7. Assessment of Potential for Improving Agricultural Water Management in sub-Saharan Africa (IWMI)

BACKGROUND AND JUSTIFICATION

Agriculture at present is the main livelihood of more than 80 percent of the poor people in sub-Saharan Africa. Agriculture, in the foreseeable future will also expect to play a major role in alleviating poverty and increasing food security of the rural poor. However, the responses to questions like how much water is required and what type of investments are required for meeting increasing needs of agriculture, domestic, industrial and environmental sectors in sub-Saharan Africa are still not clear. Rapidly increasing population in the region requires thorough assessment of the potential of the region to meet its food security under various water supply and demand scenarios.

OBJECTIVES AND SCOPE

The primary objective of this component is to study the alternative options for alleviating poverty and contributing to food and water security for the sub-Saharan African countries. Specifically the following concerns and opportunities will be examined through simulation exercises using the integrated global water-food model being developed by IWMI and IFPRI:

- The potential contribution of rainfed agriculture in the food supply and water demand equation;
- The options of regional and international trade and their impact on food security poverty alleviation in sub-Saharan Africa region; and
- Implications on water and food policies, prices and also options of investments under different water supply and demand scenarios.

METHODOLOGY AND ACTIVITIES

The global model on water and food accounting-WATERSIM (Water, Agriculture, Technology Environment and Resources Simulation Model) being developed by IWMI and IFPRI will be used for addressing the specific objectives of the study. WATERSIM, covers 111 economic regions and 125 river basins of the world. of which 40 economic regions and 18 river basins cover the SSA region.

The food demand of 16 commodities for the economic regions is estimated as a function of population, per capita consumption and prices of a commodity and the prices of competing commodities. The crop production under rainfed and irrigation conditions and the livestock production for each region is also estimated. The production function (including yield and area functions) for each crop is expressed as a function of a combination of variables from crop prices, inputs prices, labour, technology, irrigation water, water availability, investments, climate, potential yield etc. Local commodity prices are determined by the world market prices and the assumption of market clearance at global level.

Water demands for the irrigation, domestic, industrial sectors, livestock and the environment are estimated at river basin scale. The irrigation requirement of a river basin is the aggregate of the irrigation demands of food production units which fall in a river basin. The choice of technology, management variables, efficiencies are part of the assessment of water demand. The water supply for each river basin is expressed as a function of climate, hydrology, existing infrastructure, water related investments.

International trade connects food production regions. International and the regional prices of commodities are determined by balancing the global production and demand. The regional prices are then fed back into the demand functions which affect the food and water demand.
The model will be used to develop alternative water and food supply and demand scenarios with specific policy options related to sub-Saharan Africa. The alternative scenarios will specifically look at the available options including investments in irrigated and rainfed agriculture, trade (regional and international) for food security and poverty alleviation in the sub-Saharan African countries.

SYNERGIES

This component has very clear linkages to several of the other components of the Collaborative Program, particularly the regional demand, health and environment, private sector participation, and planning and implementation studies. First, the baseline data and projections for food demand and supply for key crops in the region generated in the demand study will provide both data for calibration and validation of the model and, more importantly, guidance on relevant food and water options and policy experiments. In turn, results of the policy simulations on water and food interactions that will be carried out in the assessment of potential component taking into account physical conditions of basins, water supply and uses, prices, trade, and food consumption and production, will guide water development and management planning in national governments as well as among donors. The study will provide indicative impacts of specific types of investment and help identify those that are most promising and will lead to the most desired impacts. This component will be an "eye opener" for planning and implementation on the need for proper understanding, appreciation, and use of macroeconomic models (which go beyond purely engineering ones) for better and improved planning of projects in the context of an entire nation and the world economy.

The results of this exercise will also provide guidance regarding private sector participation and investments in water in agriculture just as indicative impacts of (potential) private sector contributions can be determined or simulated in this study. In addition, the model being developed in this study will already take into account the potential contribution and impact of a rapidly growing livestock sector on food and water requirements. The health and environmental impacts of water investments can also be captured and experiments conducted to determine policy options that will minimize adverse impacts and maximize expected benefits in terms of growth in production and incomes brought about by new investments. On the poverty study link, the model may also be able to contribute in terms of indicating directions of impact of specific investments on incomes and prices affecting the poor.

In terms of synergies with other on-going research projects at IWMI, this component will reinforce the findings of the IWMI-PODIUM project and will find good use for the data and information that will be generated in the global irrigated area mapping project.

OUTPUTS

This component will provide three alternative future scenarios of water supply and demand for SSA and their policy implications for different countries:

1. 'Business as usual' scenario, where present trends of investment in water-related development continue into the future;
2. More irrigation investment scenario, where increased investment than at present is expected; and

3. A scenario of more rainfed yield and more trade between regions within SSA or more trade with regions outside the SSA.

All scenarios will give estimates of additional water requirements and the type of investments required for river basins or for economic regions. The policy implications of new investment scenarios for the different countries will be discussed. With additional funds, policy development workshops with WaterSim as a key tool can be held to develop scenarios and analyze their implications.