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The Future Of Iraq Project

Water, Agriculture, and Environment

Working Group

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(*) Reflects consensus of the participants in the working group. Other papers reflect the views of their authors.

Environment

This subcommittee undertook the discussions related to the environmental issues of which it prioritized the immediate high-risk elements for protection of human health as urgent measures to consider immediately. Members of the subcommittee agreed on the following priorities:

1. Conduct initial surveys on health and economy to assess broadly the scale of damage and immediate remedy.

2. Asking the U.S. Army Corps of Engineers to provide topographical and aerial photography maps which depict battlefield areas where there is a high likelihood of contamination in terms of WMD hit areas, as well as areas where conventional weaponery was utilized. In addition, any maps which may assist with the initial plans to address oil spills and fires.

3. Determine quarantine sites and procedure for disposal of damaged equipment (military and civilian kinds), weapon spent cartridges and scrap metal. Establish temporary pits for disposal of sewage, liquids, and domestic trash.

4. Commence an extensive public education campaign to:

    1. Publicize risks associated with temporary shallow backyard wells/pits and and the potential for the presence of contaminated shallow ground water. Explain the correct and simplest ways of sanitizing drinking water - such as boiling the water for 2-3 minutes and/or using chlorine and iodine tablets. Undertake an educational campaign to explain to the public how to deal with solid waste and trash.
    2. Use the current UN ration distribution system or possibly airdrops to distribute water disinfection tablets, trash bags, gauze masks, and perhaps handheld transistor radios.
    3. Educate the population to avoid handling scrap military equipment and potentially unexploded ammunition (UXO), and even spent weapon shells.
    4. Inform the public to avoid using the rivers as dumping grounds and to set up temporary local sites for rubbish collection.
    5. Inform the public of the end of hostilities and when water and air are safe from contaminants.

5. Conduct quick surveys of contamination levels at current landfills, industrial locations, mines (mainly sulphur and phosphate mines), waste water treatment plants.

6. Identify and coordinate with Iraqi experts in the environmental field who are employed in government, universities and related governmental offices.

7. Set up crash courses for the Iraqi engineers and technicians to learn testing techniques of

environmental contamination. These courses could evolve, in the long term, into more specialized technical and scientific courses and scholarships in the field of environmental science for the Iraqi graduates.

8. Supply mobile testing laboratories to measure water, air, and soil qualities, and contamination levels. Then to train Iraqis to use and work in these labs.

9. Declassify all data related to environmental field contemplated by the Iraqi authority and make such data available to the public and universities.

Medium-long term measures:

The subcommittee agreed to recommend the followings:

10. Utilize the Iraqi army (the career army personnel not the conscript) in working on the clean-up and protection of the environment and to use heavy vehicles and equipment which are already in their stock. Their works may be in the form of :

   A. Trucking solid waste.
   B. Cleaning up riverbanks and in dredging rivers.
   C. Clearing blocked roads.
   D. Sealing off contaminated areas.
   E. Extinguishing fires.
   F. Recovery of damaged vehicles.
   G. Creating green areas and national parks.
   H. De-mining of battlefield.

11. Establish a stand-alone Ministry of Environment which will handle all works in the field such as:

   A. Legislation
   B. Monitoring of contamination levels in industrial locations, landfill sites and waste disposal pits.
   C. Planning for future environmental projects.
   D. Setting standards for water, air, and soil qualities.
   E. Remediation and reclamation of contaminated lands.
   F. National weather forecast.

12. Assess the need of any future sites for solid and waste disposal and water treatment plants.

13. Rehabilitate the current water treatment plants and waste treatment plants, and conduct feasibility studies for building new ones.

PREPROPOSAL

Title

Accelerating Agriculture in Iraq: Wheat and Barley

Lead Institution

Kansas State University
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Manhattan, KS 66506-5501

Cooperating Institutions

Consortium of U.S. Land Grant Universities and International Agricultural Research Institutes to be named.

Contact Person

Dr. Kassim Al-Khatib

Background

Iraq has long been an agricultural country. At present, agriculture employs over 25% of the country's labor force, more than any other sector except services, but provides only about 6% of GDP because of low productivity and the importance of oil.

Wheat and barley are the major crops in Iraq. The two cereals occupy over 60% of the 5.2 million ha of arable land and provide much of the nourishment of the population. However, productivity has been declining (Figure 1) and now averages only about 0.8 to 1.0 metric tons/ha, which is among the lowest in the world. Consequently, the country must import over two-thirds of the wheat and other cereals needed to feed the population. Much of the nutritional needs have been provided by the oil-for-food program, which supports an estimated 60% of the population. Even with these imports, the daily calorie supply averages only about 2000 per capita, which is among the lowest in developing countries.

Constraints to Production of Wheat and Barley

Iraq has considerable potential to increase cereal production. The present low productivity is due to several factors: lack of improved seeds, fertilizers, and pesticides; drought; deficient irrigation facilities; insufficient and old equipment; obsolete technology; and inadequate personnel.

Half of Iraq's farmland is in the northeastern plains and mountain valleys, where rainfall is usually sufficient to sustain agriculture. Most of the remainder is in the valleys of the Euphrates and Tigris rivers, which receive little rainfall and irrigation is essential. The two rivers are fed by snowpack and rainfall in northwestern Iran and eastern Turkey, and their late and variable discharge peaks for cereals necessitate dams for storing water. The high silt content of the water, high salt in the silt and the soil, and poor drainage cause soil salinity and sterilization.

Seeds of modern, adapted cultivars are needed to increase productivity. The yield potential of present cultivars is not a limitation at only 0.8 to 1.0 tons/ha, but improved cultivars can resist the diseases and insects that often devastate wheat and barley. Fortunately, appropriate cultivars of wheat are available from the International Center for Improvement of Wheat and Maize (CIMMYT) in Mexico, and cultivars of barley are available from the International Crops Research Institute for Dryland Areas (ICARDA) in Syria. Both institutes are also working to develop salt-resistant cultivars, which will contribute to alleviating the problem of soil salinity.

Use of fertilizers on wheat and barley in Iraq is extremely low and a major cause of poor productivity. The country produces some nitrogen fertilizers and has considerable phosphorus deposits, which probably can be developed to meet its long-term needs. However, some importation of nitrogen and phosphorus

fertilizers will likely be needed to achieve immediate increases in cereal production.

Weeds, diseases, and insects are also primary causes of low productivity of wheat and barley in Iraq. Weeds compete directly with the cereals for space, nutrients, and water and greatly accentuate the effects of drought. Controlling weeds can have an immediate and significant impact on yields. Similarly, diseases and insects frequently destroy the crop, and their control would have immediate benefits. Excellent herbicides, fungicides, and insecticides are available for both wheat and barley.

Much of the equipment for cereal production is of eastern European or local manufacture. Most of it is old and prone to breaking, and lack of spare parts makes in inoperable at critical times such as harvest. Lack of modern equipment like drills and sprayers prevents adoption of conservation tillage, pesticides, and other technology.

Most Iraqi cereal scientists were trained before the 1980s and have had little contact with other countries. These scientists should be up-dated, and more scientists should be trained, particularly to improve rain-fed agriculture in northern Iraq. Extension programs, mostly in name only, are conducted by the Ministry of Agriculture and several universities. However, there is little contact with farmers, who often view extension personnel as government spies. Industry personnel involved in marketing, transporting, storing, and processing grain also operate under systems that are inefficient and wasteful. Internships with U.S. industries and degree training at U.S. universities should be provided to modernize the industry.

Recommended Programs to Accelerate Cereal Agriculture in Iraq

The following programs to promote cereal production in Iraq contain immediate and long-term approaches. The immediate approaches are intended to provide rapid, visible benefits to farmers, and the long-term approaches are intended to give a stable foundation to future agricultural development in the country.

Immediate Approaches

1. Develop and distribute "production packages" of critical inputs to farmers.

   These packages might include seeds of improved varieties, fertilizers, pesticides, and possibly a small sprayer for applying the chemicals. They would be intended for farmer-lead demonstration plots to quickly convince them of the benefits of modern technology. The program would be initiated in northern Iraq, hopefully by September 2003 for the 2004 crop, and refined and expanded nation-wide the following year.

2. Train the trainers and selected senior scientists.

   This program would identify local agricultural graduates to work with the production package program described above and train them utilizing Iraqi and U.S. scientists. Senior Iraqi scientists, who have had little contact with other countries, would be provided study tours of cereal production programs in the U.S. Personnel at the University of Arbil and University of Sulaimaniya in northern Iraq and the Ministries of Agriculture and Irrigation would be involved initially, and those at the University of Mosul and University of Baghdad would be involved later.

3. Employ local trained agricultural graduates as extension agents for the production package program.

   Extension agents trained in the application of the production packages would work directly with farmers to train them in its use. The extension agents would be expected to instruct the farmers, visit their fields regularly, and diagnose and remedy any problems.

4. Survey the long-term needs for sustainable cereal agriculture in Iraq

   A top-to-bottom survey of the cereal industry is needed to identify the country's long-term needs. Several teams consisting of U.S. government, industry, and university experts and their Iraqi counterparts would be engaged to study and make appropriate recommendations on cereal science, production, processing, and marketing problems and solutions.

Long-term Approaches

Specific long-term needs will be identified by the surveys outlined above. The following are some approaches that should be considered given the present status of the wheat and barley industries in Iraq.

1. Provide training and promote interactions with other countries' national cereal programs for Iraqi government, university, and industry personnel.

   Few Iraqi grain industry personnel have modern training or continuing contacts with persons in other countries. A program of internships of government and industry personnel with U.S. government agencies and industries, visiting scholarships for senior scientists, and degree programs for young persons is needed. Continued contact might be encouraged by sponsoring attendance at industrial and professional meetings, subscriptions to journals, and establishment of sister relationships between Iraqi and U.S. agencies, companies, and universities.

2. Sponsor production trials to determine the optimum cereal varieties, fertilizers, and pesticides for different regions and to test modern technology.

   Farmers' yield can be raised substantially with modern varieties, fertilizers to correct soil nutrient deficiencies, and pesticides to control weeds, diseases, and insects. These practices have direct effects on yields and also increase the efficiency of soil moisture, a serious problem in Iraq. Additional grains in soil moisture use efficiency can come from modern technology such as conservation tillage, which increases storage of water in the soil.

3. Strengthen and modernize the Iraqi cereal extension program.

   Extension provides a direct link to farmers to education and introduction of current information and technology. The present extension personnel should be up-dated and redirected and probably expanded. Enhanced support services to extension personnel in the form of transportation, soil testing laboratories, and pest diagnosis laboratories are needed. On-going cooperation of extension personnel with production researchers and industry should be promoted.

4. Modernize the Iraqi seed production and distribution system.

   Most of the crop seeds used in Iraqi agriculture are produced locally. The introduction and distribution of high-yielding varieties is slow. A modern system can quickly identify the best varieties, increase the supply, and distribute them to farmers. Modernization of the present system can lead to a new, private seed industry as well as provide improved seeds to farmers.

5. Rehabilitate and expand Iraqi irrigation facilities.

   Dams on the Euphrates and Tigris Rivers and their tributaries provide most of the water for irrigation in Iraq. Much of the canal system needs to be rehabilitated to decrease water losses. Additional efficiencies can come from proper irrigation scheduling. Silting of reservoirs and canals is a serious problem, as is increasing salinity of the soil. The last problem can be remedied by promoting drainage of the soil. Availability of water in the major rivers, which are all downstream from Syria and Turkey, may be a serious, future problem.

6. Encourage expansion of Iraq's fertilizer industry utilizing national resources.

   The extremely low fertilizers use on cereals in Iraq is ironic considering the country's ample resources of natural gas for manufacturing nitrogen fertilizer and deposits of phosphate. Much of the present, limited output of fertilizers in used for vegetables, and little goes for cereals. Industry should be encouraged to expand production of both nutrients to make adequate supplies available for cereal farmers. The content of potassium, the other major crop nutrient, is high in Iraqi soils.

7. Transform the Iraqi grain marketing system.

   Marketing of grain produced by Iraqi farmers is a government monopoly, with attendant inefficiencies, high costs, and low prices to producers. Transforming the system to private enterprises would increase its efficiency and the income to farmers. Modernizing the transportation and storage systems would have additional benefits of decreasing loss of grain from pests and spoilage.

8. Promote development of farmers' management, purchasing, and marketing cooperatives.

   Most Iraqi farms are small, averaging less than 10 ha. New equipment is unaffordable for these small operations, and training farmers to apply new technology is difficult. Cooperatives would enable farmers to work together with extension personnel, to purchase and utilize equipment and to bargain for fair prices for their products.

Project Timetable

1 July 2003	Initiate project
1 September 2003	Begin training of extension personnel for production package program
15 September 2003	Begin distribution of production packages in northern Iraq
1 March 2004	Begin surveys of long-term needs of cereal agriculture in Iraq

Institutional Strength of Kansas State University

Kansas State University conducts the most comprehensive wheat research, extension, and instruction program in the U.S. Projects are supported in all areas from molecular biology of the wheat plant to marketing and processing of the grain. Varieties developed by the University occupy over 77% of the wheat area in Kansas, the major wheat state in the U.S., and much of the wheat area in

adjoining states. The University is the only one that offers degrees in milling and baking sciences. It supports an International Grains Program that trains personnel and provides technical support to cereal enterprises around the world. A major federal laboratory, the USDA Grain Marketing and Production Research Center, and an affiliate of the wheat industry, the American Institute of Baking, both at Manhattan, Kansas, add further strength to the programs.

Attachments

- Resumes of project personnel

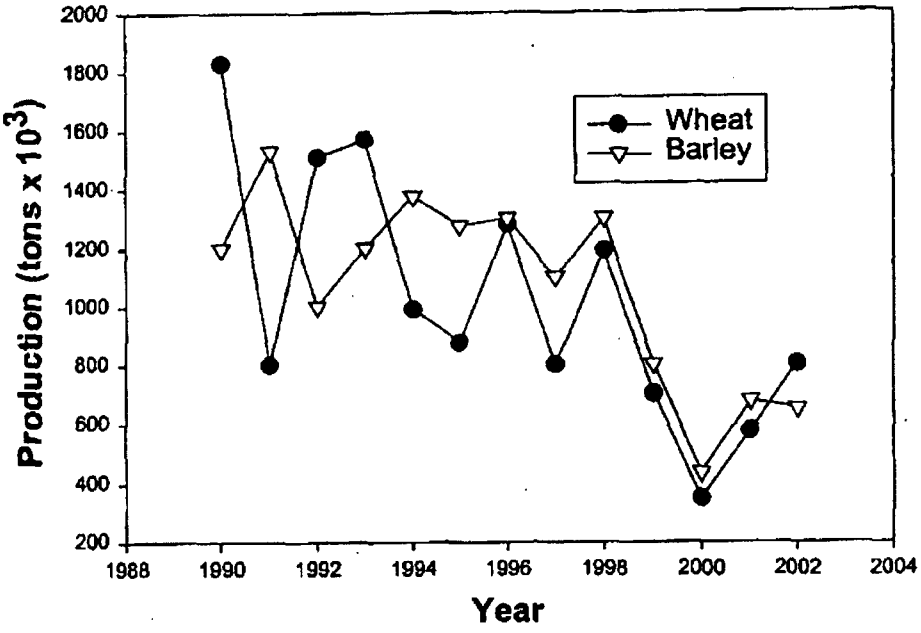

Figure 1. Wheat and barley production in Iraq between 1990 and 2002

Members of the Water, Agriculture and Environment working groups met on October 5th and 6th, 2002 and again on March 10th and 11th, 2003 to discuss short and long-term projects regarding water, agriculture and environment issues in a post-Saddam Iraq. Short-term projects address the immediate aftermath of a change of regime. Long-term projects focus on the gradual rebuilding of Iraq.

Presented herein is a summary of the projects recommended for consideration. This summary report is divided into three sections, one for the findings of each of the subcommittees formed by the members of the working group.

Water Subcommittee

Throughout its history, Iraq has battled with the flooding of the Tigris and Euphrates. Annual flows in the Tigris have varied between 30 BCM to 50 BCM. Flows in the Euphrates have been documented to vary between 20 to 40 BCM. However, the latest figures for flow are not known as they are being treated as state secrets by the regime of Saddam Hussein. What is known is that 40 percent of the waters in the Tigris are from Iraqi-Kurdistan with 50 percent coming from Turkey and 10 percent from Iran. No significant amount of the water in the Euphrates is from the Iraqi territory.

The last destructive flood of Baghdad was in 1954, following which the Tharthar Reservoir Canal was opened with waters diverted from Tigris to the Tharthar Depression at Samraa. In the 1960's and through the 1980's, several dams were built on the Tigris and its tributaries in Iraq (Derbendekhan, Dokan, Mousel, Hemreen, Diala, Bakhma) that have resulted in very effective regulation of the flow of water in the Tigris and flooding was totally controlled [seized to be a problem]. The middle and southern Iraq, however, was still being affected by periodic flooding as late as the early 1970's. However, after Syria built the Tabaka dam, the flow of water in the Euphrates was effectively reduced to low level flows (it was even stopped completely during the filling of the Tabaka reservoir).

In the mid to late 1990's, Turkey began the implementation of the GAP project, which has effectively reduced water flows in the Euphrates to 1/3 its original annual average. Turkey is in the process of harnessing the waters of the Tigris and potentially reducing its flow similarly to what is now happening in the Euphrates.

Beyond the general numbers presented above, the committee was operating with assumptions rather than real numbers and statistics. Some of our members have worked in Iraq during their careers and the discussions were informed by the knowledge that these valuable members were able to share with us. Given the lack of recent data (specifically from the 1990's), it was the committee's consensus that our recommendations must be, by necessity, general and subject to revision once current data are obtained from inside Iraq.

Immediate Projects:

Following is a list of projects that should be considered for immediate implementation. The projects are not listed in a priority.

- Assess water resources in Iraq (quantity as well as quality) to determine the possibility of use of the Thrathar, Habbania and Haditha reservoirs to supplement the water supply until such time as arrangements with riparian countries take place.
- Assess irrigation facilities and upgrade and do the deferred maintenance (such as improving pumps, siphons, etc.), which would possibly give a big boost for improving agricultural production in the short term.
- Assess the conditions of the navigation channels associated with ports and harbors including the need for dredging to improve their capacity, as well as de-mining and removing the sunken ships in Shat al-Arab.
- Safety/risk assessment of the existing dams is needed, especially in consideration of the developments in the State of the Art in the last couple of decades. More over, deferred maintenance of the dams, embankments, and associated facilities needs to be addressed.
- It is important to coordinate all assessment projects (being conducted by outside contractors) and to assure public access to promote efficient use of the information.
- Consider the use of simple purification systems that can be useful by families to treat water until municipal purification systems are put back on-line. For example small filter systems exist that can provide water to family for one month at a cost of approximately $35 per unit). Potable water supplies through the use of ROWPUs should be made available to provide water for rural areas.
- The committee recommended that the USG consider educating Iraqis about the need to purify water collected from shallow wells. Dropping leaflets that describe the methods for rudimentary purification methods was suggested as well as the use of Radio and TV signals as channels for communication.
- The effort to educate should include a component to introduce the notion of conservation of water use for irrigation as well as for domestic use.
- Consider a moratorium on building dams and possibly demolish some of the dams that have been used to displace local & ethnic communities.
- Secure water sources (reservoirs, water tanks, and rivers) and purification plants. Consider the mobilization of small osmosis plants for the purification of water.
- Repair and upgrade sewage treatment plants and other points of contamination such as major industrial sites to reduce the potential for contamination of water table as well as river water.

Mid and short term projects

Following is a listing, again not in an order of priority, of projects that are considered to be lower on the priority list.

- An on-going program to monitor water quality and quantity of water reservoir throughout Iraq should be instituted.
- Assess the local capabilities and identify the proper training experience for capacity building. Subject to be covered are recent developments in integrated water management practices.
- Implementation of the marshes restoration project.

- Recommend Iraq join the Ramsar and other international environmental conventions.
- Declare the Marshes as a world heritage site.
- The new Iraq government should consider the implementation of a "Clean Water Act" that would encourage private and public industries and entities to ensure that wastewater is treated before releasing it into the rivers. This should include drainage water from irrigation, which may include high levels of salinity, animal waste, fertilizers, etc. More importantly, industrial hazards should be dealt with. This recommendation was also endorsed by the Environment Subcommittee.
- Restructuring ministries responsible for irrigation and agriculture into smaller more efficient units.
- Establish/refurbish a network for measuring water quality (and quantity) at various locations through out the country (depending on budgetary limitations).
- Establish Departments of Water Resources, with graduate students and research facilities in several universities in Iraq. Establish research and development centers at the Ministry of Water Resources and other centers and provide them with the latest journals and other scientific literature, as well as equipment for field and laboratory work.
- The USG should help provide laboratory and testing equipment (as well as protocols) for measuring/monitoring water parameters and for training Iraqi technicians to develop local capacity to properly maintain the equipment.
- Consider the use of remote sensing methods to study water quality data.
- Optimization of the distribution network and reduce the use of water for wasteful purposes is a must especially considering the long-term reduction in available water.

Long term projects

- Sharing water resources of the Euphrates and Tigris headwaters must be negotiated with Turkey and Syria. One short-term strategy to satisfy electrical needs of Iraq and water shortage in the Euphrates may be to have Iraq pay Turkey for electricity, which would satisfy the needs of Iraq for electricity and water as Turkey releases more water to generate electricity. This would by-pass the politically thorny issue of who owns the water, which would require years of negotiations.
- Long-term negotiations should not only be based on minimum water flow, but also minimum water quality.
- Implement basin-wide water resource assessment and management strategies. Bring water experts from Iraq to the US and other western countries to study Basin Wide water resources management strategies.
- Recycling of water should be included in the planning of water use.
- Steps should be taken to reconvene the technical committee for the tripartite treaty. Insure the variability of flow of water to "replicate the natural flow cycle".
- Convene a panel of Iraqi and international experts to assess the groundwater resources in Iraq. Study the use of groundwater aquifers to supplement water supply. Studies in the 1950's are available as a baseline to compare the developments over the past 45 to 50 years.

- Improve the efficiency of water use for through the introduction of spray irrigation and drip irrigation technologies.
- The committee suggests that water rights be addressed jointly with??? the Constitutional Framework Working Group. There is an opportunity to set water rights in Iraq on a scientific basis.

Agriculture Subcommittee

Agriculture is divided into 3 major areas: natural resources, animal production, and plant production.

Short term

Food security

- Importing beef, poultry, day old chicks, rice and grains to give immediate food relief, give hope for future.
- Import vaccines, nutritional supplements, and feed for livestock to eliminate/minimize diseases. Work with ICARDA and international agencies to spread programs countrywide.
- Import spare parts for agricultural machinery, irrigation pumps, and delivery systems to utilize existing equipment to enhance production.
- Improve seed quality and import disease resistant seeds in cooperation with ICARDA and other international organizations.
- Initiate model projects, model villages, with micro-credit programs to transition from subsidized system to self-sufficient (free-market) sustainable food security system. (Use Grameen {micro-lending in Bangladesh} model)
- Rehabilitate the apple, citrus, fruit, palm orchard industry to make it profitable.
- Assess drainage and soil salinity problems in order to accommodate a larger farming population.
- Assess and improve existing extension programs in regional agricultural research centers.
- Assess the state of veterinary sciences and make necessary recommendations for improvement.

Medium Term

- Formulation of a strategy to tackle the problems of deterioration and environmental pollution of plant cultivation and natural resources particularly salinity, desertification, contraction of the green belt project and foliage and declining agricultural density.
- Formulation of a strategy for examining the condition of rain-fed lands and their periodic exposure to draught and the impact it has on economic and social development.
- Formulation of programs for the development of the countryside and encouragement of stability and settlement.
- Reviewing administrative systems and laws that impede investment in the agricultural sector, encouraging the private sector and foreign investments to vitalize agricultural production and food security.

- Formulation of a food security strategy based on Iraq's natural resources and its regional and international relations.
- Reactivating scientific research and agricultural technology transfer and cooperation with international organizations, regional and international research centers.
- Assess the state of fishery industry in Iraq and encourage their growth.
- Establish separate ministries for water resources and agriculture.

Long Term

- Assess and evaluate current irrigation systems and plan for introduction of modern irrigation techniques
- Increase number of research and development centers that deal with improving animal and plant production industry.
- Assess and evaluate current crop and animal production, study feasibility of introducing new varieties.
- Increase production of forest tree-nurseries in order to support afforestation and reforestation programs.
- Educate rural population on benefits of new techniques.
- Assess and evaluate current agricultural research policies and introduce new policies as needed by consulting with stakeholders.

Environment Subcommittee

This subcommittee undertook the discussions related to the environmental issues of which it prioritized the immediate high-risk elements for protection of human health as urgent measures to consider immediately. Members of the subcommittee agreed on the following priorities:

Short-Term:

1. Conduct initial surveys on health and economy to assess broadly the scale of damage and immediate remedy.
2. Asking the U.S. Army Corps of Engineers to provide topographical and aerial photography maps which depict battlefield areas where there is a high likelihood of contamination in terms of WMD hit areas, as well as areas where conventional weaponry was utilized. In addition, provide maps that may assist with the initial plans to address oil spills and fires.
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B. Use the current UN ration distribution system or possibly airdrops to distribute water disinfection tablets, trash bags, gauze masks, and perhaps handheld transistor radios.
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E. Inform the public of the end of hostilities and when water and air are safe from contaminants.

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   A. Trucking solid waste.
   B. Cleaning up riverbanks and in dredging rivers.
   C. Clearing blocked roads.
   D. Sealing off contaminated areas.
   E. Extinguishing fires.
   F. Recovery of damaged vehicles.
   G. Creating green areas and national parks.
   H. De-mining of battlefield.
2. Establish a stand-alone Ministry of Environment which will handle all works in the field such as:
   I. Legislation
   J. Monitoring of contamination levels in industrial locations, landfill sites and waste disposal pits.
   K. Planning for future environmental projects.
   L. Setting standards for water, air, and soil qualities.
   M. Setting standards for car emissions, emissions from petroleum wells, refineries and other sources of air pollution.
   N. Remediation and reclamation of contaminated lands.

O. National weather forecast.

3. Assess the need of any future sites for solid and waste disposal and water treatment plants.
4. Rehabilitate the current water treatment plants and waste treatment plants, and conduct feasibility studies for building new ones.

PRESS RELEASE

On March 10 and 11th, a diverse group of Iraqi scientists and engineers met in Washington DC, as part of the Water, Agriculture and Environment Working Group (WAE). The meeting was hosted by the State Department, Future of Iraq project.

The WAE group developed plans for short and long-term projects regarding water, agriculture and environment issues in a post-Saddam Iraq. Short-term projects address the immediate aftermath of a change of regime. Long-term projects focus on the gradual rebuilding of Iraq.

Regarding the water issues, the group identified four immediate projects to be undertaken after regime change, these include securing water supplies and purification plants, distributing residential filters and disinfection tablets for the purification of water, educating the Iraqi people about the hazards of water collected from shallow wells and streams. Attention was paid to the fact that there is an immediate need to secure the dams that are under the control of the regime to prevent deliberate flooding downstream which may harm the people of Iraq. Longer-term projects include the restoration of the marshes of southern Iraq, studying basin wide resource management strategies, and recommending a moratorium on dam construction, which in some cases the regime has used to displace local communities by diverting water supply.

As for agriculture the short-term projects include plans for providing spare parts for agricultural machinery, irrigation pumps and delivery systems, supplying vaccines and nutritional supplements for livestock, seeds, initiating programs to attract and keep farmers, establishing model projects, and the revival of the apple orchards of the north and palm trees of the south that were systemically destroyed by the regime over the past 30 years.

The group discussed key areas of environmental monitoring and risk assessment to be conducted immediately after change of regime, including mapping sites of battle field contamination, determining quarantine areas for disposal of equipment and contaminated materials, creating a public awareness program and handling of hazardous equipment and materials, and providing mobile labs for water, air and soil testing and training Iraqis to operate them.

The members of the WAE group, who agree that the current regime has committed grave environmental, ecological and agricultural destruction, and look forward to the day when their expertise and knowledge will be used to help Iraqis rebuild their homeland.