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NCCR Trade
Virtual Water Trade

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Outline

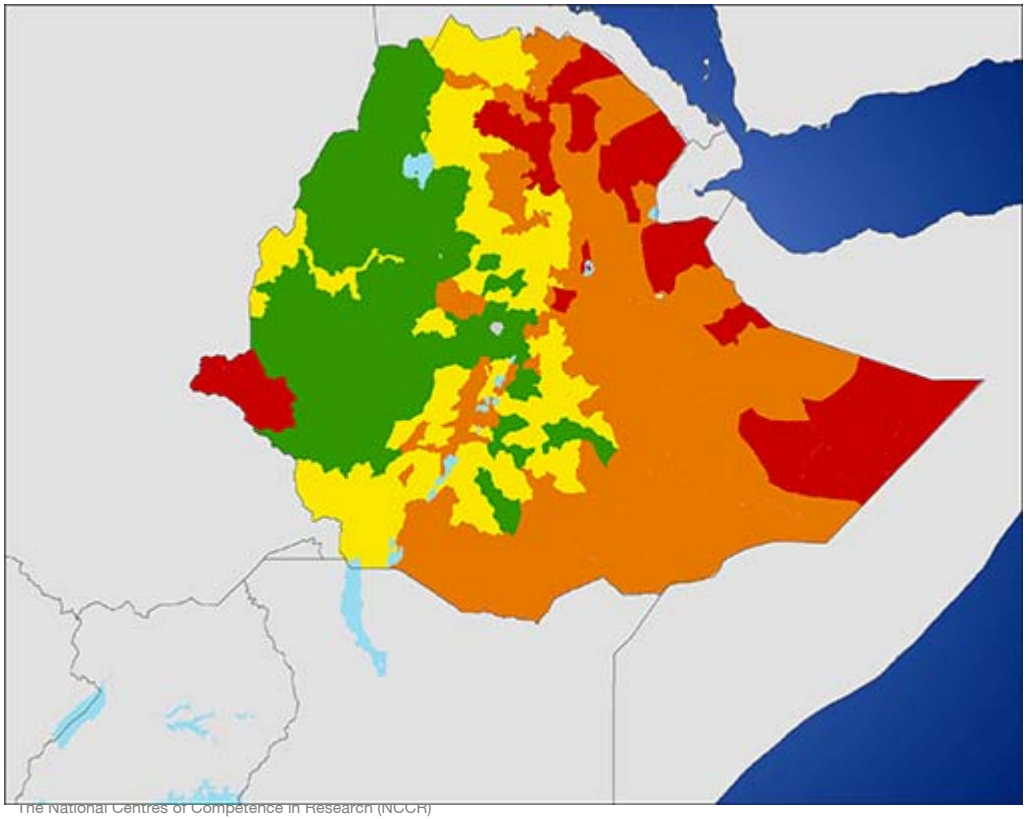
- Context
- Case study: Ethiopia
- Virtual water trade and food security
- International trade
- Role of China
- FDI in biofuels
- Methodology
- Policy relevance

Context

- Global ‘food crisis’ of 2008
- Number of undernourished people has increased by 100 million – exceeding 1 billion in total
- Growing population pressure in sub-Saharan Africa: from 750 million to 1.5 billion by 2050
- Climate change: crop yields are likely to decrease by up to 30 per cent
- Prices of food commodities will rise
- Volumes of trade are likely to grow - between regions located in higher latitudes and those located in low latitudes and dry agro-ecologies
- Volatile trade volumes due to extreme events - periodic shortfalls in supply

Case Study: Ethiopia

- Recent achievements have been wiped out, due to the food crisis and successive seasons of drought
- 5 million Ethiopians urgently need emergency food relief



Source: USAID

Case Study: Ethiopia

- Chronic food insecurity is strongly connected to high vulnerability to water scarcity
- 3 per cent of its arable land is irrigated, agricultural activities depend on erratic rainfall

Globalisation of agriculture

- Growing volumes of international trade
- Foreign direct investment (FDI)
- Surge in demand for crops suitable for biofuels production
- The changes of consumption patterns in densely populated emerging economies
- Emerging role of China as a major trading partner

Ethiopia: Exports – Imports

- 1998 - 2008, agricultural imports grew 15-fold, from US$ 90 million to US$ 1,330 million
- Exports rose from US$ 500 million to US$ 1,320 million
- Coffee is still the most significant export commodity
- Share in total export revenues has declined from 80 per cent to 40 per cent
- Export diversification towards other secondary products such as oilseed crops, cut flowers and vegetables

Exports – Imports

Export Commodities	Share (%)
1. Coffee	42.1
2. Oil seeds	18.9
3. Cut flowers	7.9
4. Fresh vegetables	6.3
Group total	**75.2**

Import Commodities	Share (%)
1. Wheat	35.4
2 .Palm oil	15.4
3. Coffee	6.5
4. Grain sorghum	6.4
5. Raw sugar	4.2
Group total	**67.8**

China's role in Africa

- Transition in dietary patterns towards secondary commodities (i.e. animal products, oils and fats) has stimulated China's engagement in the agricultural sector
- Allows China to externalize parts of its environmental footprint on its trading partners while removing some of the pressure from its strained domestic resources
- Between 2001 and 2008, Chinese imports of oilseed crops from Ethiopia increased from 0 to US$ 60 million
- China is the biggest importer of Ethiopian oilseeds
- Research study will look at the "water footprint" of Ethiopia's oilseed exports to China

Biofuels and water 'grabbing'?

- Global demand for energy, high prices of oil, compulsory targets have led to a surge in demand for biofuels
- Inflated international prices of agricultural commodities
- Encouraged private and public investors to initiate large-scale FDI projects in sub-Saharan Africa: 'land and water grabbing' ?
- European companies producing significant quantities of biofuels in the western and southeastern regions of Ethiopia
- New investment plan for jatropha production over 500,000 hectares of land
- Does biofuels production necessarily displace food production and lead to overuse of water?
- Water footprint of maize and jatropha

Methodology and Fieldwork

- Empirical estimation of the virtual water component of 10 selected crops – coffee, oil seeds, cut flowers, fresh vegetables, wheat, palm oil, sorghum, sugar, maize and jatropha
- Create a new database combining data on local crop and farming practices with the most up-to-date data on climate and trade
- FAO-CROPWAT- estimation of virtual water components – water requirement from planting to harvest
- Evapotranspiration (ETo) values and actual water requirements will be calculated for each crop by factoring in local climate, crop, farming practices and soil data
- There has as yet been no empirical study, based on hard data collected from the field in Ethiopia

Field Study

- Climate data is needed to calculate the reference evapotranspiration (ETo)

  Time series - FAO's CLIMWAT 2.0 database

  (100 stations across Ethiopia- 1971–2000)
- Data on actual crop physiology and farming practices
- Calculate Crop Coefficient - integrates the effect of characteristics that distinguish a specific crop from the base crop used for the reference evapotranspiration
- Local information on plant physiology (rooting depth, plant height etc.) and the timing of the relevant farming practices (planting date, harvest date etc.)
- Soil characteristics, soil moisture and rain infiltration rate

Virtual Water

- CROPWAT - output on water requirements for each crop
- Divided by yields observed in the selected fields of production
- Virtual water flow - the volume of trade multiplied by its water requirement: exports (e.g. coffee, oil seeds, cut flowers) - negative imports (e.g. wheat, palm oil and sugar): positive
- Negative water flow arising from exports of oilcrops to China
- Water requirements of biofuels crops (ethanol and jatropha)
- Map out the virtual water trade profiles of regions suffering from water scarcity-driven food insecurity
- Estimate how much of each of the food crops could be produced with the virtual water exported
- Weighted against the export revenues which could be used to import virtual water through imports of food crops

Relevance

- Growing population vs. sustainability of water
- Water is increasingly the most important limiting factor in agriculture - additional competing demands for food, energy, health, and ecosystem services
- Climate change will make the task of achieving sustainable use of water even more difficult
- The role of international trade in climate change adaptation in sub-Saharan Africa