“Climate change and agriculture in Africa: the nexus and situation”.

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DEVELOPMENT FIRST

1/ Meet the fundamental needs of everybody today and tomorrow

2/ Adapt to climate change in particular in agriculture

3/ Mitigate climate change

+ in 2050

DAILY DIET
HOUSING
HEALTH
EDUCATION
CULTURE
MOBILITY
etc.
From the sun and mines up to final services

At each of the 3 stages different optimization criteria
1/ In Africa increase mineral input to increase yields and to adapt to climate change

2/ Irrigate when insufficient or irregular rainfall

3/ Improved seeds
First increase land use efficiency fairly easy in Sub Saharan Africa

1. Unchanged yields e.g. Sub Saharan Africa
2. Decreasing yields e.g. Sub Saharan Africa
3. Increased yield e.g. Europe, Asia etc.
Maize yield t/ha

In Europe
almost no change

With
+ 50 kg
fertilizer per ha

In Sub-Saharan Africa large increase

Present average annual maize yield ~ 1.25t/ha
With a climate change impact decreasing average yield by 20%

1. Unchanged yields e.g. Sub Saharan Africa
   + better and more resilient plant material
   Than here

2. Decreasing yields e.g. Sub Saharan Africa

3. Increased yield e.g. Europe
   Better here

Baseline

Beginning of change in yield
2/ Also irrigate if insufficient or irregular rainfall
Increase conversion efficiencies (energy, material, and vegetable matter)

At STAGE II

Optimize Output / Input

1. Reduce average post harvest loss
2. Increase livestock conversion efficiencies
3. Increase vegetable oil extraction efficiency
4. Convert natural gas into urea etc.
5. Promote dams for irrigation & hydro electricity
Policies and measures for more sustainable development

At STAGE III

IIIa Combination of products & bioproducts

IIIb Infrastructure & land management

IIIc Scenarios

Optimize

Foodstuff
Buildings
Infrastructures
Transportation
Energy
Etc.

DAILY DIET
HOUSING
HEALTH
EDUCATION
CULTURE
MOBILITY
Etc...
Policies and measures for more sustainable development

INCREASE FOOD PRODUCTION at stage I and II

DEVELOP INFRASTRUCTURES Road, electricity, irrigation networks

MANAGE LAND for food, raw material, bioenergy & to generate income. Use efficiently natural resources: land, water and energy from hydro, biomass and fossil fuel

Assess different scenarios for development (impact of climate change, socio economic sustainability etc.).

At STAGE III

Optimize

IIIa Combination of products & bioproducts

IIIb Infrastructure & land management

IIIc Scenarios

Foodstuff
Buildings
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Etc.

DAILY DIET
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etc...
Transportation Network & Market Connexion of Agriculture in West Africa
To sell products and to supply cities

Co-evolution of Road Network and Market Connexions
Also with higher yields less GHG & less land use change or more land for other crops

**GHG/ha/year of cropland**

- No fertilizer: ~2.8 t CO₂eq
- With fertilizer: ~2.4 t CO₂eq

**Increasing yields versus land**

- 1 ha of avoided land use change

**Avoided land use change**

- Carbon stock preservation due to avoided land use change
- Annual "Avoided decrease of harvestable phytomass" outside of the cropland considered
- 1 to 4 toe/ha/year
- => avoided emissions
- 3.5 to 14 tCO₂eq/ha/year
- @200 tCO₂* (½ forests & ½ grassland)
With crop production you are to consider the whole landscape

**GHG/ha/year of cropland**

<table>
<thead>
<tr>
<th>No fertilizer</th>
<th>With fertilizer</th>
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<tbody>
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<td>~ 2.8 t CO₂eq</td>
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</table>

1.4 t CO₂ eq
1.4 t CO₂ eq

**Cropland**

Avoided land use change

~ 2.4 t CO₂ eq

**Not only local fields**
But at the whole planet

Where is it technically possible to produce easily on additional unit of food without land use change?
But the whole planet

Where is it technically possible to produce an additional unit of food without land use change?
Policy recommendations

1. In each country promote policies and measures to increase effectively "land use efficiency", (e.g. 50 kg of fertilizer per ha by 2015, as recommended by NEPAD already in 2006 & irrigation).
   - to increase food security
   - to adapt to climate change
   - and for mitigation of CC by reducing land use change

2. In International negotiations, (e.g. at Durban), highlight that for Africa the highest priority should be given to increasing "land use efficiency" (with co-subsidizing, inter alia, by industrialized countries)

3. Assess, Experiment & Promote replication of success stories, in policies and measures to increase land use and conversion efficiencies, resilience, and to diversify crops, including for bioenergy
Implementation recommendations

1. **Set up an effective funding mechanism, to actually increase fertilizer and other input**

2. **In each country, or region, with national entities, (faculties, research centres, extension services etc.. )** assess effects of increasing fertilizer input and other actions on (1) average crop production (2) avoided GHG emission, and/or on (3) additional land becoming available for other crops.

3. **Calculate cost and benefits for farmers and countries of different options increasing “land use and conversion efficiencies”, & how much money could be generated annually (with 10 € ton of avoided CO$_2$e)**

**ACPC should assist countries in these tasks**
Thank you

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