts, G, Merkx, Van Oost, K and van Wesael, B. (2013). Managing soil carbon for global benefits. Scientific and Technical Advisory panel for Global Environmental Facility. | | | | |
|---|--|------------------------|----------------|---------------------|---------------------|
| | Capability | Condition | Capital | Connectivity | Codification |
| Food Security | | Related to soil carbon | | | |
| Water Security | | | | | |
| Climate Change Abatement | Some emphasis | Major emphasis | | Some value | |
| Biodiversity Protection | | | | | |
| Energy Security | | | | | |
| Human Health | | | | | |

Conclusions – For consideration?

- Consider place of land management practices –
 - link between capability and condition
 - Link between condition and economic viability of agricultural systems
- Problem of applying scale
 - Landholder
 - Catchment/watershed/landscape
 - National / global
- Capital is the economic dimension but the economic viability of an enterprise is not specifically mentioned under capital? The stabilization and possible increases in farm income are an important economic requirement in the adoption of land management practices that might be required for soil security (Original Three pillars).

List of land evaluation publications

- Govers, G, Mercks, R, Van Oost, K and van Wesemael, B. (2013). Managing soil organic carbon for Global benefits. A STAP Technical Report. Global Environmental Facility, Washington D.C.
- Liniger H., Studer R. M., Hauert C., Gurtner, M. (2011). Sustainable Land Management in Practice. Guidelines and best practices for Sub-Saharan Africa. TerrAfrica, World Overview of Conservation Approaches and Technologies (WOCAT) and Food and Agricultural Organization of the United Nations (FAO).
- Office of Environment and Heritage (2012). The land and soil capability assessment scheme – second approximation. A general rural land evaluation system for New South Wales. Office of Environment and Heritage. Department of Premier and Cabinet, Goulburn St, Sydney.
- Palm C., Sanchez P., Ahamed C., Awiti A. (2007). Soils: A Contemporary Perspective. *Annual Review of Environmental Resources* 32: 99–129.
- Winterbottom R., Reij C., Garrity D., Glover J., Hellums D., McGahuey, Scherr S. (2013). *Improving land and water management*. Working Paper, Installment 4 of *Creating a Sustainable Food Future*. Washington DC: World Resources Institute. Accessible at: <http://www.worldresourcesreport.org>

