Sugarcane Production and the Environment

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Better Sugar Meeting, June 21

WWF and Agricultural Commodities

- The goal—reduce measurably the most significant social and environment impacts of commodities with the most significant impacts
- Identify both on-farm and ecoregion or large-scale impacts
- Focus on the 5-10 most significant environmental and social impacts, not laundry lists
- Identify a range of better management practices (BMPs) for different scale producers
- Analyze the costs associated with the different BMPs—most pay for themselves in 2-3 years
- Through a multi-stakeholder, transparent process agree on the most significant impacts as well as acceptable, measurable standards

Commodities and the Private Sector

- Measurable standards achieved by BMPs can be used as screens for investors, buyers or insurers to make commodity production more sustainable
- The private sector needs to be engaged/involved in the identification and analysis of impacts and standards, but not do it by themselves
- Similarly, government can benefit from BMPs by using them as the basis of regulations, permits and licenses
- But governments are limited by what is possible politically
- “Better” will never be more than “good” and the focus will be on prescription (do this don’t do that)

Why Sugar?

- 103 countries produce sugarcane
  15 countries devote 25% or more of their land to sugar
  Globally the area planted has more than doubled since 1960
  Sugar is the first or second most valuable export for 13 countries
- Per hectare yields have only increased 30% since 1960
- Production does not vary dramatically globally—implying similar production efficiencies
- Sugar is produced in former wetlands and other fragile ecosystems because until many crops it will grow there
- Subsidies have discouraged innovation in sugar production so gains in efficiency could be considerable
- 1,500-3,000 liters of water to produce 1 kg of sugar

The Main Environmental Impacts of Producing Sugar from Cane

- Habitat loss, cumulative impacts and impacts on biodiversity
- Excessive water consumption in cultivation
- Soil erosion, declining soil health and fertility
- Agrochemical use
- Water pollution
- Sugarcane processing
- Farming marginal lands
- Global sugar trends with environmental implications

Habitat Conversion

- Historical clearing of a wide range of unique habitats for sugarcane cultivation is probably one of the most significant causes of biodiversity loss from agriculture on the planet.
- Production is possible where other crops don’t do well.
- Production expanded and contracted historically depending on price and competitiveness.
- This is important because the “marginal” areas affected are high in biodiversity and provide valuable ecosystem services. These fragments are key to rehabilitation.
- Habitat conversion continues (e.g. wetlands, riparian areas, areas of slope).

Water Issues Associated with Sugarcane Production

- Over exploitation of water resources

  Diversion from rivers, in extreme cases exposing dry riverbeds

  Excessive use of groundwater, particularly where pumping is cheap, exceeds groundwater recharge

  Cumulative impacts of water use with expanded production
- Waterlogging of soils resulting from poor drainage or inefficient use of water
- Salinization of soils
- Water storage and infrastructure development (e.g. dams, canals, etc.)

Improved Irrigation Systems

- The goal of increased efficiency—more crop per drop
- Technology (general improvement from furrow to sprinkler to surface drip and finally to subsurface drip)
- Management also key to increased water use efficiency

  Alternate furrow irrigation (30%), narrow “v” shape (45%), shorter furrows (42%)

  The whole is greater than the sum of the parts—combination of management approaches (e.g. shorter furrows & mulching) is better.
- Lack of information inhibits more efficient water use
- Lack of financing inhibits adoption of BMPs
- Lack of proper water pricing discourages efficiency

Burning sugar fields reduces organic matter, increases input use and reduces production

Center-pivot irrigation system is more water efficient than the alternatives, but it requires 50% less water if the fields are not burned.

Soil Erosion, Health and Fertility

- Primary tillage—on average every 4 years—causes erosion, reduces water retention, exposes soil to the elements, and turns soil communities on their heads
- The impact of conventional sugarcane production on soil in the tropics is better than annual crops but not sustainable (erosion estimates range from 15 to 505 MT/ha/year depending on the slope)
- Bare/clean cultivation and cultivation on slopes and in riparian areas increases erosion and reduces soil health
- Soil erosion results in the need for soil amendments
- Burning removes organic matter and increases input use (especially in tropics where organic matter 0.5 to 4%)

“Clean” sugarcane production:

- **increases agrochemical input use**
- **reduces production and**
- **employs *less* labor than other systems**

Sugarcane growing on productive land and marginal land in South Africa

Slippage and soil erosion in this sugarcane field in South Africa occurred because the fields were not terraced and there was no buffer zone around the natural water course.

Terraces in South Africa reduce water loss and soil erosion

Agrochemical Use and Impacts

- Agrochemicals used—insecticides, herbicides, fungicides, nematocides, fertilizers, ripeners
- Accumulation of agrochemicals changes competition and composition of soil organisms (whether by pesticides or fertilizer) and chemical composition (e.g. acidification)
- Non-target impacts on biodiversity—in the field and in adjacent areas due to spray drift and runoff.
- Spillage of agrochemicals into the environment

Effluents and Aquatic Ecosystems

- Contamination of surface and groundwater by nutrients and pesticides poses human health risks as well as risks to biodiversity
- Sedimentation affects hydrology, freshwater stream flow, light penetration, and spawning grounds
- In marine areas, silt can clog mangroves and suffocate coral reefs and seagrass beds
- Pesticide contamination of freshwater and marine ecosystems can result in bioaccumulation in a wide range of trophic levels (e.g. Meso-American Reef)
- Cumulative runoff impacts from even small amounts of pesticides, nutrients and soil erosion are pronounced in bottleneck freshwater and marine environments

Mill and Processing Implications

- Wastewater

  Up to 10 cubic meters of water just to wash 1 MT of cane

  Water from the boiler house used to concentrate the sugar

  Water from cleaning all the equipment

- Emissions

  Flue gases

  Soot, ash, and other solid substances

  Ammonia is released during the concentration process

- Solid waste

  plant matter and sludge are released into rivers and can cause massive fish kills

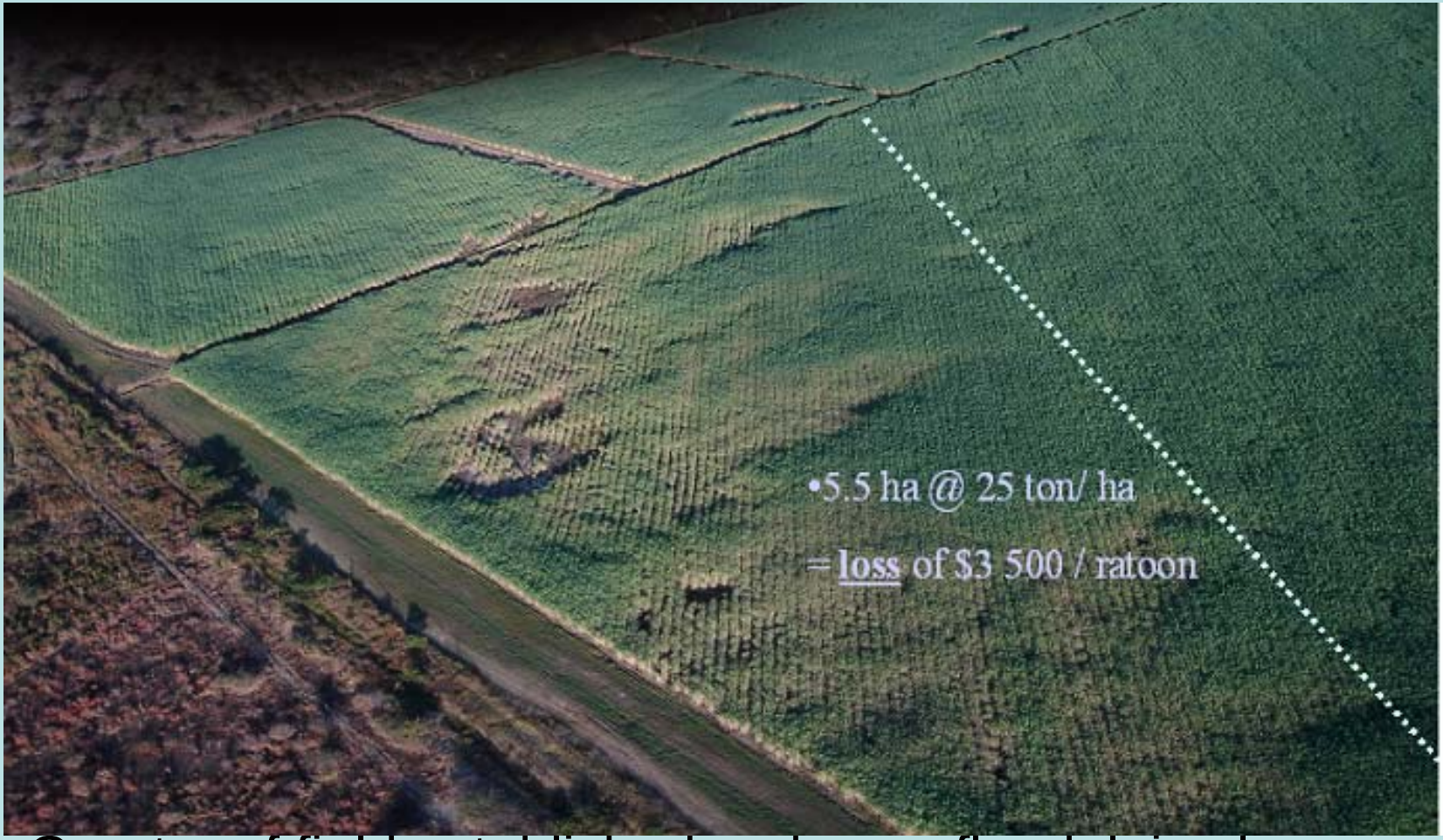
Water Issues Associated with Sugarcane Processing

- Cane can require from 3-10 m3 of washing water for every ton of cane
- Excessive use because water is free
- But, the more water used, the more energy is needed to refine sugar
- As water becomes more expensive, use will decrease
- Water already being recycled in mills

Sugarcane Production on Marginal Land

- Marginal agricultural lands are important because they have higher biodiversity and ecosystem values than more productive agricultural land
- Furthermore, most agricultural producers loose money farming marginal land
- Most farmers with at least 10 ha of land could stop farming 5-15% of the most marginal and produce more on what's left
- Furthermore, they would reduce input use (e.g. fertilizer, pesticides, labor) and effluents

- Half of irrigation pivot on heavy floodplain clay causing extensive water-logging and salinity
- Production cost are greater that returns (-$ 270/ ha in 2nd ratoon)



- Quarter of field established on heavy floodplain clay, resulting in extensive water-logging and salinity
- Production cost > returns (-$600/ha in 4th ratoon)

Trends with likely Environmental Implications

- Liberalization of sugar subsidies globally and specifically the WTO case regarding EU production and exports
- Oil prices and the increased production of ethanol
- Biofuels and bioenergy production increases from sugar, especially electricity for sale on the grid
- Countries that loose preferential trade status will cut corners to compete (e.g. Caribbean, much of Africa)
- Countries that are low cost producers will expand production into more marginal areas (e.g. Brazil)
- GM sugar
- Growing global trend of using smallholders and contract farmers to supply cane to the mills (e.g. direct on-farm impacts and product quality requirements—clean cane)