Symposium Agriculture, Mauritius Chamber of Agriculture
Mauritius, 29-31 October 2003

RECONCILING AGRICULTURE AND ENVIRONMENT:
THE NEW CHALLENGE

Arnaud Comolet
UNDP-BDP Environment Policy Advisor
7 October 2003
# Table of contents

- **Introduction** ........................................................................................................... 3
- **Environmental impacts of agricultural activities** ......................................................... 4
- **Environmental impacts of agriculture: recent trends in industrialized countries** .......... 7
- **Agriculture-environment relationships in LDCs: the case of soil and water** ................. 9
- **The driving forces of environmental impacts in agriculture** ........................................ 10
- **The environmental incidences of agricultural policies** .................................................. 11
- **Agro-environmental policies** ....................................................................................... 12
- **Challenges for the future** ............................................................................................. 13
- **Conclusion** .................................................................................................................. 15

**Annex 1: Proposed framework for indicators of integration of environmental concerns into agricultural policy** .................................................................................................................. 18
Introduction

Agriculture plays a crucial role in sustainable development and in hunger and poverty eradication. It continues to be the main engine of economic growth of practically all developing countries. Over the past 30 years, agricultural productivity growth resulting from successful agricultural research and development meant food production in developing countries tripled, outstripping population growth.

Support to the agriculture sector suffered in recent years from a combination of waning public interest, declining investments, poor performance, and inappropriate policies. The 1980s and 1990s saw a precipitous decline in funding for this area as donors transferred resources to other sectors and as developing countries turned their interest elsewhere. However, there is a renewed focus on the imperative of broad-based rural development. In Africa for instance, governments have identified agriculture as a priority sector in the New Partnership for Africa's Development (NEPAD).

It is expected that the world’s population will increase from 6 billion to 10 billion by mid-century, and this will lead to greatly increased demands for food, primarily from developing countries. In the next half-century worldwide the agri-food industry will need to double its output to meet the expected increased demand for food, either by intensification or expansion.

To meet increasing food demand, agriculture has been evolving in many regions through an industrialization and/or intensification process characterized by farming practices using more agricultural chemicals, machinery inputs and knowledge. Technological and economic changes in the agricultural sector often resulted in depletion or degradation of the natural resource base, generating costs that are only now being realized. These environmental impacts are the cause of growing concern in many countries, and there is a general recognition of the need to enhance the beneficial, and reduce the harmful environmental impacts of agriculture, to ensure the sustainability of resources use, and to improve the environmental performance of agriculture.

It follows that future increase in food and other agricultural production will have to come mainly from sustainably intensified and more efficient use of natural resources. The challenge is whether agricultural activities can efficiently and profitably produce food to meet that growing world demand over time without degrading natural resources.

Reconciling the need for sufficient and safe food and environmental quality is therefore an outstanding task for the world community in the coming years.

---

Environmental impacts of agricultural activities

Agricultural activities make use of natural resources and in many regions have shaped the natural environment and landscapes. To produce food and non-food agricultural products agriculture uses natural resources, labour and capital under different farming practices that determine the potential environmental impacts. Worldwide, agricultural activities - land cultivation, freshwater use, irrigation, habitat encroachment through agricultural expansion- have transformed between one third and half of the earth land surface.

Agricultural activities have both beneficial (e.g. providing wildlife habitats, landscapes, and acting as a sink for greenhouse gases) and harmful impacts on the environment through changing the quality or the quantity of locally available natural resources, which are also the foundations of natural habitats, biodiversity and landscapes.

The most prominent harmful environmental impacts of agriculture include the loss of biodiversity and decline in important habitats and species, loss of landscape diversity and quality, water pollution and excessive abstraction levels, soil erosion, air pollution by ammonia and greenhouse gases and the use of toxic substances.

On the other hand, in many areas, specific types of agriculture over the centuries have played an important role in creating the site-specific biodiversity, soil properties and landscape amenities. Historically, features such as hedges, buffer zones and trees were created as an integral part of the management of agricultural production.
In industrialized countries, the most severe pressures tend to arise in the more intensively managed farmland (e.g. horticulture, arable production, lowland dairying and other livestock housed indoors). Conversely, low input systems, such as extensive grazing of livestock as well as traditionally managed, long-established orchards and olive plantation are closely associated with valued cultural landscapes and high nature value farmland. In LDCs, poverty, extensification and weak productivity are the major cause of environmental degradation.
Main categories of detrimental environmental impacts of agriculture are:

- Pollution (point source, diffuse);
- Land use (biodiversity/habitat losses or maintenance);
- Overuse of other natural resources (e.g. water, deforestation);
- Abandonment of land use (differentiated landscapes and related biodiversity, shaped by agriculture over centuries, can be harmed by the abandonment of land use);
- Food quality (nutritional quality of food).

More specifically main environmental impacts (beneficial/harmful) of agriculture are:

- **Impacts on soil**: damaging effects fall into three categories:
  - Physical degradation: erosion, desertification, waterlogging and compaction, moisture balance.
  - Chemical degradation: change in acidity, salinisation, contamination by pesticides, heavy metals, nutrient supply (nitrogen), etc.
  - Biological degradation: changes to micro-organisms and to humus content of the soil.

  At the same time, certain farming systems such as managed grazing, the presence of hedges and trees, and traditional rotating patterns, may be essential to maintain soil quality.

- **Impacts on water**:
  - Water quality: nutrients in run-off water (nitrogen and phosphates) which can lead to eutrophication of continental and marine waters, pesticides loading, sediment runoff and leaching, salinity.
  - Water quantity: irrigation consumption, use efficiency, water resource depletion (e.g. rate of replenishment of water table exceeded, change in flow of water courses), water retention capacity, flood prevention.

- **Impacts on biodiversity, wildlife and semi-natural habitats**: farm and indigenous animal and plans species (i.e. farm dependent biodiversity: many species are dependent for their life cycle on the continuation of farming practices), agriculture now extends to cover about one-third of the land surface and is the largest user of biodiversity, use of genetically modified organisms (GMOs).

In this regards, the main agents of changes are:

- Increased fertilization
- Land improvement, drainage, irrigation
- Increase specialization
- Lost of field margins and non-farmed habitats
- In discriminated use of pesticides
- Replacement of traditional practices
- Increased mechanization
- Abandonment of agricultural land which can have disastrous consequences.
• **Impacts on air quality**: emissions of dust, odors, pesticides, ammoniac (acidification) and greenhouse gas (methane, nitrous oxide), ODS (methyl bromide), absorption of carbon dioxide.

• **Impacts on rural landscape**: the physical landscape is inextricably linked to farming practices, which have shaped it. As with biodiversity, the landscape may be threatened by the abandonment of farming or by change of practices (tourist or recreational potential).

• **Impacts on food quality**: unsafe food, especially due to microbial contamination, is a major problem for domestic consumer and is a key issue in international market

**Box 1: Production-linked and non-production environmental services**

Farmers can provide:

**Production-linked environmental services** (e.g. landscape and water retention services provided by mountain milk production and rice paddy fields. In the first case, preserving specific agricultural habitats and associated landscape may be considered necessary for preserving tourism activity. In the second case, agricultural activity reduces flooding risks).

**Non-production linked environmental outputs**, goods and services provided through farmer’s own agricultural resources with a level of supply independent of any commodity production, by using unproductive land to manage wilderness areas or semi natural habitats, or preserving historic buildings and landmarks: the aesthetics value of farm buildings, stone walls, hedgerows, or hillside terrace, the provision of biodiversity and habitats through specific land management, including preserving land set-aside from commodity production with specific conservation practices attached to it).

**Environmental impacts of agriculture: recent trends in industrialized countries**

While some progress in reducing environmental harmful environmental impacts of agriculture has occurred over the last 10-15 years in industrialized countries, the environmental performance of agriculture has deteriorated in other cases. In many regions pollution levels are relatively high (e.g. nitrogen and pesticides loading in water) and various environmental risks persists (e.g. soil erosion, water resource depletion). In recent years there has been improvement in wildlife habitats, landscapes and sinks for greenhouses gases provided by agriculture.
There has been a decrease of over 10% in both nitrogen and pesticides\(^2\) use in many European Countries and Japan, and associated improvements in water quality and lowering gas emissions since the mid 1980s. Soil erosion rates have declined in Australia, Canada, and the United States, and progress has been made in adopting farming practices that enhance environmental performance, such as the shift to using nitrogen plans, integrated pest management and conservation soil tillage.

The environmental performance of agriculture has deteriorated with the expansion of farm production on a smaller area of land and the regional concentration of activities, such as livestock farming. In turn, this has resulted in higher levels of nutrients surpluses, ammonia and greenhouse gas emissions, with consequences in water and air pollution in some regions of Canada, Europe, New Zealand and USA. There is also growing competition for scarce water resources both between agriculture and other users and also for meeting the water needs of aquatic ecosystems for recreational and environmental purposes.

Improvements in technology and farming practices have led to a reduction in the use of inputs per unit volume of production.

There has been a continuous upward trend in agricultural water use in most industrialized countries since the early 1980s, associated with the increase in the irrigated land area. The expansion in the irrigated area has been encouraged in many countries by government investment in irrigation infrastructure and irrigation water subsidies. The price of water paid by farmers is often substantially below that paid by industrial and households users. As a result, a number of aquifers are overexploited

Reforms in the livestock sector have resulted in beneficial (reduced grazing pressures) as well as adverse effects (concentration of livestock herds).

Policy reform has also contributed to slowing down or halting the conversion of environmental fragile or ecologically valuable land to agricultural uses in industrialized countries. Shift out of crop production into grazing and forage production have taken place. The grass or tree cover established on erodible land as a result of such shifts has reduced soil erosion rates, and in some cases, has helped restore degraded land.

Change in land use have sometimes been encouraged by land diversion schemes, which have paid farmers to leave land idle, or to replace arable lands by less intensive forms of production, reverting back to nature or forests. Over time, incentives to remove the most environmentally sensitive or ecologically valuable lands from production have been introduced, and farmers have been required to make environmental improvements on the diverted land. As a result, the environmental quality of substantial areas of land has been improved, wildlife habitats has been created or restored, and the risk of nutrient leaching has diminished.

\(^2\) Recent decline in pesticide use may be partly attributable to the fact that more specific or concentrated active substances have been developed.
In some countries farming systems have been supporting a rich variety of flora and fauna as well as scenic landscapes that are valued by the population. Elsewhere, agricultural activities have been associated with land conservation, including avoidance of landslides and flooding. As such production systems would in some cases be unprofitable without support, there are concerns that such environmental externalities could be reduced if reform causes the associated agricultural activity to shrink.

While agriculture currently contributes only 8% of the total radiative-forcing of anthropogenic greenhouse gas emissions, it is a major contributor to nitrous oxide (N\textsubscript{2}O) and methane (CH\textsubscript{4}) emissions. The Inter-Governmental Panel on Climate Change has estimated that agriculture alone will account for 20% of the projected increase in anthropogenic radiative-forcing between 1999 and 2020-2050 if no change from the current trend occurs.

### Agriculture-environment relationships in LDCs: the case of soil and water

Agriculture is now and will continue to be a key sector for low-income countries and the poor who live there. In developing countries, 80% of export earnings come from the agricultural sector. About 70% of poor people in LDCs live in rural areas and depend directly or indirectly on agriculture for their livelihoods.

**Soil**

Arable land per person in developing countries has shrunk from 0.32 hectare in 1961/63 to 0.21 hectare in 1997/99 and is expected to drop to 0.16 hectare by 2030. At the same time, several processes are contributing to declining quality of land resources. Soil erosion is responsible for about 40% of land degradation world-wide, while 20-30% of irrigated land in developing countries has been damaged by waterlogging or salinity.

Nearly 40% of the world’s agricultural land experiences serious productivity reductions due to soil degradation, with rates up to 75% for some regions. Extreme poverty and hunger push people onto marginal lands and more fragile ecosystems characterized by drought stress and low soil fertility.

**Water**

According to the FAO, irrigated agriculture accounts for almost 70% of the global freshwater use. Due to inefficient irrigation systems, 60% of this water is then lost. Limited and unreliable access to water is a determining factor in agricultural productivity in many regions, a problem rooted in rainfall variability that is likely to increase with climate change. Today, huge losses in irrigation systems and poor water management practices worsen the water crises that already exist in many countries. Irrigation and poor drainage lead to salinization and waterlogging. Of the 260 million hectares of irrigated land world-wide, 80 million are affected by salinisation. Excessive extraction for
irrigation has lowered water tables to critical levels in many places (e.g. South Asia, Sub Saharan Africa and the Middle East). The use of pesticides and fertilizers in agriculture pollutes groundwater. Invasive species have covered huge water areas throughout, clogging irrigation channels, threatening infrastructure and leading to the collapse of fisheries.

Currently, the 17 percent of the world’s cultivated land that is under irrigation produces 40 percent of the food in the world. Much of the projected increased demand for food will have to come from improved and expanded irrigation, but this will be only a partial solution. Most irrigation systems are financially out of reach for the poor smallholders. Most food demand for poor people will come from areas where investment in irrigation makes no sense, with too little return from the significant capital needed. The major part of the crops produced worldwide is still grown in rain-fed agriculture and in order to improve the livelihoods of the farmers in the developing world, more emphasis must be put on employing practices that ensure higher yields per water input.

**The driving forces of environmental impacts in agriculture**

Environmental impacts arise as a result of farming activities of many kinds.

The environmental effects of farming activities are dependent on the local agro-ecological conditions and farm management practices, and there is no unique relationship between these activities and their effects. Moreover for some environmental effects there is incomplete knowledge and data to establish trends (e.g. groundwater pollution, change in farming practices and environmental outcomes, attributing the relative impact of agriculture on water pollution).

The effects on the environment are not only driven by policies but depend also on the development of markets and technical progress. There is a variety of driving forces which underlie farmers’ decisions, of which policy is one. Other important driving forces include changes in market conditions, technological development, changes in the wider economy, particularly the rising cost of labour, and a range of structural changes, or new consumer perceptions.

As far as policies are concerned, the agricultural policy has a central place, however the role of other policies including those covering land issues and tax, food safety and hygiene, social security and interest rates should not be overlooked.
The environmental incidences of agricultural policies

In several sectors there is evidence that agricultural policies have stimulated increased production with direct environmental consequences. These stem either from intensification and specialization.

Most industrialized countries have delivered substantial levels of production-linked support affecting resource use, farming practices and environmental quality. Agricultural support policies have induced changes in farming practices by encouraging increases in production through the use of agricultural chemicals, the drainage of wetlands in agriculture, or farming on environmentally fragile land, which have often reduced environmental quality. Support levels vary considerably across countries, and in many countries support remains high and based on output.

By the early 1990s, most industrialized countries had begun reforming their agricultural policies with the long run aim of reducing support and trade distortions, and in general making producers more responsive to market signals. A gradual reduction of market prices support and associated price distortions have occurred as a result of the agricultural trade liberalization associated with the implementation of the 1994 Uruguay Round
Agreement on Agriculture. These changes have the potential to influence the overall scale of agricultural activity, and its environmental impacts.

Over the long term, reforms in a number of countries have led to a small, gradual reduction in overall support to the sector and some shift from support based on output to other forms of support. Support to commodity market prices has decreased but still represents 68% of support to farmers, with payment based on output and on area (or headage) of specific commodities, and payments based on input use representing, respectively, 16 and 8% of support to farmers in 1999.

Many industrialized countries have been introducing a variety of policy measures to address environmental concerns. Some of them are shifting to policies less linked to production and implementing agri-environmental measures, which have the potential to reduce pressure on the environment.

By lowering output price support and input subsidies, shifting to policies that are less linked to production, and implementing agri-environmental measures, policy reforms have in many cases generated a double benefit: they have resulted in more efficient allocation of resources, and they have reduced pressure on the environment. They have lowered the demand for chemical and mechanical inputs, and have led to an extensification of crop production.

**Agro-environmental policies**

In industrialized countries, there has been a rapid increase in public agri-environmental expenditures during the 1990s.

In many countries farmers are obliged to meet the cost of meeting environmental goals, but there are cases where farmers are paid to reduce environmental damage, and in some countries farmers are required to undertake practices related to the environment for being eligible for support.

Agri-environmental measures aim at reducing the environmental harm or enhance the environmental benefits of farming activities. They cover ways of using agricultural land, which are compatible with the protection and improvement of the environment, the landscapes and its features, natural resources, the soil and genetic resources. They allow compensation to be paid to farmers facing a range of mandatory environmental standards (e.g. transition from headage to area payments for the beef sector)

That means that the demand for sufficient, safe and secure supplies of food and non-food agricultural productions is met in economically efficient and least trade distorting ways while societal values and issues are taken into account, with respect to the distribution of wealth and income.
Agri-environmental measures standards are current legally enforceable and measurable levels of environmental quality defined, for example, in terms of the levels of environmental loading (e.g. maximum level of nitrates in water), farming practices (e.g.; adherence to specific crop rotations or integrated pest management), or maintenance of habitats (e.g. minimum areas of semi natural grasslands, or density of specific plant species). It can be achieved through the adoption of appropriate technologies and practices or simply changing the level, type and location of agricultural production.

Agri-environmental measures appear to have been effective when the environmental objectives are clearly specified and the actions required by farmers are closely targeted to the objectives. Measures should be tailored to the environmental, economic and social situation prevailing in a given area. Agri-environment schemes have the flexibility to respond to the great variability in local conditions. They must be based on measures above the reference level of "good farming practice". Agri-environmental measures may have also been effective when farmer compliance is closely monitored and the effects on farming practices and the environment are continuously assessed against the stated goals, and training and advice are provided to ensure that farmers are sufficiently informed about the measures and the best ways to implement them.

However, payments to remunerate environmental benefits or compensate farmers for adopting practices to improve their environmental performance still account for only a small share of total transfers to producers.

**Challenges for the future**

The challenge is now to reconcile food production and environmental goals.

This means that particular attention should be given to identifying and scaling up good practice investments, such as soil fertility-replenishment based on agro-forestry and that the right balance between the role for market approaches and different forms of policy interventions should be found.

Here are examples of potential future reforms:

**Knowledge improvement and information dissemination**

- Better understanding, measuring and analysis of environmental effects of agriculture activities (sound classification framework, appropriate analytical tools, good information systems, agri-environmental indicators, see Annex 1).
- Monitoring and evaluating agricultural, agri-environmental, and environmental policies. Explore new methods for measuring the performance of agricultural practices that take into account contributions to the ecosystem.
- Analyzing the linkages between agriculture, trade and environment (e.g. sanitary and phyto-sanitary trade barriers).
Environmental mainstreaming into agricultural policies

- Enhance capacities, policies, legislative framework and institutions that promote sustainable practices and systems.
- Provide long term perspective on sustainable agriculture by identifying criteria of good practice.
- For those agri-environmental outputs that are externalities or public goods not charged or remunerated by markets, their provision also implies defining the policy parameters for developing the appropriate policy options. These include economic instruments (payment or taxes), regulations or voluntary approaches for encouraging farmers to adopt specified farming practices, as well as approaches for harnessing market forces and/or improving technology and information for the provision of environmental outputs.
- Policies must deal with issues of access, control and use of natural resources.
- Establish positive incentives (e.g. payment) or negative incentives/disincentives (e.g. tax)
- Public and private investment must be increased to manage the resources base, improve technical production efficiency and create enabling environment. The establishment of public/private allocation mechanisms would aim to internalize account for, and allocate costs and benefits, to try to maximize overall welfare.

Information dissemination

- Promote information exchange, networking and technology generation and dissemination related to best practices
- Promoting more ecological practices in agriculture at the local level by dissemination information on success stories around the world. Scaling up of proven technologies to arrest land degradation and improve soil fertility, water management and use practices.
- Better information, advice and training of farmers focused on the "public good" aspects of farming practices.

Enabling environment

- The rights and responsibilities of farmers regarding the adoption of technologies and practices need to be clearly defined (with associated property rights), and thus the circumstances under which they are either entitled to remuneration or obliged to pay.
- To achieve sustainable forms of agricultural production, farmers need to have clearly defined property rights, the right knowledge and motivation, access to available technologies, adequate financial resources, and receive appropriate signals (incentives and disincentives) for taking into account the externalities and public goods associated with their production.
- Farmers should be put in decision-making roles and make use of their knowledge of crops, production constraints and local ecosystems.
- Wider participatory approach involving a range of stakeholders: not only farmers, but also agri-food industry, consumer groups and NGOs with an interest in sustainable farming.
Research development

- Facilitating research: historically, research and development activities have been aimed at developing technologies which, by maximizing private profits, have contributed to a large increase in agricultural productivity and output, but which have not always been sustainable. To contribute to the sustainability of agriculture alternative technologies need to be both profitable and to improve the environmental performance of agriculture, thus helping to reconcile sustainable and profitable food production. Farmer should be engaged in the dialogue on technology adoption to generate a sense of ownership.

Market mechanisms

- Amending those market regimes which provide incentives for environmentally damaging forms of production.
- Include environmental considerations in marketing and food labeling. Developing markets for agricultural outputs produced under environment-friendly conditions (remuneration of environmental quality/product differentiation protected through labels, e.g. organic farming).
- Other market mechanisms: tax raising prices of pollution input.

### Box 2: Example of specific measures

- Soil: promoting soil fertility-replenishing practices (improved crop rotation, agro-forestry, organic agriculture, etc.).
- Water: increase the efficiency of water use and promote water pricing systems to discourage wastages, secure water rights, adoption of integrated pest management practices and eliminating pesticides subsidies
- Biodiversity: identifying synergies between the conservation of biodiversity and the increasing agricultural productivity, promoting agricultural practices which reduce pressures on forested areas and development of alternative livelihood opportunities for food insecure forest dependent
- Climate change: mitigation of GHG emissions by encouraging farmers to increase carbon stocks in agro-ecosystems, to improve nitrogen and water use efficiency and to improve soil organic matter, reduction of vulnerability and adaptation to climate change.

Conclusion

Agriculture is important in stimulating sustainable economic growth and rural employment, and it is the cornerstone for food security and poverty reduction. If rural poverty and hunger are to be reduced, increased outputs will have to come mainly from intensified and more efficient use of limited means of production. Therefore, reconciling food production and environmental goals is becoming a key challenge.
The international community should support measures that increase market access and reduce unfair competition for agricultural products (WTO). At the same time, action must be taken to arrest the destruction and degradation of the natural resource base, as this is increasingly becoming the barrier to increasing productivity.

Environmentally sustainable system of agriculture production means reducing environmental damages from farming activities, conserving natural resources, especially land and water, and contributing to the provision of environmental benefits such as landscapes, biodiversity, flood control and land conservation.

An integrated natural resources management approach that makes the best use of the natural resources and yet satisfies the goals of population is needed. The strategies for improving the sustainable use of natural assets include:

- Reducing land degradation,
- Improving water conservation, allocation and management
- Protecting biodiversity,
- Promoting the sustainable use of forest and natural habitats,
- Addressing the impacts of climate change.

However, there is no simple way of achieving environmentally appropriate farm management. Defining the ways of taking into account the environmental impacts of agriculture requires a case-by-case response in relation to the settings of the environmental targets and definition of environmental reference levels.

In addition, the combination of agricultural and environmental policy measures needs to be carefully designed and implemented to ensure coherence so that they improve environmental quality in the most cost-effective and transparent way, with least distortion to production and trade.

Environmental targets may be different among countries and regions, as well as the range of policy instruments to provide them. The diversity in agricultural production systems, legal traditions, and policy objectives may require different policy actions. Good farming practices are usually site and farm system specific. They depend on natural conditions, types of production systems, agricultural structures and social perceptions.

Provision of specific environmental outcome may be achieved by voluntary measures, regulation, payments or taxes. However, the global effect of those measures, such as the redistribution impacts or impacts on trade and competition, may be different (e.g. payment vs taxes).

It should also be stressed that individual measures to promote environmental integration under the agricultural policy cannot be considered in isolation. They must be compatible with realistic budgetary constraints and the wider objectives of the agricultural policy, concerning notably food security, farm products prices and farm incomes. There is a need to ensure the compatibility of environmental objectives with economic, social, trade and other international objectives.
Box 3: General principles for policy action

(1) Is there any evidence that there is a demand to enhance environmental benefits, and/or a need to reduce environmental cost currently generated by farmers?
(2) Is it technically possible and economically efficient to change current farming practices by more environmentally friendly farming practices?
(3) If yes, the desired environmental target levels (in terms of level of emission, farming practice, environmental output) have to be set and used as a basis for the necessary allocation of the associated costs and benefits
(4) Identify the best combination of policy instruments, in the light of the following criteria:
   - Economic efficiency
   - Cost-effectiveness
   - Flexibility
   - Enforceability
   - Transparency/fairness/equity
   - Policy compatibility
   - Political acceptability

Preconditions to the proper implementation of a long term sustainable agriculture policy are:
(1) improve the understanding and measurement of environmental effects of agricultural activities through agri-environmental indicators;
(2) undertake an inventory, review and assessment of policies and approaches addressing environmental issues in agriculture;
(3) draw together the analysis of the above issues to identify the characteristics of operational good policy practice.

The United nations, and UNDP more specifically, can play an important role by helping countries to put in place the enabling conditions and establish the normative framework that would encourage a better environmental mainstreaming into agricultural policies.

Box 4: The Drylands Development Center

UNDP addresses the particular needs of farmers and pastoralist in dryland areas through its Drylands Development Center (DDC) in Nairobi, which supports countries affected by desertification and drought in the implementation of the Convention to Combat Desertification. The centre supports National Action Programme processes with concept development and methodological guidance, technical backstopping, programme formulation, resource mobilization and capacity building.
### Annex 1: Proposed framework for indicators of integration of environmental concerns into agricultural policy

(Source: European Commission, 2000)

<table>
<thead>
<tr>
<th>Factors and responses influencing farming practices</th>
<th>Indicators</th>
<th>Data requirements</th>
<th>Key tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public policy</td>
<td>Area covered by AEP</td>
<td>Available in programmes and member state reporting on cross compliance</td>
<td>Aggregation of local data</td>
</tr>
<tr>
<td></td>
<td>Regional levels of good farming practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regional levels for environment targets</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area under nature conservation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market signals</td>
<td>Organic producer price premium</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td>Technology and skills</td>
<td>Holder’s training levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes</td>
<td>Area of organic farming</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td>Characteristics of farming practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Use</td>
<td>Average consumption of N and P fertilizers</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consumption of pesticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water use intensity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Energy use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use</td>
<td>Topological change</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cropping/livestock patterns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trends</td>
<td>Intensification/extensification/ specialisation/diversification/marginalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harmful and beneficial processes or agriculture?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution</td>
<td>Soil surface nitrogen balance CH4 emissions</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pesticide soil contamination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water contamination (directives/monitoring)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource depletion</td>
<td>Groundwater abstraction and water stress</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Land cover destruction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction of low genetic diversity species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefits</td>
<td>Area of high nature value grassland etc. Production of renewable energy sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site specific state</td>
<td>Species richness (birdlife richness)</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td>Natural resources</td>
<td>Soil quality</td>
<td>Sub-national data required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nitrates/pesticides in ground/surface water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground water levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global impact</td>
<td>Habitats and biodiversity</td>
<td>Aggregate indicator required</td>
<td></td>
</tr>
<tr>
<td>Natural resources</td>
<td>Share of agriculture in emissions, nitrate contamination, water use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape diversity</td>
<td></td>
<td>Further development work required</td>
<td></td>
</tr>
</tbody>
</table>

There are, however, areas in which the definition of operational indicators remains a major challenge (marked “*”). This is particularly the case for farm management, beneficial processes, landscapes, global habitat stock and biodiversity and landscape diversity. For these, appropriate indicators need to be defined on the basis of the considerable information that is currently available. Although a large amount of contextual information on factors and responses influencing farming practices is available, this needs to be further developed into a more complete set of coherent indicators. To date, little work has been done concerning the presence of genetically modified organisms, both as regards voluntary release and long-distance dispersion.
References


