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GLOBAL LAND AND WATER
MANAGEMENT:
PLANNING AND IMPLEMENTATION

Frans Doorman
Senior Consultant - Project Manager
DLV Agriconsult
Bennekom, The Netherlands

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Introduction: the problem

In large parts of the world, home to a majority of the global population, land and water use is neither ecologically nor economically sustainable. Inadequate agricultural practices and the cutting of forests cause erosion and other forms of soil depletion. Each minute, close to 20 acres of the world's agricultural land are lost. In 1991, 17% of the total vegetated area on earth was found to be degraded to a larger or smaller extent.¹ Twelve million km² - a surface larger than that of the U.S. and Mexico combined - has been affected so severely that rehabilitation is beyond the capacity of the individual farmer.²

The degradation problem is greatest in the developing countries. In India, for example, 800,000 km² is affected by erosion; six billion tons of topsoil is lost annually.³ Ethiopia loses one billion tons of topsoil each year. If current trends continue, over the next 25 years in this country alone, an area the size of former East Germany will change into desert.⁴

Yet erosion is also a problem in the rich countries. In England and Wales, 37% of the agricultural land is subject to erosion; some 4 billion tons of fertile top soil are lost each year. Similarly, due to inadequate management the wheat belt in Canada has lost half its organic material and continues to erode. In Australia, 23% of range and cropland is affected.⁵ According to the U.S. Department of Agriculture, in the U.S. one third of the total area used for crop production, some 430,000 km², suffers from unacceptable levels of erosion.⁶

In dry regions, erosion is followed by the formation of deserts. The United Nations Environment Program holds that 30% of the world's land surface is threatened by desertification. Three-quarters of this area, some 33 million square kilometers, are already moderately affected. If present trends continue the total area of arable land will be halved within a century. Already, the cost of land degradation in arid regions, in the form of reduced crop yields and livestock productivity, is huge: world-wide annual losses are estimated to run to more than \$42 billion. Losses in the more humid regions, including the U.S. corn belt and Europe's most productive regions, have yet to be estimated.⁷

Land is also lost to faulty irrigation practices. Excessive use of water, due to high losses before the water actually reaches the crop, causes salinization and water logging. The United Nations World Commission on Environment and Development has estimated that as a result, each year some 10 million hectares of irrigated land are abandoned.⁸ Salinization greatly

¹ Data from The United Nations Environment Program (UNEP) and the International Soil Reference and Information Center in Wageningen, the Netherlands.

² Brown, L.R., et al., 1994, *State of the World 1993: A Worldwatch Institute Report on Progress Towards a Sustainable Society*. W.W. Norton & Company, New York.

³ Goldsmith, E., and N. Hildyard, 1990, *The Earth Report 2: Monitoring the battle for our environment*. Mitchell Beazley, London.

⁴ Brown et al., 1994, *State of the World 1993*, op. cit.

⁵ Goldsmith & Hildyard, *The Earth Report 2*, op. cit.

⁶ Brown et al., 1994, *State of the World 1993*, op.cit.

⁷ U.N. estimates, cited in Brown et al., 1994, *State of the World 1993*, op.cit.

⁸ World Commission on Environment and Development, 1987, *Food 2000: Global policies for sustainable agriculture*. Zed books, London/New Jersey.

reduces agricultural potential, as many crops do not tolerate soils with a high salt content. The areas affected are large: for Argentina, for example, the Commission indicates that nearly 50% of the irrigated area has salinization problems. For Iran and Iraq, a figure of 40% is given; in the U.S., 25-30% of the total irrigated area is either threatened or already affected by salinization.⁹

The situation with regard to fresh water is at least as serious as that of land. In the mid- 1990 over 200 million people, living in 26 countries, faced water shortages. In parts of Canada, the U.S., China and India, current shortfalls will increase strongly in the near future. In Kansas, for example, lack of water is estimated to put 75% of existing crop land out of production by the year 2025. In parts of California, water shortages have led to limits being set on the growth of urban areas. In India, by the turn of the century water requirements are projected to exceed dependable supplies in every single state. Yet enormous amounts of water continue to be wasted: up to half the fresh water humanity uses is lost due to shoddy irrigation practices.¹⁰ According to the United Nations Environmental Program, by the year 2050, some 50 to 60 % of the global population will face water shortages.¹¹

The Global Land and Water Management Program

The proposed program consists of two consecutive phases:

1. The first, or Planning phase focuses on the development of the global land and water management plan, to be elaborated at world, regional, national and local level. The plan will focus on reaching a situation in which water and land are used in an ecologically sustainable, socially equitable and economically feasible manner.
2. The second phase will involve implementation of the plan, in the form of a range of large-scale projects, involving infra-structural development, hardware supply and knowledge management and transfer.

Phase 1: the Global Land and Water Management Plan

As indicated, the global land and water management plan will be elaborated at different levels, from global to regional, national and local, with the more detailed plans from the lower levels fitting into the more general designs at the higher levels. The key unit for planning will be the watershed – from that of the world's major rivers down to local tributaries. The plan is to be based on the ecologically and technically optimal use of land and water, but will at the same time take account of current land use and socio-economic conditions, as well as comparative agro-ecological and economic advantages for regions and countries. Participation of the local population in plan development, especially at the local level, will be a key component of planning procedures.

A key result of the planning exercise will be the design of a world-wide infrastructure for water management and land use, aimed at resolving current and expected shortages of water in a sustainable manner. Also, the infrastructure will aim to control flooding, among others by taking account of the possible effects of global warming. In addition to improved and where possible, increased water use for irrigation, a prime point of attention will be the protection and reclamation of soils through reforestation, terracing, drainage and other measures. Both will be

⁹ Goldsmith, E., and N. Hildyard, 1990, *The Earth Report 2*, op. cit., and Brown et al., 1994, *State of the World 1993*, op. cit.

¹⁰ Lester Brown et al. 1994 *State of the World Report*. World Watch Institute, Washington DC.

¹¹ *de Volkskrant*, September 24, 1997.

of major importance not only from an environmental point of view, but also for increasing food production and raising farm incomes in a sustainable manner, especially in poor countries.

The Global Land and Water Use Plan, then, will aim at three main goals: the optimal use of land and water from a viewpoint of ecological sustainability, the satisfaction of the global demand for agricultural, forest and other land-based products, and food security and acceptable incomes for rural populations. These goals should be reflected in an integrated framework for land use - from the global, via the regional and national to the local level. This framework will be developed in synergy with the above-mentioned design of a global infrastructure. Main goal will be to optimize agricultural production and other forms of land use by increasing productivity and profits as well as making such use ecologically sustainable. The planning for this framework should take into account not only technically optimal land and water use, but also current land use as well as comparative ecological and economic advantages for regions and countries. Moreover, it should be based on local, regional, national and international demand, and the need to maintain supplies of non-perishable products as reserves in case of major crop failures.

On the basis of the different-level land use plans it will be established which areas should remain under what forms of agricultural production, which land ought to be taken into production, and which should be given other uses, such as commercial forestry or natural vegetation. Also, the plans should specify all natural areas requiring special management and protection. For areas destined for agricultural production, broad outlines should be sketched of agricultural systems that will be sustainable from an ecological, economic and social point of view, taking into account current and future demand for agricultural products.

The final step in the elaboration of the Management Plan will be the elaboration of an action plan. At this stage again, participation of the future beneficiaries will be a determining factor, especially at the local level. However, an even more important element will be the factoring in of political realities. In several areas of the globe watersheds of major rivers include (parts of) several countries which, especially in case of an overall shortage, compete for water. Indeed, experts have mentioned that in the coming decades, the most likely reason for countries going to war with each other is the battle for access to fresh water resources - a likelihood that makes the elaboration of global and regional land and water use plans all the more urgent. The plans, therefore, should also establish, on the one hand, a fair distribution of water resources among different countries, regions and localities that share the same watershed. On the other, political reality would require that such a distribution also takes account of current usage, future needs, and the power and other relationships between the different parties involved.

Phase 2: Implementation

Implementation of the above-described Land and Water Management Plan will require a huge effort at all levels: from global to local. Particularly costly will be the construction of infrastructure to improve land and water use. Another major effort will be needed for training, education, agricultural extension and research for the conversion from unsustainable to sustainable farming methods and water management practices. Political and administrative measures, including the elaboration of legal frameworks and the creation of regulatory agencies will be needed to have land managers adjust their activities to local, regional and national land use plans. To a significant extent the latter are already in place in the most developed countries, but in most poor countries there still is a long way to go in this respect. All in all, implementation of the plan will require new levels of international co-operation, in a financial as well as an operational sense.

Executing agencies, timeline, funding

Phase 1: Planning

To elaborate the Plan a network will be formed of organizations operating at and across the different levels: from global to regional, national and local. Much of the information needed for elaborating the Plan is already available today, in the form of a wide range of studies and information bases at a host of different international and national organizations and institutes. These include regional universities and international research institutes as well as local organizations, both governmental and non-governmental. The proposed project will aim to collect all relevant already existing information, supplement it where needed with its own, and incorporate both into the Plan.

A central project office will be responsible for the overall coordination of the information gathering, processing and planning. An important additional task will be to provide technical and funding support for the regional partners in the network. Most important, the central office will be responsible of the elaboration of the global plan, and the fitting of the lower level plans into that plan.

In June 2001, an outline of a financing proposal for part of Phase 1 was presented to the European Community. This outline contained the suggestion to base the central project office in the town of Wageningen, The Netherlands. Wageningen is the seat of almost all major Dutch agricultural institutions involved in research, extension and academic training. The Dutch firm DLV Advisory Group (formerly the agricultural extension service of the Dutch government, privatised in the 1990's) was proposed as project manager. Technical input and management was to be provided by the relevant departments and institutes of Wageningen University Research (WUR, the result of a fusion between Wageningen Agricultural University and the strategic and practical agricultural research institutes of the Netherlands). Wageningen would thus come to form the core of a network of organisations to be set up and made operational via the many contacts of WUR with institutes, all over the world, involved in land and water management.

Phase 2: Implementation

Implementation of the Global Land and Water Use Plan will involve an enormous, concerted international effort - at all levels. International financing organisations with expertise in this field, notably the World Bank, could play a co-ordinating role. International aid, in the form of grants, loans, and technical assistance will be essential for poorer countries to carry out their parts of the Plan. The private sector, in particular the engineering, consultancy and construction sectors, will have a key role to play, as will national and international organizations with capacity in this fields.

Timeline, costs and funding needs

Planning phase

The detailed Elaboration of the Global Land and Water Use Plan will probably take up to ten years, at a cost of up to a hundred million dollars. This time and money will be spent only partly on actual data gathering, processing and planning. Indeed, the most costly and time consuming part will be to create the institutional capacity to elaborate plans at the national and local level, notably in the least developed countries. The corresponding institutional capacity will be created through technical assistance, hardware supply and training. Funding

for part of the first phase, to the extent of Euro 40.000.000, has been proposed to the European Community.

Implementation phase

The cost of Plan implementation will amount to several hundred billion dollars, to be distributed over a thirty to forty year time span. Most of this sum will go to the construction of infra-structural works. To be sure, several major construction works underway today, mostly with financing from international development banks such as the World Bank, would be incorporated in the Plan. Nevertheless, a huge additional amount of financing will be needed, for an important part in the form of grant aid, to allow the less developed countries to carry out their components of the Plan as well as create the institutional capacity for their medium and long term management.

Anticipated impact on economic development

Implementation of the Plan will lead to a huge, worldwide impetus for the construction, engineering and consultancy sectors. Moreover, especially in the poorer countries, there will be a double positive effect on economic development. First, demand for labor for the construction of the needed infrastructure will result in major employment and income generation for local populations. Second, infra-structural development and increased knowledge of land and water management will allow rural populations, and especially farmers, to raise production and incomes, with corresponding economic spin-off effects. In the short, run then, the activities related to project implementation, notably construction and land reclamation, will give a major impetus to local economies, especially in poorer countries. In the medium and long term the returns on these investments, in the form of increased production and productivity, will provide a basis for permanent economic growth.

Source

This contribution has been submitted by Frans Doorman, a manager and senior consultant at DLV Agriconsult, the international division of DLV Advisory Group. Doorman has a PhD in rural development sociology of the Agricultural University of Wageningen, the Netherlands. He has 20 years of experience in development co-operation for institutional development, rural development and natural resource management, mostly in Latin America, the Middle East and Africa. He is the author of the book *Global Development: Problems, Solutions and Strategy: a proposal for socially just, ecologically sustainable growth* (see the web site www.globalization.nl), as well as several scientific papers. He can be reached via e-mail at f.j.doorman@dlv.agro.nl.

Notes:

- ¹ Data from The United Nations Environment Program (UNEP) and the International Soil Reference and Information Center in Wageningen, the Netherlands.
- ² Brown. L.R., et al., 1994, *State of the World 1993: A Worldwatch Institute Report on Progress Towards a Sustainable Society*. W.W. Norton & Company, New York.
- ³ Goldsmith, E., and N. Hildyard, 1990, *The Earth Report 2: Monitoring the battle for our environment*. Mitchell Beazley, London.
- ⁴ Brown et al., 1994, *State of the World 1993*, op. cit.
- ⁵ Goldsmith & Hildyard, *The Earth Report 2*, op. cit.

- ⁶ Brown et al., 1994, *State of the World 1993*, op.cit.
- ⁷ U.N. estimates, cited in Brown et al., 1994, *State of the World 1993*, op.cit.
- ⁸ World Commission on Environment and Development, 1987, *Food 2000: Global policies for sustainable agriculture*. Zed books, London/New Jersey.
- ⁹ Goldsmith, E., and N. Hildyard, 1990, *The Earth Report 2*, op. cit., and Brown et al., 1994, *State of the World 1993*, op. cit.
- ¹⁰ Lester Brown et al. *1994 State of the World Report*. World Watch Institute, Washington DC.
- ¹¹ *de Volkskrant*, September 24, 1997.