5th World Water Forum

Theme 2. Advancing Human Development and the Millennium Development Goals (MDG)

Topic 2.3. Water and Food for ending poverty and hunger

TOPIC REPORT

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on behalf of the

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EXECUTIVE SUMMARY

The main theme of the 5th World Water Forum (WWF5) is *Bridging Divides for Water*. This time a set-up of the program is chosen, consisting of six Themes and under each Theme about four topics. Theme 2 concerns: *Advancing Human Development and the Millennium Development Goals (MDG).* Under this Theme there are four Topics. One of these topics is Topic 2.3: *Water and Food for Ending Poverty and Hunger.*

For each Theme and each Topic one or two coordinators have been identified to take care for the preparation and organisation of the sessions to be held during WWF5 in close cooperation with the World Water Council (WWC) and the host organiser Turkey. The coordinator for Theme 2 is UN-Water/FAO. Coordinator for Topic 2.3 is the International Commission on Irrigation and Drainage (ICID). For each Theme and each Topic a Consortium has been established of key interested parties, based upon their interest in and/or relevance to the Theme or the Topic. These consortia are expected to prepare the Topic Report and the sessions on the Theme or the Topic and play an active role in the conduct of the sessions during WWF5.

This Topic Report of Topic 2.3 has been prepared in several steps and got its present shape after two Consortium meetings and various intermediate rounds of revisions and comments received from the Consortium and Consultation Partners, as well especially through the virtual meeting space (VMS) platform that has been established for the 5th World Water Forum. It will be the basis for the presentations and discussions on Topic 2.3 during the 5th World Water Forum. Based on this report and the presentations and discussions during the Forum a Draft Synthesis Report will be prepared that will be circulated to the organisers, the Consortium Partners and the Consultation Partners for comments. Thereafter it will be submitted in its final format and publicised.

The following key questions for have been formulated for Topic 2.3:

- *Key question I.* How to achieve the required food production to meet the growing demand?
- *Key question II.* How can food market measures boost rural development and poverty alleviation?
- *Key question III.* Water for bioenergy or food?
- *Key question IV.* How can better water management reduce poverty and hunger? A synthesis.

During the Forum a session will be organised regarding each key question. Details on the sessions are shown in the Session Situation Document that is based on this Topic Report.

The key issues on each of the key questions can be summarised as follows.

Key issues of key question I. *How to achieve the required food production to meet the growing demand?*

- how to bridge between agricultural and water policies to avoid both global and local food crises?
- how can institutional and technical water management improvements contribute to the required increase in food production?
- what types of investments are necessary to develop additional water resources including non conventional and to modernize existing irrigation and drainage schemes to improve water productivity?
- how can rainfed agriculture contribute more effectively, while maintaining irrigated agriculture, to enhance food security and improve livelihoods in rural areas?
- what policies and actions are needed to ensure the sustainability of water resources and the river basin services that underpin the increases in agricultural productivity that must be achieved?

Key issues of key question II. *How can food market measures boost rural development and poverty alleviation?*

- how can poor farmers benefit from market opportunities and how to improve the marketing chain?
- how can local markets be strengthened e.g. by capacity building and farmer empowerment (including micro-financing) consistent with trade?
- how can new agricultural market opportunities help in financing improved water productivity and services?

Key issues of key question III. *Water for bioenergy or food?*

- how can rural communities benefit from bioenergy crops?
- how to avoid conflict with food production by considering reversible crops from non-food to food production, and using marginal water and land?
- how to develop farming practices compatible with nature balance, increasing the resilience of rural poor and ecosystems on which they depend?
- what may be the implications of bio-fuels policies and trends for the water resources, availability and allocation among uses (including by ecosystems) and thus on ecosystems and livelihoods?

Key issues of key question IV. *How can better water management reduce poverty and hunger? A synthesis.*

- how to reconcile agricultural and water policies to avoid both global and local food crises?
- how can institutional and technical water management improvements and investments contribute to increase the food production?
- how can scientific findings more effectively be transferred to practical technologies, especially supporting the poor farmers?
- how can poor farmers benefit from market opportunities?
- how can local developments benefit from bioenergy?

The context and more detailed information on each of the key questions is shown in this Topic Report. Very general recommendations have been formulated. It is the intention that much more specific conclusions and recommendations will be formulated, based on the presentations and conclusions during the Forum sessions. These will be included in the Synthesis Report.

For Topic 2.3 there will be four sessions during the Forum. Session I is the introductory session and is scheduled on Wednesday March 18, 14.30 – 19.00 hour. Sessions II and III are parallel sessions and are both scheduled on Thursday March 19, 8.30 -13.00. Session IV is a plenary session and includes the integration of the previous three sessions. This session is scheduled on Thursday March 19, 14.30 – 16.30. This scheduling implies that for the Sessions I, II and III a duration of four hours has been scheduled and for Session IV two hours.

This Topic Report has been circulated in several draft versions among the Consortium Partners. The document can be downloaded from the web sites of ICID: www.icid.org, and the Forum organisers: www.worldwaterforum5.org, as well as from the VMS platform.

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I Introduction

The main theme of the 5th World Water Forum (WWF5) is *Bridging Divides for Water*. This time a set-up of the program is chosen, consisting of six Themes and under each Theme about four topics. Theme 2 concerns: *Advancing Human Development and the Millennium Development Goals (MDG).* Under this Theme there are four Topics. One of these topics is Topic 2.3: *Water and Food for Ending Poverty and Hunger.*

For each Theme and each Topic one or two coordinators have been identified to take care for the preparation and organisation of the sessions to be held during WWF5 in close cooperation with the World Water Council (WWC) and the host organiser Turkey. The coordinator for Theme 2 is UN-Water/FAO. Coordinator for Topic 2.3 is the International Commission on Irrigation and Drainage (ICID). For each Theme and each Topic a Consortium has been established of key interested parties, based upon their interest in and/or relevance to the Theme or the Topic (Annex I). Among others, these consortia were expected to prepare a Topic Report. In addition there are Consultation Partners (Annex 1).

This Topic Report of Topic 2.3 has been prepared in several steps and got its present shape after two Consortium meetings and various intermediate rounds of revisions and comments received from the Consortium and Consultation Partners, as well especially through the virtual meeting space (VMS) platform that has been established for the 5th World Water Forum. It will be the basis for the presentations and discussions on this topic during the 5th World Water Forum. Based on this report and the presentations and discussions during the Forum a Draft Synthesis Report will be prepared that will be circulated to the organisers, the Consortium Partners and the Consultation Partners for comments. Thereafter it will be submitted in its final format and publicised.

This Topic Report is intended for the organisers, the Consortium Partners, Consultation Partners, and for those interested in Topic 2.3, as well as for the Theme Coordinator and others to record the progress with respect to the development of the Topic. With respect to the four key questions the paper summarizes the key issues and the broader context. The report doesn't contain yet much conclusions and recommendations. These will be presented in the Synthesis Report that will be prepared based on this Topic Report, and on the presentations and discussions during the four forum sessions on this topic as described in the Session Situation Document that is based on this Topic Report. The references that have been used and other interesting references with respect to this topic are shown in Annex II.

II Set up of the 5th World Water Forum

The set up of the programme for the 5th World Water Forum consists of six Themes and under each Theme about four topics. The six Themes are:

- Theme 1: *Global Changes & Risk Management*
- Theme 2: *Advancing Human Development and the Millennium Development Goals (MDG).*
- Theme 3: *Managing and protecting water resources to meet human and environmental needs*
- Theme 4: *Governance and management*
- Theme 5: *Finance*
- Theme 6: *Education, Knowledge and Capacity Building*

Under each Theme there are about four Topics. The Topics under Theme 2 are:

- Topic 2.1: *Ensuring water, sanitation and hygiene for all*
  - *ensuring adequate infrastructure*
  - *protecting public health in the near term*

- Topic 2.2. *Water for energy and energy for water*
- Topic 2.3: *Water and food for ending poverty and hunger.*
- Topic 2.4: *Optimizing multiple uses of water systems e.g. water supply and irrigation*

It has been stressed by the Theme 2 coordinator that *'No matter where the debate goes, the role of the topic coordinator will be to maintain the overall direction towards the MDGs. Such an approach will also help us to stay focused as there is otherwise a risk that the discussions will go thin within each topic. It is very clear from the instructions provided to us that the themes and topics are not expected to cover all aspects of the identified challenges but should rather focus on the most critical aspects'.*

In addition the Theme 2 coordinator has stated: *'We will therefore need to establish a process where we can ensure consistency and co-ordination among the topics and the overall theme. Such a process will ensure that each topic, through the sessions, is addressing the MDGs appropriately and in a way that later will facilitate aggregation at the theme level and the development of some key draft messages'.*

During the Forum 3 to 4 sessions are scheduled for each Topic as well as for the Theme. For Topic 2.3 there will be four sessions. Session I is the introductory session and is scheduled on Wednesday March 18, 14.30 – 19.00 hour. Sessions II and III are parallel sessions and are both scheduled on Thursday March 19, 8.30 -13.00. Session IV is a plenary session and includes the integration of the previous three sessions. This session is scheduled on Thursday March 19, 14.30 – 16.30. This scheduling implies that for the Sessions I, II and III a duration of four hours has been scheduled and for Session IV two hours.

III Key issues of Theme 2. Advancing Human Development and the Millennium Development Goals (MDG)

A critical task of Theme 2 is to secure the focus on and linkages to the Millennium Development Goals (MDG) The eight Millennium Development Goals (MDGs) – which range from halving extreme poverty to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015 – form a blueprint agreed to by all the world's countries and the entire world's leading development institutions. They have galvanized unprecedented efforts to meet the needs of the worlds poorest. The most relevant MDGs for Topic 2.3 are:

I. eradicate extreme poverty and hunger;
II. promote gender equity and empower women;
III. ensure environmental sustainability;
IV. develop a global partnership for development.

At Theme level it will have to be checked how the various MDG targets are interlinked, how they are integrated; what are the conflicting goals and what are the resolution mechanisms. A specificity and critical point of Theme 2 is the MDGs and this should underline the discussions in the debate, questions and ultimately some sessions. It should then be ensured that the MDGs are taken on board and be discussed within the specific topic through subtopics, etc. It does not necessarily mean that the partition of questions will have to be revised, but certainly that they have to be geared in a way that they are addressing the following:

- where do we stand;
- what have we learned recently;
- probably more importantly in terms of impacts of WWF5, what should we propose in terms of interventions revision for increasing the effectiveness of water to achieve the MDGs.

'Comprehensiveness is banned at WWF5' in other words the organizers repeatedly said that they don't want a thin comprehensive approach on all water issues aspects, etc., but more a validated set of focus on which we should go deep. That process avoids adding and adding things as it has been done in the

past. Not easy to do because each and every institute partner stakeholder, etc., has its own focus and may want a high share for it, but it will be the role of the Theme and Topic coordinators to map the entire picture and then get an agreement from the consortium to centre WWF5 on a limited number of critical issues on which progresses can be reasonably expected within the time frame left for the WWF5.

IV Key questions of Topic 2.3. Water and food for ending poverty and hunger

The key questions for Topic 2.3 are:

- *Key question I.* How to achieve the required food production to meet the growing demand?
- *Key question II.* How can food market measures boost rural development and poverty alleviation?
- *Key question III.* Water for bioenergy or food?
- *Key question IV.* How can better water management reduce poverty and hunger? A synthesis.

In the next sections the context and outline with respect to each of these key questions will be presented

IV.1 Key Question I. How to achieve the required food production to meet the growing demand?

Context

The importance of the key question can be summarised as formulated underneath:

- globally water is not limiting for agriculture. But heterogeneity prevails and some countries will increasingly face water scarcity. Future needs of water for food are huge and up-to-date water management systems will be required at a large scale (Figure 1). Water management includes the full range of options - from in-field rainwater harvesting to full-scale irrigation;
- external factors, like: impacts of bio-fuel (also called agro-fuel) products, domination of hydropower in reservoir operation, climate changes, virtual water trade, changes in agri market and the price of commodities have a strong influence on the engine of agriculture activities. Such changes will require additional adaptations in the development of water management measures to ensure global food production - duplication in 25 - 30 years - and to reduce the probability of a severe crisis in the coming years (Annex III);
- modernization of agricultural water management (technical, management, financial, environmental) will be required at a large-scale, especially in emerging countries, to achieve the required increase in food production, also in some cases to save water for other uses, and in other cases to save money to develop further the water resource;
- the demand for production cannot be met with the existing structure and anticipated trends in irrigated and rainfed food production, this need to change significantly, at national regional and global levels. The optimal mix of small-scale and large-scale water management systems under prevailing and expected future conditions will have to be identified. Specific efforts are required to prevent miss management of water on the way from the source to the fields.

Outline

Key issues:

- how to bridge between agricultural and water policies to avoid both global and local food crises?
- how can institutional and technical water management improvements contribute to the required increase in food production?
- what types of investments are necessary to develop additional water resources including non conventional and to modernize existing irrigation and drainage schemes to improve water productivity?

- how can rainfed agriculture contribute more effectively, while maintaining irrigated agriculture, to enhance food security and improve livelihoods in rural areas?
- what policies and actions are needed to ensure the sustainability of water resources and the river basin services that underpin the increases in agricultural productivity that must be achieved?

Population growth is expected to take place predominantly in the urban areas in the emerging and least developed countries. Therefore, especially these countries will be confronted with the need to increase their food supply by increasing production in their own territory, maybe in combination with increased imports. Emerging countries face the additional complication that the standard of living is rapidly rising resulting in an increase in consumption per person and a change in diet.

From the point of view of food production there is a common feeling that in the coming decades about 80 - 90% of the required increase will have to be realised on existing cultivated land and about 10 - 20% on newly reclaimed land.

At present 45% of global food production is achieved at 1,100 million ha without any water management system, 40% of the food production is achieved at 275 million ha irrigated land and 15% at 130 million ha rainfed land provided with a drainage system. These figures imply that the largest proportion of agricultural area is without any water management system. In the rainfed areas without a water management system, water harvesting, soil conservation and watershed management may result in some improvements, especially in the livelihood of poor farm families. There is, however, no way that the cultivated area without a water management system can contribute significantly to the required increase in food production (with the additional threat posed due to global climate change). Due to this the share of irrigated and drained areas in food production will have to increase. This can be either achieved by installation of irrigation or drainage systems in areas without a system, improvement or modernisation of existing irrigation and drainage systems, installation of irrigation systems in rainfed areas with a drainage system, or installation of drainage systems in irrigated areas. There is thus a need to consider a series of water management solutions from purely rainfed to large-scale irrigated areas (Figure 1). In addition compensation has to be realised for the loss of agricultural land due to various reasons as for example urbanisation, salinisation and of 11 the million ha that was lost in the territory in the former Soviet block.

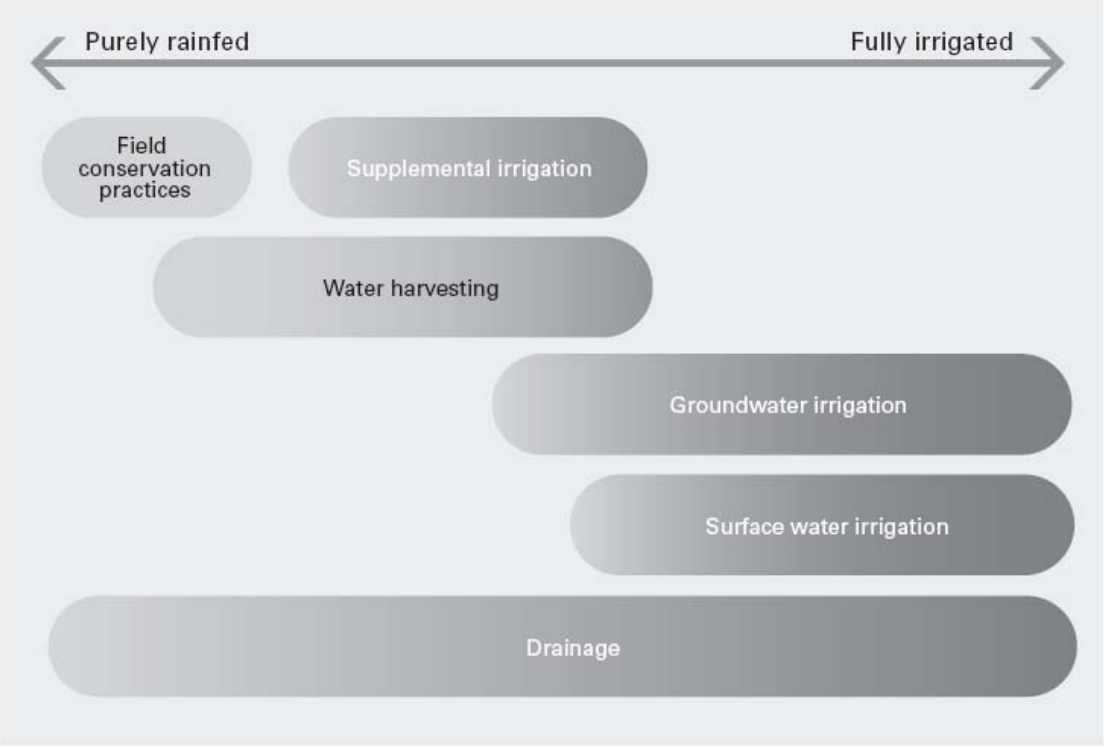

Figure 1. Diverse options for agricultural water management (International Water Management Institute, 2007)

Irrigated agriculture counts for some 70% of total water withdrawals. It will therefore be of importance to continue with the efforts to increase the efficiency of irrigation water use, while ensuring multiple other factors, including environment, related to irrigation. A substantial part of the production in the arid and semi-arid zones is based on the mining of groundwater resources. Pollution of water resources and environmental concerns with respect to application of agro-chemicals may reduce the potential for their use for agriculture.

To maintain food security or food self-sufficiency, many countries in the arid and semi arid zones have reached or are already beyond their water carrying capacity: they use more than the renewable amount. Importing food as an alternative to producing it themselves will alleviate stress on their water resources and make water available for priority and more productive purposes. Financing food imports requires access to world markets which for most of the least developed countries is difficult due to the subsidy and tariff systems of most developed and emerging countries, but also related to quality and food safety standards which are difficult to attain at the stage of development these countries are in.

Most of the poverty exists in rural areas in emerging and least developed countries. Increase in food prices may therefore contribute to reduction of poverty in these rural areas, provided that poor farmers reach such a level of production that they can sell a substantial part of their yield and revenues exceed price increases in the production process. Only with access to markets farmers can invest in improved agricultural practices and post harvest processing activities generating employment.

Another development, as it occurs, for example in countries in the Middle East/North Africa and also in areas in the North China plain where groundwater depletion is occurring, is generally conversion to more precision irrigation in order to supply local or regional/global horticultural markets. Market access is not really a problem for these countries. However, the staple crops continue to be imported and commercial food import bills rise. Whether this involves an adverse balance of trade depends on the market conditions, but whether there is a need for a deliberate policy or not is a moot point. In such cases the more pertinent question is for how long such water scarce countries will be able to continue with irrigation.

At global level roughly 7,000 billion m^3/year of water are required for food production (considering only evapotranspiration of crops and pastures), that is roughly 1,100 m^3/cap/yr of which 1,800 billion m^3 comes from irrigation and the other 5,200 billion m^3 from rainfall. This is the result of plant functioning: plants evaporate water so that they can absorb CO_2. Producing 1 kg of cereals costs from 500 to 1,500 litres of water. Producing oil or meat costs much more (to the total process involved) from 3,000 to 15,000 litres of water per kg produced. Producing 1 kcal requires roughly 1 litre of water. Each person requires a minimum of 2,800 kcal/day i.e. 2,800 litres/day or 1,020 m^3/yr. Increasing the productivity of agricultural water is nevertheless possible and required.
Three main ways are to be considered:

- *integrated water resources management*, from the river basin level to the end users in combination with efficiency improvements in irrigation systems. Increasing hydraulic efficiency of irrigation systems by reducing 'losses', improving the systems, changing of irrigation technologies, improving operation and maintenance. At large scale the potential of saving must be scrutinized considering real and virtual losses at basin level, real loss is water evaporation from bare soil whereas seepage losses from canals might be or not real losses depending on the recycling process of this water further downstream;
- *increasing low yields* (i.e. less than 2 tons/ha) which result in excessive evaporation (be it in irrigated or rainfed systems). If all yields would be above 2 - 3 tons/ha, water use would be reduced by about 1,500 billion m^3 (Figure 2). Increase in water use efficiency is mainly caused by reduction of evaporation from the soil, due to the better cover of the plants and the resulting increased interception;
- *reduction of post harvest crop losses* (only 50% of the production is consumed) and looking after virtual water conservation and storage.

A question is whether an important source of water efficiency increases lies in the improvements in small-scale agriculture (low yields). Better agricultural water management to improve the yields of this type of agriculture is the key, keeping in mind that water is not the only production factor, others being land, fertilisers, reduction of post harvest crop losses, looking after virtual water conservation

and storage, etc. There is an important social dimension in this. Often the pathway to move from low to high yield is through land consolidation, mechanisation, etc. Keeping low yield farming systems might be a social objective to keep small farmers which are securing their food supply through their farming activities in business. It is same even for part time farmers who secure food for the family by practising a loose agriculture, getting income from elsewhere. To really engage into yield improvement - which is also required in light of the change in ratio between rural and urban population at a global scale - farmers have to be dynamic and making their living only out of it (Figure 3). This, however, will put a lot of farmers migrating towards cities.

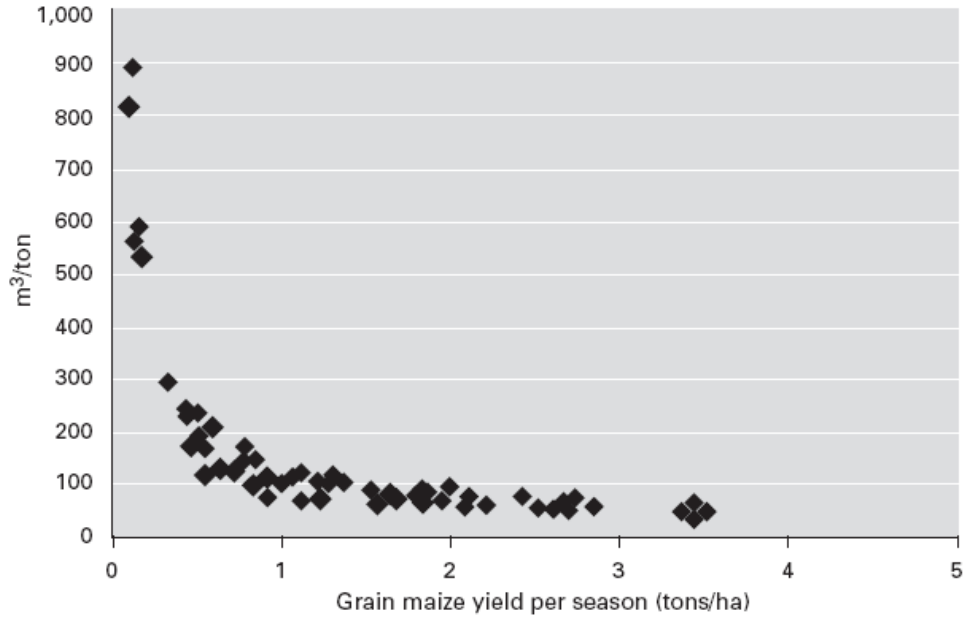

Figure 2. Relation between yield and water use in m^3 per ton of grain for maize (corn).

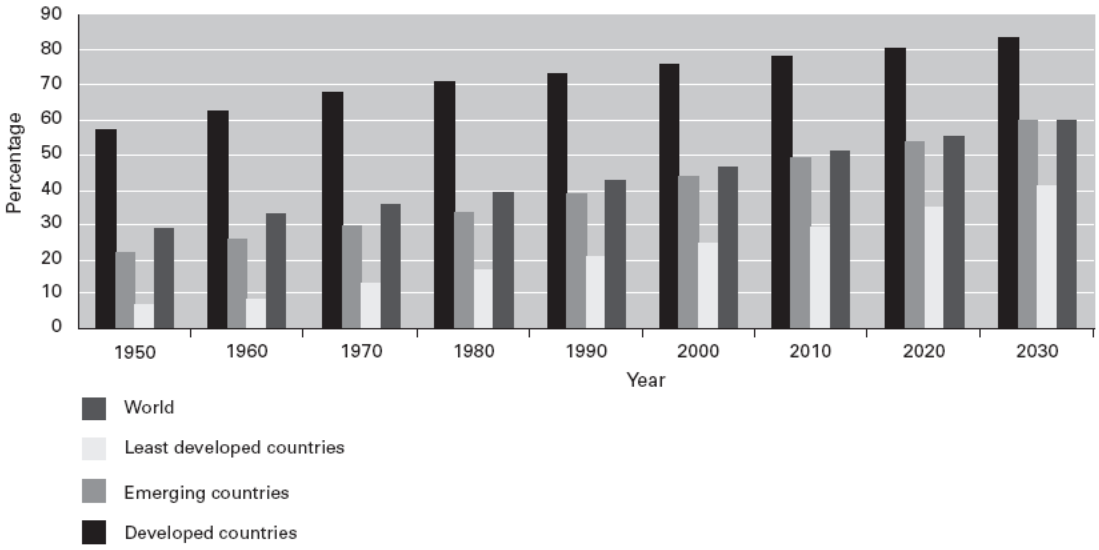

Figure 3. Development of the ratio of the rural and urban population in the different types of countries

The required increase in food production means a range of water for food between 10,000 and 14,000 billion m^3. This depends to a large extent of the capacity of small-scale agriculture to increase productivity (yields and water productivity), of the expansion of irrigated agriculture and of drainage systems in either rainfed or irrigated agriculture areas. Out of the increase of 3,000 to 7,000 km^3 in rainfed areas without a water management system, water harvesting and watershed management may

result in some improvements as well, especially in the livelihood of poor farm families.

At each level of this continuum, the issues of water storage, artificial recharge and efficiency need to be considered depending on the local conditions. Thus a range of potential solutions needs to be developed, keeping in mind in particular the level of development, the capacities of the farmers, market prices and farm costs, including those of water management. Implementation of IWRM would have to be combined with the development of extension services and presentation of innovative practices as part of government assistance to farmers.

Especially in the emerging and least developed countries it will be of importance to analyse how water can be managed more effectively for sustainable agriculture to continue to be a key pathway out of poverty and means to achieve food security, especially for the poor, how will water rights be shaped or threatened by changes in technology, and how will water rights be ensured for the poor, and for small and marginal farmers? Water rights of the farmers need to be guaranteed by governments. This plays for example an important role in irrigated areas where agriculture has to compete with hydropower.

What is being bridged here? Water, Water management, Food

IV.2 Key question II. How can food market measures boost rural development and poverty alleviation?

Context

The importance of the key question can be summarised as formulated underneath:

- most of the poverty exists in rural areas in emerging and least developed countries. Increase in food prices can contribute to reduction of poverty in rural areas in these countries, provided that poor farmers reach such a level of production that they can sell a substantial part of their yield at a feasible price and they retain land and water rights;
- before examining the relation between water and agriculture, it is fundamental to understand the dynamics of agriculture development that are related to population dynamics especially between rural areas and urban areas in emerging countries, and low agricultural productivity in least developed countries. It is also fundamental to understand the processes of agrarian change, and changing access to water and land;
- the demand for production cannot be met with the existing structure and anticipated trends in irrigated and rainfed production. This need to change significantly, at national, regional and global levels. The optimal mix of small-scale and large-scale systems under prevailing and expected future conditions will have to be identified;
- most least developed countries have sufficient resources to be food self sufficient, but local markets are almost inexistent and do not allow a proper local food economy.

Outline

Key issues:

- how can poor farmers benefit from market opportunities and how to improve the marketing chain?
- how can local markets be strengthened e.g. by capacity building and farmer empowerment (including micro-financing) consistent with trade?
- how can new agricultural market opportunities help in financing improved water productivity and services?

Especially in least developed and emerging countries farmers have a specific role in the societies they feed: they are requested to produce food at a price that is affordable in particular to the poorest people living in cities. Through this role they guarantee social stability and as a counterpart, they pay little taxes. This role is very much related to the concept of food-sovereignty; it explains why food prices are not and most probably will never be simply regulated by market rules.

Population dynamics and agriculture development are strongly and in a complex way interrelated. Increases in productivity require (or are the result of) increases of farm size and mechanisation (in addition to increase of inputs). These changes require farmers who are in a development mode and not in a survival mode.

However, in many least developed countries, local markets are almost inexistent, and do not allow farmers to market their products, ranging from staple food to higher value crop products (e.g. vegetables, or fruits). The development of such markets is key to move farmers out of the survival mode, since otherwise people living in urban zones may get imported food products cheaper than local ones. Question remains how different forms of market access and commercialisation may reshape livelihood opportunities for the poorest farmers? In light of this cooperation of farmers may by an importance mechanism to raise their income even up to the small scale ones.

In these conditions, rural exodus is positive if it actually helps those who remain on their farms to develop their production. This is likely to be the case if the migrants are attracted to urban areas where they have alternative job opportunities. It is negative if migrants move to urban areas because they cannot survive anymore or if they are ready to accept the difficulties of slums or shanty towns. A good balance between farmers and poor population migrating to urban areas is therefore a key to development and to food sovereignty.

Interactions between agriculture and natural resources (land, water, ecosystems) also need to be considered, this is especially the case in Asia and in the Near and Middle East where the density of population is the highest. It is also very relevant, as it is expected that, by far, most of the increase in production will have to come from existing cultivated land. This may imply: introduction of or improvement in water management, increase in cropping intensity, increased application of fertilisers and pesticides. Especially the last item may have far reaching implications for the environment and would require strong regulation to prevent very damaging consequences.

What is being bridged here? Water, Food, Markets

IV.3 Key question III. Water for bioenergy or food?

Context

The importance of the key question can be summarised as formulated underneath:

- bio-fuels will provide least developed countries and poor farmers with new opportunities for employment to improve their economy and livelihoods?
- bio-fuels will raise the food prices - the poor will be the first affected?
- bio-fuels are detrimental for the environment?
- bio-fuels production will increase the stress on land and water resources.

Outline

Key issues:

- how can rural communities benefit from bioenergy crops?
- how to avoid conflict with food production by considering reversible crops from non-food to food production, and using marginal water and land?
- how to develop farming practices compatible with nature balance, increasing the resilience of rural poor and ecosystems on which they depend?
- what may be the implications of bio-fuels policies and trends for the water resources, availability and allocation among uses (including by ecosystems) and thus on ecosystems and livelihoods?

Surging fuel prices and the quest to reduce green house gas emissions triggered the interest for development of bio-fuels, which have positive consequences on agriculture prices at farm gates. Consequently, more and more land is converted to production of bio-fuels and more and more water is required to grow these energy crops. Though this provides opportunities for farmers to escape the

poverty trap, this may happen at the cost of food production and environmental integrity. The question of rapid reversibility to food from non-food agriculture production might be critical to set national strategies that deal with bio-fuels production, reduce food self-sufficiency on routine basis while safeguarding potential supply in case of global food supply shocks. Finally the question whether bio-fuels production and dissemination will help in reducing green house gas (GHG) emissions must be discussed seriously.

Bio-fuels are solid, liquid, or gas fuel consisting of, or derived from biomass. They can be produced from any carbon source that can be replenished rapidly e.g. plants. Bio-fuels reduce up to 60 - 80% of carbon emission as opposed to using fossil fuels such as petroleum and diesel. Bio-fuels are used globally with the most common use in automotive transport. Bio-fuel industries are expanding in Europe, Asia and the Americas.

Sugarcane is the most important crop for producing bio-fuels today and the feedstock for more than 40% of all fuel ethanol. Maize (corn) ranks a close second: the primary source for bio-fuels production in the USA, it supplies nearly the same share of world fuel ethanol as sugarcane.

Bio-diesel, produced mainly from rapeseed or sunflower seed, comprises 80% of Europe's total bio-fuels production. The EU accounted for nearly 89% of all bio-diesel production worldwide in 2005. Germany produced 1.9 billion litres, or more than half the world total.

In 2005, Brazil produced 16.5 billion litres of fuel ethanol (45.2% of the world's total) with the USA a close second at 16.2 billion litres, or 44.5% of the total. Ethanol provides roughly 40% of Brazil's non-diesel fuel and 2 - 3% of USA non-diesel fuel. The growth is rapid: in 2008 Brazil produced 27 billion litres and USA 38 billion litres of ethanol.

Brazil plans to expand also production of bio-diesel increasing to 5% by 2013. Colombia mandates the use of 10% ethanol in all gasoline sold in cities with populations exceeding 500,000. In Venezuela, the state oil company is supporting the construction of 15 sugarcane distilleries over the next five years, as the government introduces an E10 (10% ethanol) blending mandate. An EU directive has set the goal of replacing 5.8% of transportation fuel by bio-fuels by 2010 in all member states. In Canada, the government aims for 45% of the country's gasoline consumption to contain 10% ethanol by 2010. In Southeast Asia, Thailand has mandated an ambitious 10% ethanol mix in gasoline starting in 2007. For similar reasons, the palm oil industry plans to supply an increasing portion of national diesel fuel requirements in Malaysia and Indonesia. In India, a bio-ethanol program calls for E5 blends throughout most of the country targeting to raise this requirement to E10 and then E20. In China, the government is making E10 blends mandatory in five provinces.

Important issues are: what investments, policies, and agreements are needed to ensure that the diversion of land and water resources for bio-fuels production does not offset national and international efforts to alleviate poverty and enhance food security? On the other hand a point would be if there are investments, policies, or agreements that can be made to increase the likelihood that bio-fuels production might be helpful in alleviating poverty and enhancing food security?

Of the world's 47 poorest countries, 38 are net oil importers, and 25 of these import all of their oil. Yet many of these countries have substantial agricultural bases and are well-positioned to grow highly productive energy crops.

Bio-fuels could help to reduce poverty in the emerging and least developed countries, through increased employment, wider economic growth multipliers and energy price effects. However, it will have to be investigated whether such new opportunities will really substantially improve the conditions for poor farmers. Can bio-fuels also be coordinated from smallholder production? What have we learned about the link between poverty-reduction and livelihood improvement for small irrigators producing commodities now also being targeted for bio-fuels.

Introduction of bio-fuels also provides farmers with higher returns, not only of the bio-fuel crops but also of their regular food crops: as many farmers convert to bio-fuels, the supply of staple food crops will reduce and prices increase, which can then make food production more attractive. Even with subsidies, economic savings with bio-fuels from avoided oil imports can be considerable: from 1976 - 2004, Brazil's ethanol production substituted for oil imports worth US$ 60.7 billion - or as much as US$ 121 billion including avoided interest that would have been paid on foreign debt.

Bio-fuels rely on many of the same policy, regulatory or investment shortcomings that impede agriculture as a route to poverty reduction. As many of these shortcomings require policy improvements at a country level, rather than a global one, a country-by-country analysis of the

potential poverty impacts of bio-fuels is required.

Due to rising demand for bio-fuels, farmers worldwide have an increased economic incentive to grow crops for bio-fuels production instead of staple food production. Without political intervention, this could lead to reduced food production and increased food prices. Impacts of this would be greatest on poorer countries or countries that rely on imported food for their subsistence. An increase in bio-fuels demand will lead to sustained higher food prices and adversely affect poor consumers in least developed and emerging countries. Recent increases in maize prices were reportedly related to the opening of new bio-fuel plants.

In early 2007 there were a number of reports linking stories as diverse as food riots in Mexico due to rising prices of maize for tortillas, the pasta price hike protest in Italy and reduced profits at Heineken, the large international brewer, to the increasing use of maize grown in the US Midwest for bio-ethanol production (the barley area was cut in order to increase maize production).

The most recent UN report on bio-fuels also raises issues regarding food security and bio-fuels production. While the argument for bio-fuels in terms of energy efficiency and climate change are legitimate, the effects for the world's hungry of transforming wheat and maize crops into bio-fuels are 'absolutely catastrophic', and terms such use of arable land a 'crime against humanity'.

Bio-fuels aim to be carbon neutral. In practice, bio-fuels are not carbon neutral because energy is required to grow crops and process them into fuel e.g. fertilizer manufacture, fuel used to power machinery, and fuel used to transport crops and fuels to and from bio-fuel processing plants. However, using bio-fuels to replace a proportion of the fossil fuels that are burned for transportation can reduce overall greenhouse gas emissions. This does assume, however, that the land used for growing the crops would alternatively be desert or paved area. If the land was previously a (tropical rain-) forest, the carbon absorption of this forest should be deducted, which implies that the net effect of burning bio-fuels is an increase in greenhouse gasses. Also the 'displacement' effects of large-scale bio-fuels production, in terms of its direct and indirect role in promoting land use changes and soil carbon losses have to be incorporated

The release of Nitrous Oxide (N_2O) among the commonly used bio-fuels, such as bio-diesel from rapeseed and bio-ethanol from maize, can contribute as much or more to global warming than fossil fuel savings.

Second generation bio-fuels production processes use non-food crops. These include the stalks of wheat and maize, wood, special energy or biomass crops and waste biomass. These processes could utilise the waste products of current food-based agriculture to sustainably manufacture fuel. It is important to note that carbon in waste biomass is used by other organisms, e.g. it is broken down in the soil to produce nutrients, and provides a habitat for wildlife. The large-scale use of such 'waste' biomass by humans might threaten these habitats and organisms. It also could reduce the soil fertility.

In some regions of the world, a combination of increasing demand for food, and increasing demand for bio-fuel, is causing deforestation and threatens biodiversity. The expansion of sugarcane plantations will place pressure on environmentally sensitive native ecosystems, including rainforest in South America. In forest ecosystems, these effects themselves will undermine the climate benefits of alternative fuels, in addition to representing a major threat to global biodiversity. The best reported example of this is the expansion of oil palm plantations in Malaysia and Indonesia, where rainforest and peat domes are being destroyed to establish new oil palm plantations. It is an important fact that 90% of the palm oil produced in Malaysia is used by the food industry Malaysian Palm Oil Council; therefore bio-fuels cannot be held solely responsible for this deforestation. There is a pressing need for sustainable palm oil production for the food and fuel industries; palm oil is used in a wide variety of food products.

Various institutions have argued for a 5-year freeze on bio-fuels while their impact on poor communities and the environment is assessed. One problem with this approach is that economic drivers are required to push the development of more sustainable second generation bio-fuel processes: these will be stalled if bio-fuels production decreases. Supporters of bio-fuels claim that a more viable solution is to increase political and industrial support for, and rapidity of, second generation bio-fuels implementation from non-food crops.

Bio-fuels production will compete with food crops for scarce land and water resources, already a constraint to agricultural production in several parts of the world. If all national policies and plans on bio-fuels are successfully implemented, an additional 30 million hectares of crop land will be needed

along additional irrigation water withdrawals. With respect to these additional withdrawals there is quite a range in estimations from 30 km^3 in 2000 to 47 km^3 in 2017 to 180 km^3. Te latter estimation has not been linked to a specific year. Impacts for some individual countries could be highly significant. China and India, the world's two largest producers and consumers of many agricultural commodities, already face severe water limitations in agricultural production, yet both have initiated programs to boost bio-fuels production.

From water perspective it makes a large difference whether bio-fuel is derived from fully irrigated sugarcane grown in semi-arid areas or rainfed maize grown in water abundant regions. The use of water-extensive oilseeds (such as Jatropha trees), bushes, wood chips and crop residuals (i.e. straw, leaves and woody biomass) is promising though these often are used as animal feed or organic fertilizer (compost).

While some areas face water and land limitations, others have sufficient capacity, provided that productivity improvements materialize. Thus, production may take place in land and water abundant regions that are currently not involved in bio-fuels production

What is being bridged here? Water, Food, Energy, Markets

IV.4 Key question IV. How can better water management reduce poverty and hunger? A synthesis.

Context

The importance of the key question can be summarised as formulated underneath:

- the trend of increasing food prices on the world market necessitates far reaching interventions and investments to prevent under-nourishment, especially for the urban poor and the (landless) rural poor in the least developed countries. These increasing prices also need to reach the smallest farmers and bring profitable agriculture to them;
- the increase in food prices will result in higher production levels per unit area, especially in emerging countries, which will result in food production such that under-nourishment can be substantially reduced;
- the required global increase in food production needs to be achieved in a sustainable and equitable way, such that environments remain stable and small producers retain access to water and land resources;
- the on-going decline in the global food stock of cereals will have to be reversed by far reaching interventions and investments to promote food production in emerging and least developed countries.

Outline

Key issues:

- how to reconcile agricultural and water policies to avoid both global and local food crises?
- how can institutional and technical water management improvements and investments contribute to increase the food production?
- how can scientific findings more effectively be transferred to practical technologies, especially supporting the poor farmers?
- how can poor farmers benefit from market opportunities?
- how can local developments benefit from bioenergy?

Global population is expected to grow to some 8 billion in 2025 and 9 billion in 2050, increasing the global population density per km^2 of arable land from the present 430 to 525 in 2025 and 600 in 2050 (Figure 4). In 2050 two-third of the world population will live in cities (Figure 3). Food production roughly has to double in 25 - 30 years to meet the needs of the world's population, including the presently 850 millions under-nourished, the population increase and the changes in diets (Figure 5). With respect to the 850 million under-nourished people their number has been on the decline for several decades, but has become stable or even slightly increasing in the past 5 years.

To meet the increase in food demands under the increasing pressures on water and land resources due to urbanisation or other reasons for taking out of production of a certain part of the irrigated or drained areas, competition with other uses, pollution and climate change more productive water use in rainfed and irrigated agriculture is essential. This will require large investments to realise productivity gains that will ensure that fewer rural producers can supply the demand of a rising urban population. The magnitude of such investment requires understanding by governments, corporations and individual farmers on the economic and financial returns. This requires a reconsideration of subsidy and tariff systems to enable farmers on the one hand to access markets but on the other hand to be sufficiently protected against advanced competitors to allow them to develop their own capacity. It also requires attention to the role of small producers and labourers who survive close or below the poverty line, to ensure that new patterns of intensification bring positive agrarian transformations.

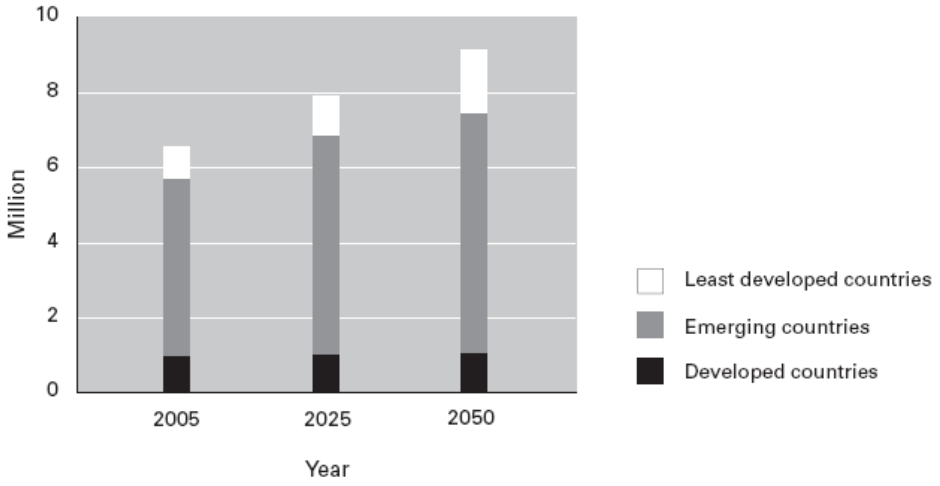

Figure 4. Population in 2005 and prognoses for 2025 and 2050

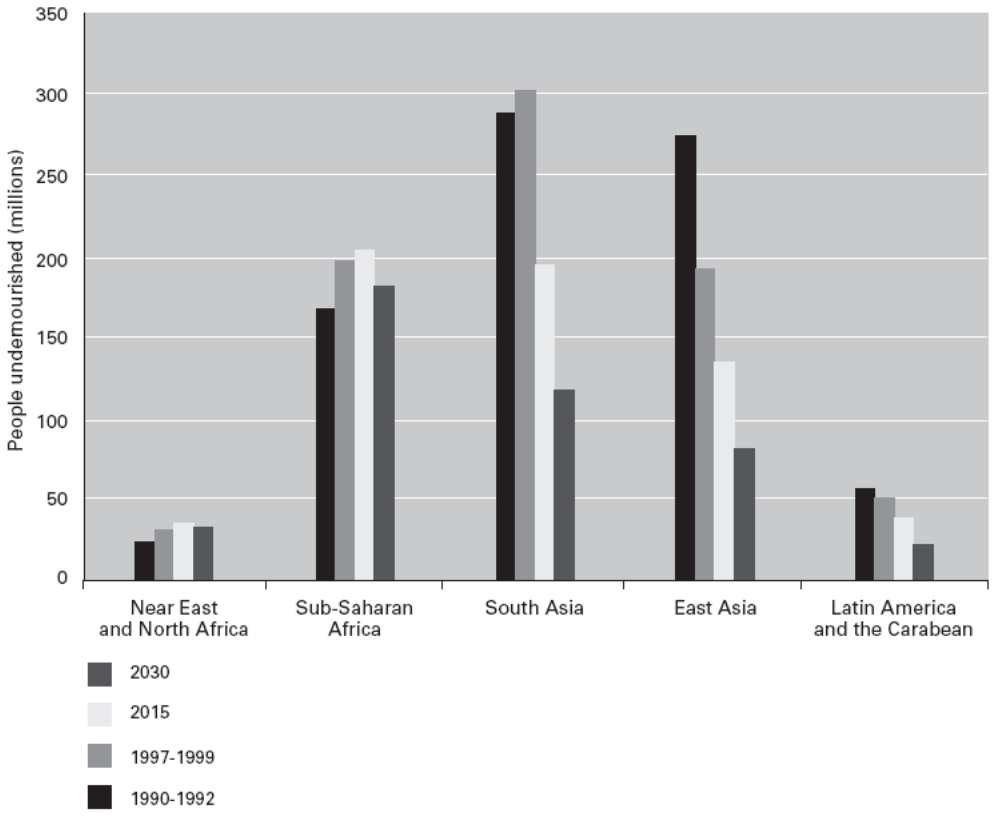

Figure 5. Estimated and projected number of undernourished people by region, 1991 – 2050 (UNESCO)

Agriculture and food production are key to the future of our world and key also to the Millennium Development Goals (MDG). From Figure 4 it can be observed that by far most of the population (73%) lives in emerging countries, but that most of the population growth in percentage is expected in least developed countries. In developed countries, no growth is expected. Population growth in emerging and least developed countries is expected to be concentrated in urban areas.

With respect to agriculture, it is of importance that it first of all plays a role to produce food crops. However, a variety of non-food crops, like cotton, tobacco, flowers, etc. may be produced on agricultural land. In addition food may be produced by lifestock, fisheries, and various aquatic environments. Cultivation of bio-fuel products, like sugarcane, oil palm and maize may have far reaching consequences. In fact it is probable that for a substantial part of bio-fuels production, food-producing lands are or will be transformed to non-food producing lands. The complexity of land and rural water is an important factor when analysing the issues at stake (Figure 6).

With respect to this it is also interesting to observe how prices for basic food crops have developed over the past period. After a continuous lowering of global food prices during many decades, the bottom was more or less reached in 2000 - 2001, since then prices at the World Market are rising. Although the average prices of 2007 were still at the level of 1998/1999, during the last months of 2007 and during the first months of 2008 a sharp rise could be observed. During the second part of 2008 a reduction in the prices could be observed. However, by the end of 2008 the prices were around the average of 2007, except for rice where the price was about 70% higher than the average of 2007. Average prices of 2008 were at least 30% higher than the averages for 2007. If this trend continues, it will become increasingly difficult, especially for the urban poor in the emerging and least developed countries to purchase their food (Figure 7). On the other hand also the production prices like prices of power, spare parts, different services and fertiliser have increased, which has reduced the improvement of benefit and may even in some cases have resulted in a negative overall result.

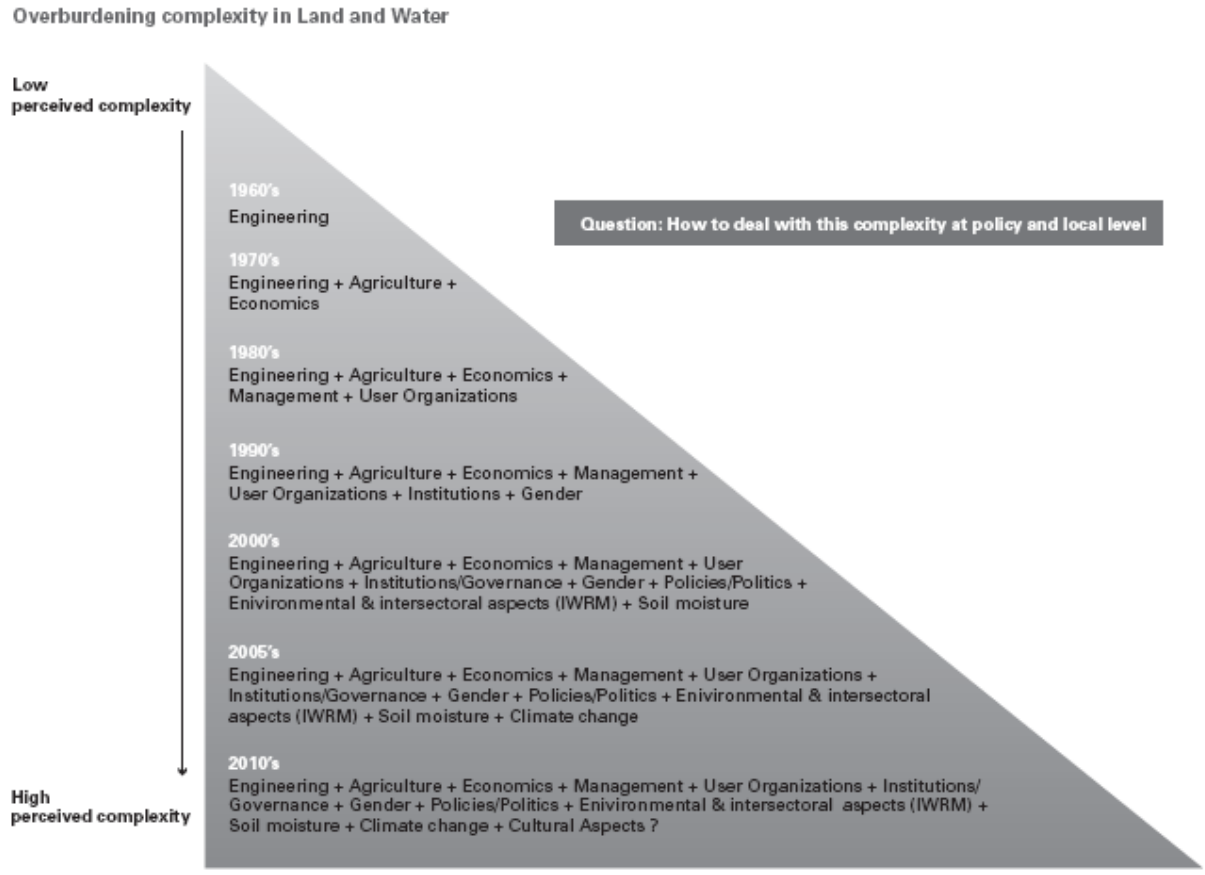

Figure 6. Complexity of land and rural water (Huppert, 2006)

Notwithstanding measures for control of population growth undertaken by some emerging and least developed countries, projected needs for an envisaged increased population must be properly planned. With respect to this the emerging and least developed countries will be confronted with the need to increase their food supply by increasing production in their territories, maybe in combination with increased imports. For emerging countries, there is the additional complication that the standard of living is rapidly rising resulting in an increase in consumption per person and a change in diet.

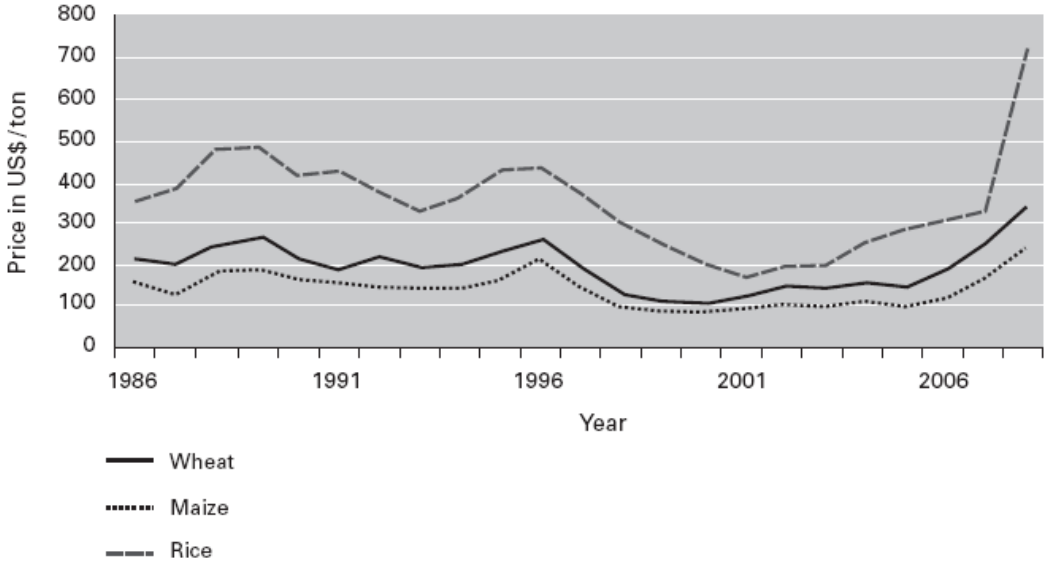

Figure 7. Development of prices on the world market for some basic food crops

From the point of view of food production, there is a common feeling that in the coming decades 80 - 90% of the required increase will have to be realised on existing cultivated land and 10 - 20% on newly reclaimed land. From the point of view of sustainable rural development, socio-economic and environmental aspects play especially crucial roles.

Food security, Food stock and food/non-food production

The security of food supply results at a given point of time in a combination of food production potential for the short term and food stocks. The sharp increase of food prices in 2007 is reflecting the tension on both terms: less land for food production (more for bio-fuels) and declining food stocks at least in relative terms. There are many worrying about a possible food supply shock if this tension exacerbates. The question of rapid reversibility from non-food production to food production is thus coming into as an important feature of the food security. For instance a system that has massively turned to sugarcane for ethanol can revert very rapidly (one season) to rice in case of a big shock on food supply.

Thus for some countries developing non-food production on intensive agricultural lands might be a good strategy to take advantage of staple food imports from countries which have a comparative advantage while maintaining a potential capacity for food that can match population needs in case of crisis.

If we look at production of cereals in the three types of countries, as well as in different continents, the following figures are of interest. Developed countries have an export surplus of about 10% of their production. Emerging countries have a net import, but this is quite low if we express it in deficit per person and it looks like they are overall able to be food self-sufficient. Least developed countries have an import surplus in cereals of 30% of their own production. Granting that, in the absence of water management facilities, these figures could vary due to linkages with variations in precipitation, planning for the global requirements would have to be on a robust basis of projected trends. Solutions for such tendencies, that are temporal with linkages with climate, are best achieved by interventions that can insulate the impact of variations in climate. With respect to this the declining

trend in investments in the sector - at least from international donors - during the last decade needs a critical review. The question is if it is needed to reverse this trend and if so to determine in consultation with the local governments, which may be the priorities?

Agriculture remains key to development of many countries. In many emerging and least developed countries, agriculture remains the main component in the Gross Domestic Product (GDP) and farmers (especially small-scale) represent the majority of the population. The situation differs, however, and can be classified in three main blocks:

- *Developed countries.* Agriculture's share of the GDP is low and farmers represent only a small and declining proportion of the population. Agriculture is generally supported by these societies, which has several debated effects on the world food trade. This situation is the result of several decades (if not centuries) of technological progress. Today the productivity in these countries is about 500 times more than that of small-scale farmers in emerging and least developed countries;
- *Emerging countries.* The situation in several of these countries shows similarities with what prevailed in the recent past in developed countries: the development of economy drives farmers from their land to the urban areas and increasing demand generates increases in production. In these countries there remain large numbers of rural poor lacking access to land or other resources; some of these countries have recently become among the largest food exporters. As far as farmers are concerned, one may observe three different trends:
  - increase in farm sizes and introduction of mechanisation;
  - cultivation to higher value crops (vegetables, cash crops) in order to retain a living on a relatively small plot;
  - part-time farming, in combination with a job in the industry or the service sector.

  Such changes have had far reaching consequences in the developed countries, reducing the farmers' population to 2 - 3%. Such a process has already started in several emerging countries and one may expect that during the coming century such a process will occur in a substantial number of these countries. A special problem occurs when workers migrate to cities and the rural area remains without experienced farmers. All fieldwork is then generally put on the shoulders of the women. In such a situation, strong support of new farmers will be needed, especially through training, promotion of local processing of agricultural production, and low cost credit for farmers;
- *Least developed countries.* One may expect that for the medium-term future, agriculture will remain the activity of a majority of farmers with little productivity, lacking all types of inputs and resources to increase their productivity. Despite this situation, these countries are increasingly importing food. It will be of importance to find ways that these countries become overall food self-sufficient, or access imported food in socio-economic conditions that don't challenge their own food production and keep away local farmers from local markets. Specific points of attention are: how will investments take place in countries that have suffered conflict, or where states are failing, and many of the poorest producers live, what place will remain for smallholder irrigators in new global food markets, and how will investments support and not dislocate these small-scale irrigators? The processes of agrarian intensification need special attention to limit further marginalisation of the poorest farmers and environmental degradation.

The question of agriculture and rural development will remain a major concern in many of the contexts belonging to the latter category. However given the biophysical and economical handicaps many farming and rural communities are facing, the development can hardly be only on the traditional agriculture entrepreneurship model. The social set up and the family sharing of activities are also experiencing major changes, in some cases dramatic as a result of military conflicts or natural disasters, in others still drastic but pushed by the economy. For instance many rural areas are experiencing a feminisation of the agriculture as the result of men becoming part time urban workers.

Accelerated changes, diversification, various sort of threats including those related to climate changes, are all calling for a more integrated rural development based on diversified sources of incomes, livelihood oriented and focusing on multi-option for adaptation and resilience to develop or

absorb chocks.

Obviously this new strategy of rural development (new rurality) more flexible, reactive and adaptive will have strong implications for natural resources and water management: water being used differently over time by different users in different locations with different service interactions with different governance, competition. This calls for differentiated and context-specific responses such as Multiple Use Services or actions more users oriented (women).

V. Overall conclusions and recommendations

It is intended that the Topic Scoping will result in a set of recommendations on the Topic, as well as on the key questions. Drafts of these recommendations have been added after the first and second Consortium meeting and the intention is that they later on will be improved, based on additional input and comments.

However, we have already added underneath recommendations, especially to National and State Governments:

- The most significant development challenges of least developed countries are:
  - poverty reduction and food security;
  - reverse diminishing economic growth especially in agriculture;
  - ensure social equity and environmental sustainability.

  These are directly and intimately related to integrated water resources management, food security, irrigation development and the livelihoods of people in these nations. Therefore governments of least developed countries would have to promote development of small/medium, affordable and sustainable infrastructure suited to the intended beneficiaries and paying due attention to market access and resilience to natural disasters. Priority actions to be implemented to operationalise the recommendations for the least developed countries would have to include the following critical issues:
  - improvement of assessment function, database management and information/data sharing;
  - formulation of irrigation and drainage policies that are pro-poverty reduction;
  - participatory irrigation and drainage system management and empowerment of farmers;
  - training and capacity building of: farmers, WUA leaders, Project managers, NGOs and local experts involved in the management of public irrigation and drainage schemes;
  - increased technological learning and interface between research and manufacturers with farmers;
  - promotion of improved rainwater management, which includes, for example, rainwater capture and conservation, use of more drought tolerant or better adapted varieties, use of fertilizer, and soil improvement to reduce rural poverty;
- governments of emerging and least developed countries would have to:
  - accelerate the adoption of participatory management of irrigation and/or drainage infrastructure, the formation of professionally oriented farmers and water users organizations, enhance legal systems and support financially irrigation and drainage administration;
  - strengthen the transfer and dissemination of irrigation and drainage technological and management skills from professional experts in governments and international organizations to the farmers' irrigation and drainage management organizations;
- in principle, all Governments would have to conserve and allocate adequate water resources and develop additional resources considering the needed adaptation to climate change in particular where the low flows are affected.

After the Forum a Synthesis Report will be prepared where especially the recommendations will be more strongly formulated, based on the presentations and discussions during the Forum.

VI. Proposed steps until and after WWF5

The proposed steps until and after WWF5 are summarized in Table I. These steps were partly formulated by the organizers and partly by the topic coordinator.

This Topic Report has been circulated among the Consortium Partners. The document can be downloaded from the web sites of ICID: www.icid.org, and the Forum organisers: www.worldwaterforum5.org, as well as from the VMS platform.

Table I. Proposed steps until and after WWF5

Time	Task/objectives
10 February 2009	Topic Report
16 – 22 March 2009	5th World Water Forum, Istanbul, Turkey
Sessions on Topic 2.3	Session I: Wednesday March 18, 14.30 – 19.00 hour. Sessions II and III are both scheduled on Thursday March 19, 8.30 -13.00. Session IV is scheduled on Thursday March 19, 14.30 – 16.30.
Mid April	Draft Synthesis Report to Consortium Partners and Consultation Partners for their review and comments
Mid May	Deadline for receipt of comments on the Draft Synthesis Report
End of May 2008	Submission of Synthesis Report to Theme 2 Coordinator

ANNEX I. Consortium and Partners and Consultation Partners of Topic 2.3 of WWF5 and their specific interest

Coordinator: International Commission on Irrigation and Drainage (ICID)						
Type of organisation	**Organisation**	**Contact person**	**Session I**	**Session II**	**Session III**	**Session IV**
			How to achieve the required food production to meet the growing demand?	*How can food market measures boost rural development and poverty alleviation?*	*Water for bioenergy or food?*	*How can better water management reduce poverty and hunger? A synthesis.*
Farmer Associations	International Federation of Agricultural Producers (IFAP)	David King/Ajay Vashee				
	Consortium of Indian Farmers Association (CIFA)	Akkineni Bhavani Prasad			X	
	National African Farmers Union, South Africa,	Khamarunga Banda			X	
International Agencies/ UN Agencies	Food and Agriculture Organization of the United Nations (FAO)	Mr Parviz Koohafkan/ Dr. Pasquale Steduto/ Alexander Müller/ Jean-Marc Faurès	X	X	X	X
	International Fund for Agricultural Development (IFAD)	R. Cleveringa/A. Nepreu/ Vineet Raswant	X	X	X	X
Other Institutions	Gender & Water Alliance	Joke Muylwijk				
	French Water Partnership (FWP)	Nathalie Chartier-Touzé			X	X
	Israel Export & International Cooperation Institute	Ms. Ronit Golovaty				X
	Winrock International	Mary Renwick				
	International Development Enterprises (IDE)	Ms. Sue Drummond Haley		X		
	Centre for built environment (CBE)	Ruhul Gupta		X		
National Government	Agriculture and Agri-Food Canada	Laurie Tollefson	X			X
	Water sector project, Bangladesh	Md. Moshiur Rahman		X		
	Ministry of Jihad-Agriculture, Iran	Mr. Zieaoddin Shoaei, Mr. Allaei and Mr. Parastar				
	Ministry of Water Resources, China	Mr. Wang Xiaodong				
	Central Water Commission, India	A.K. Bajaj	X			
	Brazilian Water Agency (ANA)	Ben Braga, Antonio Felix Domingues			X	
	Ministry of Transport, Public Works and Water Management - Rijkswaterstaat	Bart Schultz	X	X	X	X
Ass. of agricultural producers	The World Vegetable Centre (AVRDC)	Madhusudan Bhattarai	X	X		X
	Brazilian Reference Centre on Biomass	Jose Moreira			X	
Professional Associations	International Commission on Irrigation and Drainage (ICID)	Bart Schultz/ M. Gopalakrishnan	X	X	X	X
	International Hydropower Association (IHA)	Richard Taylor/Michael Vink			X	
	World Bioenergy Association (WBA)	Kent Nystrom				
	Association Française pour l'Eau, Irrigation et le Drainage (AFEID)	Henri Tardieu	X	X	X	X

Research Institutions	International Center for Agricultural Research in the Dry Areas (ICARDA)	Theib Y. Oweis	X			X
	Scientific Information Center of Interstate Coordination Water Commission (SIC ICWC)	Victor A. Dukhovny/Umarov	X			
	International Water Management Institute (IWMI)	Colin J. Chartres/ Barbara van Koppen/ Makonnen Loulseged	X			X
	International Food Policy Research Institute (IFPRI)	Dr. Claudia Ringler			X	
	CGIAR Challenge Program on Water and Food (CGIAR CPWF)	Jonathan Woolley/Annette Huber/Simon Cook	X			X
	Institute of Water Conservancy and Hydropower research (IWHR)	Mina				
	Institute for Agriculture and Trade Policy	Ms. Shiney Varghese	X			X
Environmental agencies / NGO	World Conservation Union (IUCN)	Mark Smith/Katharine Cross/Ganesh Pangare	X		X	
	Ecoagriculture Partners (EP)	Thomas Oberthur		X		
	Roundtable on Sustainable Biofuels (RSB)	Andrea Athanas			X	
Universities	UNESCO-IHE	K. Prasad	X			X
	CIHEAM/ Bari	Prof. Atef Hamdy	X			X
	Univ. of Melbourne	Prof. Hector Malano				X
Private sector	Veolia Water	Boris David	X			
	Rubicon Systems Australia Pty.Ltd.	Tugba Erol/Anthony Oakes				
	Irrigation advisor	Mark Svendsen				X
Regional Organizations	Arab Water Council	Safwat Abdel-Dayem	X			X
	Centre for Environment & Development for the Arab Region & Europe (CEDARE)	Omar Elbadaw				

Overview of interest shown by Consultation Partners on Topic 2.3						
Type of organisation	**Organisation**	**Contact person**	**Session 1**	**Session 2**	**Session 3**	**Session 4**
			How to achieve the required food production to meet the growing demand?	*How can food market measures boost rural development and poverty alleviation?*	*Water for bioenergy or food?*	*How can better water management reduce poverty and hunger? A synthesis.*
Other Institutions	Arab Organisation for Agricultural Development	Dr. Salem Al-Lozi				X
	Independent Community Bankers of America (ICBA)	Camden R. Fine	X			
	International Network for Water and Ecosystem in Paddy Fields (INWEPF)	Yasuhisa Kayama				
National Government	National Integrated Water Resources Management Commission, Nigeria	I.K. Musa				
	Ministry of Water Resources, Ethiopia	Teshome Atnafie Guyo				
	Ministry of Public Works, Indonesia	Hafid Gani				
Multilateral donors	Asian Development Bank (ADB)	Thomas Panella				
	Islamic Development Bank (ISDB)	Intizar Hussain				
Trade organizations	Sustainable Agriculture Initiative (SAI)	Peter Erik Ywema				
Professional Associations	International Commission on Large Dams (ICOLD)	Dr. Luis Berga				
Foundations	Gates Foundation	Ms. Melissa Ho				
Research Instiurions	Center for Environmental and Geographic Information Services (CEGIS), Bangladesh	Giasuddin Ahmed Choudhury				
	Eawag - The Swiss Federal Institute of Aquatic Science and Technology	Jafet Andersson				
Universities	Wageningen University	Prof. Wim Cofino				
	UC-Davis Agricultural and Resource Economics	Allen Summer				
Local civil society	Japan Water Forum	Dr. Taeko Yokota				
Regional Organisations	Urban Agriculture Network	Jac Smit				
Forum Organisers	World Water Council	Daniele Gaillard				
	Devlet Su Isleri Genel Mudurlugu (DSI)	Dr. Dünya Su Forumu				
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ANNEX III. Some characteristic data on global cereal production (Schultz et al., 2009)

Area	Population			Realised and estimated needed cereal production									
	1995	2005	2035	1995			2005			2035			
	million	million	million	million tons	kg/person	nett export surplus in million tons	million ton	kg/person	nett export surplus in million tons	million tons*)	kg/person	million tons if present trend would continue	kg/person
Asia	3,450	3,960	5,050	937	271	-89	1,070	269	-80	2,130	422	1,212	240
Africa	726	922	1,640	94	129	-22	137	149	-43	274	167	214	130
Europe	729	731	698	365	501	11	418	572	29	836	1,210	560	802
Americas	784	890	1,150	451	575	97	573	644	81	1,150	997	828	720
Oceania	29	33	45	28	966	5	41	1,240	18	82	1.820	55	1,220
World	5,720	6,540	8,590	1,880	328	2	2,240	342	4	4,470	521	2,869	334
Developed	885	966	1,040	557	651	84	686	710	67	1,370	1,320	888	853
Emerging	4,230	4,810	6,130	1,230	290	-78	1,410	294	-52	2,830	461	1,728	282
Least developed	601	766	1,410	92	153	-4	136	178	-10	272	192	253	179

*) Based on a duplication in 30 years compared to the 2005 situation and similar production increase in the continents and the types of countries