

## **SOIL SUSTAINABILITY GUIDELINES**

This document is intended to guide the conversation on sustainable practices related to soil used for the production of biofuels. While reviewing this document, please keep in mind reporting mechanisms as well as checks and balances. Within this document we have loosely categorized criteria into the following groupings:

- carbon content
- erosion
- crop rotation
- nutrition/chemical use
- productivity
- crop expansion

Both erosion and productivity were further broken down into agriculture and forestry.

Below is the list of references used for the soil criteria:

- Roundtable on Sustainable Biofuels
- Council on Sustainable Biomass Production
- International Sustainability and Carbon Certification
- Roundtable on Sustainable Palm Oil
- Better Sugarcane Initiative
- Roundtable on Responsible Soy
- Renewable Transportation Fuel Obligation
- Sustainable Forestry Initiative
- Forest Stewardship Council

You will find links to these programs and/or documents on the LCFS Sustainability webpage (<http://www.arb.ca.gov/fuels/lcfs/workgroups/lcfsustain/lcfsustain.htm>).

## **Carbon**

- A number of indicators are selected and a baseline is established to be able to monitor continual improvement on those aspects where desired improvements have been identified. Producers are free to choose the continual improvement indicators that are relevant to them to demonstrate continual improvement with respect to the requirements of this standard; e.g. Soil carbon content, use of agrochemicals, state of riparian vegetation etc. The baseline year is the year of first certification assessment.
- The results of monitoring are reviewed and appropriate action is planned and taken when necessary to ensure continual improvement
- Soil organic matter is monitored to quantify change in soil carbon and steps are taken to mitigate negative trends. For group certification of small farms - the monitoring of soil carbon can be done using samples.
- Opportunities for increasing carbon sequestration through restoration of native vegetation, forest plantations and other means are identified.
- Program participant maintains or improves soil carbon levels.
- A zero or positive score on the Soil Conditioning Index shall be considered an adequate proxy for maintaining or improving soil carbon content.

## **Soil Erosion**

Erosion impacts soil quality, land productivity, habitats and water quality. Practices that have an effect on erosion include ground cover management, tillage, biomass recycling, terracing, and natural regeneration or restoration.

### ***Guidelines for Ag***

- Soil erosion minimized through the design of feedstock production site and use of sustainable practices including crop rotation, direct planting, maintaining ground cover, terracing, and maintaining or creating tree hedges
- Soil quality is maintained or improved and erosion is avoided by good management practices
- Use of erosion control measures to minimize the loss of soil and site productivity
- Knowledge of techniques to control soil erosion is demonstrated and these techniques are implemented
- Documentation of soil management plan aimed at sustainable soil management, erosion prevention and erosion control
- Annual documentation and application of good agricultural practices with respect to:
  - Prevention and control of erosion;
  - Maintaining and improving soil nutrient balance;
  - Maintaining and improving soil organic matter;
  - Maintaining and improving soil pH; Maintaining and improving soil structure;
  - Maintaining and improving soil biodiversity;
  - Prevention of salinisation
- Field cultivation techniques used to reduce the possibility of soil erosion
- Evidence of measures of reduced soil erosion available. Maps of fragile soils must be available. A management strategy should exist for plantings on slopes above a certain limit (needs to be soil and climate specific). A management strategy should be in place for other fragile and problem soils (e.g. sandy, low organic matter soils)

### ***Guidelines for Forest***

- Soil cover and fertility are maintained in a condition that is sufficient to minimize soil erosion. This is dependent on: slope; stability of the soil; potential for soil compaction; and characteristics of the climate, such as the intensity and frequency of precipitation

## DRAFT DOCUMENT FOR THE PURPOSE OF DISCUSSION

- Logging operations and the use of roads and skid trails occur only when soil compaction, erosion, and sediment transport do not result in degradation of water quality, site productivity, or habitats
- In order to minimize soil disturbance, silvicultural techniques and logging equipment are selected in accordance with slope and the hazard rating for soil erosion
- Permanent roads have structures to control soil erosion year-round and are managed under a winter maintenance plan
- Landings are designed and constructed to minimize soil erosion
- Access to temporary and permanent roads is controlled to minimize impacts to soil and biota while simultaneously allowing legitimate access
- Forest owners or managers retain and recruit sufficient large, green trees; snags; understory vegetation; down logs; and other woody debris in riparian zones to provide shade, erosion control, and in-channel structures.
- Grazing by domestic animals is controlled to protect the species composition and viability of the riparian vegetation and the banks of the stream channel from erosion
- Techniques that minimize soil erosion are well-known and should be adopted, wherever appropriate
- Smallholders should be able to demonstrate that they have an understanding of the techniques required to manage their soils and that they are being implemented.
- National interpretation should refer to national guidance, and identify the best management practices and appropriate techniques for maintaining soil quality in local conditions, including guidance on soil types, and any appropriate performance thresholds, such as maximum acceptable slope gradient for planting
- Baseline soil surveys and topographic information, including the identification of marginal and fragile soils, areas prone to erosion and slopes unsuitable for planting.
- Measures should be planned to minimize erosion through appropriate use of heavy machinery, terracing on slopes, appropriate road construction, rapid establishment of cover, protection of riverbanks, etc.

## **Crop Rotation**

*This is mostly related to soil nutrition and erosion.*

Fallow areas with natural or planted vegetation in order to recover natural fertility and interrupt pest life cycles

### **Soil Nutrition/Chemical Use**

- For annual crops, operators shall implement measures to improve soil health (or soil productivity or soil organic matter), such as Conservation Agriculture practices as defined by the FAO, including but not limited to organic direct planting, permanent soil cover and crop rotation
- Fallow areas with natural or planted vegetation in order to recover natural fertility and interrupt pest life cycles
- None of the chemicals recorded in the WHO's 1a (extremely hazardous) and 1b (highly hazardous) lists shall be used (Can be found here: [http://whqlibdoc.who.int/publications/2010/9789241547963\\_eng.pdf](http://whqlibdoc.who.int/publications/2010/9789241547963_eng.pdf))
- Minimize chemical use required to achieve management objectives while protecting employees, neighbors, the public and the environment, including wildlife and aquatic habitats
- Minimized chemical use required to achieve management objectives
- Use of least-toxic and narrowest-spectrum pesticides necessary to achieve management objectives
- Use of pesticides registered for the intended use and applied in accordance with label requirements
- Use of integrated pest management where feasible
- Supervision of forest chemical applications by state- or provincial-trained or certified applicators
- Use of management practices appropriate to the situation, for example: a. notification of adjoining landowners or nearby residents concerning applications and chemicals used; b. appropriate multilingual signs or oral warnings; c. control of public road access during and immediately after applications; d. designation of streamside and other needed buffer strips; e. use of positive shutoff and minimal-drift spray valves; f. aerial application of forest chemicals parallel to buffer zones to minimize drift; g. monitoring of water quality or safeguards to ensure proper equipment use and protection of streams, lakes and other water bodies; h. appropriate storage of chemicals; i. filing of required state or provincial reports; and/or j. use of methods to ensure protection of threatened and endangered species.

## **Productivity**

### ***Guidelines for Agriculture***

- Biofuel operations shall implement practices that seek to reverse soil degradation and/or maintain soil health (or soil productivity, soil organic matter).
- A soil management plan shall be implemented that includes practices that prevent or reverse degradation over the long term
- Periodic sampling of soil on the feedstock production site shall be performed to evaluate the effect of implemented practices on the organic matter content. Where such practices are not maintaining soil organic matter at the optimal level, alternative practices shall be investigated.
- Small-scale operators shall implement practices aiming to maintain or enhance soil organic matter on the feedstock production site.
- The soil management plan shall include practices that seek to maintain the level of organic matter deemed optimal to the local system for sustained productivity and ecological services, taking into account crop specificities as well as local economic, climatic, geologic and ecologic conditions. Realistic targets shall be set in accordance with the producers' capacities, the context of production, the feedstock in use and on a reasonable timeline.
- Knowledge of techniques to maintain soil quality (physical, chemical and biological) is demonstrated and these techniques are implemented.
- Long-term fertility depends on maintaining the structure, organic matter content, nutrient status and microbiological health of the soil. Managers should ensure that best agricultural practice is followed. Nutrient efficiency must take account of the age of plantations and soil conditions.
- Program Participant establishes comprehensive management planning and implementation of practices to improve soil function and productivity.

***Guidelines for Forest***

- Provide for regeneration after harvest
- Maintain the productive capacity of the forest land base
- Protect and maintain long-term forest and soil productivity carbon storage, and conservation of forest resources through prompt reforestation, soil conservation, afforestation and other measures
- Protect forests from economically or environmentally undesirable levels of wildfire, pests, diseases, invasive exotic plants and animals and other damaging agents
- Designation of all harvest areas for either natural regeneration or by planting
- Reforestation, unless delayed for site-specific environmental or forest health considerations or legal requirements, through planting within two years or two planting seasons, or by planned natural regeneration methods within five years
- Clear criteria to judge adequate regeneration and appropriate actions to correct understocked areas and achieve acceptable species composition and stocking rates for both planting and natural regeneration
- Minimized plantings of exotic tree species, and research documentation that exotic tree species, planted operationally, pose minimal risk
- Protection of desirable or planned advanced natural regeneration during harvest
- Planting programs that consider potential ecological impacts of a different species or species mix from that which was harvested
- Afforestation programs that consider potential ecological impacts of the selection and planting of tree species in non-forested landscapes
- Implementation of forest management practices to protect and maintain forest and soil productivity
- Post-harvest conditions conducive to maintaining site productivity (e.g. limited rutting, retained down woody debris, minimized skid trails)
- Retention of vigorous trees during partial harvesting, consistent with scientific silvicultural standards for the area
- Criteria that address harvesting and site preparation to protect soil productivity

## **Crop Expansion**

- To prevent expansion or development into areas of critical biodiversity
- Expansion of cultivation is responsible
- National definitions of High Conservation Value Area (HCVA) to take precedence over international where both exist. In the absence of national HCVA maps or data base, credible documentary evidence required that no HCVA converted after 1 Jan 2008
- Also includes soils with a large risk of significant soil stored carbon such as peat lands, mangroves, wetlands and certain grasslands
- After May 2009 expansion for cultivation has not taken place on land cleared of native habitat with exceptions
- Any area already cleared for agriculture or pasture before May 2009 and used for agriculture or pasture within the past 12 years can be used for crop expansion, unless regenerated vegetation has reached the definition of native forest
- There is no expansion in native forests
- In areas that are not native forest, expansion into native habitat only occurs according to one of the following two options: Option 1. Official land-use maps such as ecological-economic zoning are used and expansion only occurs in areas designated for expansion by the zoning. If there are no official land use maps then maps produced by the government under the Convention on Biological Diversity (CBD) are used, and expansion only occurs outside priority areas for conservation shown on these maps. Option 2. An High Conservation Value Area (HCVA) assessment is undertaken prior to clearing and there is no conversion of High Conservation Value Areas.
- There is no conversion of land where there is an unresolved land use claim by traditional land users under litigation, without the agreement of both parties