

Environment and Agriculture

This key sheet is part of a series of awareness raising tools developed by Irish Aid to accompany its Environment Policy for Sustainable Development.



1. Introduction

This key sheet is part of a series of awareness raising tools developed by Irish Aid to accompany its Environment Policy for Sustainable Development. Key strategies for implementing the policy are:

- i) mainstreaming, where the environment is recognised as a critical part of sustainable development and is taken into account in all policies, programmes, activities and funding decisions; and
- ii) partnership, where Irish Aid works with national governments, multilateral organisations, international agencies and civil society organisations to contribute to sustainable development.

The first step in mainstreaming is to understand how the environment is linked to the development challenge or sector YOU are responsible for. In this key sheet, we describe the links between the environment and agriculture, and suggest sources of additional information. More detailed guidelines on mainstreaming environment into our agriculture support will be produced at a later date.

The environment matters to agriculture because:

- > It provides the basis for food and agricultural systems.
- > Agriculture can have positive (e.g. conserving habitat for wild species) or negative (pollution, soil degradation) impacts on the environment.
- > Environmental degradation and lack of access to environmental assets undermines food security and deepens poverty, with women and children most affected.





Farmer Abra Rejani in his barley field, Kunchamedeb village, Ethiopia.

2. The environmental basis of food and agricultural systems

Agriculture uses about a third of the world's land surface and depends directly on the wider environment for its existence and sustainability. Sunlight, water, nutrients and a diversity of plants, animals and microbes all play fundamental roles in agricultural production and — ultimately — global food security (Box 1).

Farmers, herders and fishermen can often make the best use of their environment through special, locally adapted, agricultural systems. These systems dictate their choices of crops and livestock, land and water management practices, production systems and local institutional arrangements.

Local knowledge about the environment is crucial in this regard. Farmers in Nigeria, for example, know that the variegated grasshopper severely damages their cassava crops after all their other crops have been harvested. To limit the damage, farmers replant maize and random clusters of sorghum on their cassava plots until harvest time. This conscious manipulation of crop diversity is an important indigenous method of pest control.¹

Box 1 Biodiversity's role in agriculture²

Agricultural biodiversity refers to the variety of living species that are important to agriculture. It comprises the diversity of genetic resources (e.g. different varieties and breeds) and species used in agriculture directly or indirectly, including species that support production (e.g. soil organisms and pollinators) and broader ecosystems within which agriculture takes place (e.g. pastoral, forest and aquatic), as well as the diversity of these agro-ecosystems themselves.

As part of the living environment, agricultural biodiversity plays key roles in: decomposition and nutrient cycling; natural pest control; soil conservation; pollination and seed dispersal; local and global climate; the water cycle; and biomass production.

1 Altieri 1998

2 FAO 1999b

3. Agriculture's impacts on the environment

Agriculture can either sustain or degrade the environment. The Millennium Ecosystem Assessment³ has documented agriculture's main negative effects on land and freshwater, as well as the importance of agricultural landscapes in providing products for human sustenance, supporting biodiversity and maintaining ecosystem services. Negative impacts include:

- > Conversion of forests, grasslands and other habitats for agricultural use
- > Degradation of soil quality (20 per cent of African soils are seriously degraded⁴)
- > Pollution of soil and surface water, aquifers and coastal wetlands through excessive or inappropriate use of pesticides and fertilisers
- > Significant loss of crop and livestock genetic diversity through the spread of industrial monocultures, reducing resilience in the face of climate and other changes — Mexico, for instance, has lost over 80 per cent of its maize varieties since 1930, while native barley is suffering severe genetic erosion and durum wheat is being lost in Ethiopia.⁵

Negative impacts are particularly closely associated with intensive agriculture, which affects the environment through high-energy consumption and the polluting effects of inputs such as pesticides and fertilisers. The energy required for irrigation, farm machinery and the production of fertiliser results in large greenhouse gas emissions, which contribute to climate change.

However, agriculturalists are also the custodians of much of the world's rural landscapes and of the biodiversity represented by hundreds of thousands of crop and livestock varieties.⁶ Agricultural systems, both modern and traditional, that rely on ecosystem management rather than the external inputs of intensive farming can sustain the environment.

African polyculture systems — which grow a variety of different crops on the same piece of land — are a case in point. They are used in at least 80 per cent of the cultivated area of West Africa, and are often highly biodiverse. As a result, they can be a way of conserving valuable crop and livestock diversity as well as effectively suppressing pests and boosting nutritional values.⁷ Food and agriculture systems can be designed to

3 Millennium Assessment 2005

4 IFPRI 2000

5 FAO 1996

6 FAO 1999a

7 Okigbo and Greenland 1976

enhance both the provision of ecosystem services and human well-being.⁸

Sustainable agriculture can be achieved by maintaining healthy soils; reducing water pollution; increasing the number and variety of wild species on farms (e.g. soil organisms, pollinators and pest-control agents); maintaining crop and livestock diversity; and being energy efficient, thereby cutting emissions of carbon dioxide to reduce global warming (see Box 2).

▾ Box 4 Sustainable agriculture

Poor farmers can more than double their yields and raise their incomes by adopting resource-conserving practices.⁹ A study looked at the introduction of such practices in more than 12 million farms in 57 developing countries, mostly in Africa. On average, farmers increased their yields by 79 per cent. Elements of sustainable agriculture include:

- > Rotating crops to increase soil fertility
- > Growing “cover” crops along with main crops to reduce water runoff
- > Integrated pest management — which favours ecological pest control over pesticide spraying
- > The use of livestock manure for fertiliser
- > Planting legumes, which boost nitrogen levels in the soil
- > Using windbreaks and contour farming with appropriate borders to conserve soils and water
- > Breaking the soil only where seeds are to be planted, because ploughing entire fields can degrade soil and lead to erosion.

4. Loss of environmental assets can undermine food security and deepen poverty

The FAO¹⁰ estimates that there are 854 million hungry people in the world. Some of the many interrelated causes of hunger are rooted in the way environmental assets (e.g. land, water, seeds) are controlled, managed and marketed.

8 Millennium Assessment 2005

9 Pretty *et al.* 2006

10 FAO 2006

4.1 Inequitable access to natural resources for agriculture

A significant cause of hunger and environmental degradation is local people’s loss of access rights to natural resources such as land, water and trees. Their lack of control severely reduces the incentive to conserve these resources, and undermines local food and livelihood security. In most developing countries, the poor have no secure tenure over their “own” land and this, along with colonial land grabs and the displacement of farming people from fertile to marginal lands with poor soils or inadequate rainfall, has led to environmental degradation. In some countries the progressive incorporation of these people into poorly paid seasonal workforces for export agriculture — a practice only slightly modified in the post-colonial period — means the landless and near-landless remain hungry and poor.

4.2 Erosion of environmental assets important for food and agriculture

The intensification of agriculture and introduction of technologies such as pump irrigation and chemical pesticides can generate new environmental problems and even increase food insecurity.

Declining diversity

Wild food resources (seeds, leaves, roots, wild animals) harvested in agricultural and forested areas can provide important food reserves, particularly for vulnerable groups such as women and children. Often, selling such resources can yield a better income than local wage labour.¹¹ In southern Africa, for example, the value of day-to-day consumption of wild food sources is worth around US\$800 million per year, according to the recent Millennium Ecosystem Assessment.¹²

Agricultural intensification, with its emphasis on commodity crops, often erodes these resources by promoting improved crop varieties and monocultures and increasing the use of pesticides, which can kill wild food resources. In the process, indigenous knowledge on the use of wild foods, and agricultural practices important for preserving biodiversity, can be lost. Indigenous knowledge is often extensive: the agropastoral Tswana of Botswana, for instance, can easily respond to shifts in the abundance of local food sources because of their vast knowledge of local plant and animal food sources — they consume 126 plant and 100 animal species.¹³

The Global Crop Diversity Trust, which Irish Aid has invested in, aims to conserve and make available as many crop varieties as it can, principally by supporting the development and upkeep of ‘seed banks’. The Trust focuses in particular on seed or gene

11 IIED 1995

12 Biggs *et al.* 2004

13 Grivetti 1976

banks in the developing world where insufficient funding and skilled manpower are placing the long-term viability of the banks at risk. The seeds the banks conserve are likely to play a critical role in recovering from future natural and manmade disasters.

Competition for water

Policies and credit support for the spread of deep, motorised bore wells for irrigated cash crops such as sugarcane have created water scarcity for the poor as underground aquifers have been sucked dry in many parts of dryland India. A similar situation exists in parts of dryland Africa where land is used for growing vegetables and other export crops that rely on irrigation for their production.

Energy and climate

The energy costs of the global food and agricultural system are increasing. The carbon emissions of each link in the industrial food chain from seed to plate — including the production of inputs such as fertiliser and pesticides — all contribute to climate change, notably through transport (“food miles”). The social and ecological costs of climate change are potentially higher for poor people in coastal environments and drylands. Coastal areas are at risk from rising sea levels and drylands are already vulnerable to climate variability and extreme events (see Climate Change key sheet).

4.3 Market forces can promote environmental degradation and poverty

Most conventional economic assessments undervalue or ignore environmental “goods and services” such as water and soil fertility partly because it is hard to assign them a value (see Biodiversity key sheet). This then leads to overuse or misuse and degradation.

Globally traded food is increasingly processed and sold by transnational corporations to meet the desires of relatively wealthy, urban consumers. This often forces farmers worldwide to comply with demands for standardised environmental management regimes and uniform food production (such as European Union Regulation 2257/94, which stipulates shape, minimum length and diameter for bananas). The lack of markets for most traditional crops means they are unable to remain part of agricultural landscapes, leading to a loss of biodiversity.

Current market prices for both commodity crops (e.g. coffee and vanilla) and basic staples (e.g. millets and sorghum) do not reward farmers for sustainable environmental practices. As a result, environment and agriculture-based livelihoods are being undermined on an unprecedented scale as market prices fail to cover production costs. Ways of addressing this in international trade include supply management agreements and the removal

of unfair barriers such as subsidies that encourage food dumping on local markets (see Environment and Trade key sheet).

5. Mainstreaming environment in food and agriculture systems

Sustainable agriculture requires methods of conserving resources that are developed, used and governed by local organisations, with support from external research and development institutions. These actions can help achieve the Millennium Development Goals for hunger alleviation and environmental sustainability by integrating consideration of the environment into food and farming:

5.1 Draw on local knowledge and modern science

Major investments are needed to improve our rudimentary knowledge of the relationships between environment and agriculture, and to share this learning with different actors.

Such research, combining methods from the social and natural sciences, should include historical analyses and draw on the knowledge of local farmers and resource users. There is a strong rationale for democratising the production and dissemination of knowledge in an age of uncertainty by directly involving “extended peer communities”,¹⁴ which include farmers, herders, forest dwellers, fishermen and other rural people (Box 3).

Box 3 Extended peer communities

— ‘Ethiopian farmers lead research’

Irish Aid supports a farmer-led operational research programme in Ethiopia. Consortia in Tigray and the SNNPR region of the country, made up of farmers, NGOs, universities, agriculture research centres and government departments (food security and the bureau of agriculture and natural resources), work together to find practical solutions to the challenges faced by farmers. The programme is challenging as it aims to make the farmer the driver of the research agenda and to ensure that academics, policymakers and practitioners work together to find sustainable solutions to farmers needs. Research to date has focused on soil and water conservation, new plant breeds, innovative farming techniques and land tenure.

5.2 Strengthen local organisations and federations of producers

Local groups and organisations are important in facilitating collective action, coordinating the management of food systems and their environments, and sharing labour and costs. As such they need to be strengthened and empowered (Box 4).

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Local adaptive management

Local organisations are well placed to monitor and adapt to environmental change. This is important because of the great spatial and temporal variation within and between agricultural environments. This complexity emphasises the need for flexible responses, mobility and adaptive resource management in which local farmers, pastoralists, fishermen and forest dwellers play a central role.¹⁵ Platforms that bring relevant actors together are key in building capacity for social learning, negotiation and collective action.¹⁶

IIED's work with pastoralists in East Africa, supported by Irish Aid, is helping build their capacity to engage with the policy processes that affect their lives. The project trains leaders of these communities and other advocates in effectively arguing for pastoralism as a livelihood and an integral part of policy design and implementation.

More democratic governance

Federated organisations are important in influencing policy by representing the concerns of small-scale food producers. These organisations need increased capacity to frame and advocate policies, and to strengthen communication and alliances between themselves (see Environment and Governance key sheet).

5.3 Enhance local capacity

Official and non-governmental support agencies need to shift from implementing projects to promoting local people's development. This process should strengthen local institutions and enhance local people's capacity to take part in planning, management, governance and evaluation. However, as well as training staff at such agencies personnel in these approaches,

there must be a broader transformation of institutional mechanisms, cultures, financial management, and reporting systems, among others. Without this, it is unlikely that the mainstreaming of participatory approaches and environment into agriculture will succeed.¹⁷

5.4 National and international policies

By raising some of the issues below in international fora and at the national level in agriculture sector programmes, Irish Aid can influence the future impacts of agriculture on the environment.

> Strengthen local rights and security of tenure

Sustainable agriculture and the alleviation of hunger require agrarian reform and an equitable redistribution of rights to access resources such as land, water, forests and seeds. Such reforms need to distinguish between territory and land, and consider the rights of indigenous peoples to autonomy in their territories. Policies will need to balance the diverse needs of these and other groups, including farmers, pastoralists, forest dwellers, fisherfolk and people who settle on marginal lands — such as those with poor soils.¹⁸

> Encourage national policies for sustainable agriculture

Global food security relies on sustaining the environment and the ecological processes that underpin agriculture. National policies are needed to ensure political commitment, incentives, and to build educational and institutional capacities to promote sustainable agriculture. Approaches include integrated pest, crop, nutrient and soil management, as well as land-use planning. The current overemphasis on genetic engineering techniques must be balanced by approaches that are based on agro-ecology and landscape ecology as well as cultural and biological diversity.

> Reform trade policies, markets and economic incentives

The mainstreaming of environmental sustainability into food and agriculture will require systemic reforms of trade policies, markets, taxation, subsidies and economic incentives. These must reinforce the UN Convention on Biological Diversity, the UN Framework Convention on Climate Change, Agenda 21, the Millennium Ecosystem Assessment and the FAO's Right to Food Guidelines of 2004,¹⁹ rather than contradict or actively undermine them (see Box 5).

¹⁷Bainbridge *et al.* 2000

¹⁸ICARRD 2006

¹⁹www.fao.org/righttofood/

¹⁵Gunderson, Holling and Light 1995

¹⁶Borrini-Feyerabend *et al.* 2004

➤ Box 5 Key principles for trade and market reforms — Forum for Food Sovereignty²⁰

At the Forum for Food Sovereignty in Nyéléni, Mali, in February 2007, some 500 farmers, pastoralists, landless peoples and others met to discuss 'food sovereignty' — the notion that farmers should be in control of what they farm and how they farm it. A set of key principles was agreed at the forum:

- > The priority of agricultural production should be to feed people locally.
- > Economic development should be promoted in rural areas by creating circuits of production and consumption by buying inputs and selling produce at local markets.
- > Countries should have the right to protect themselves from low-priced food imports.
- > International trade should be better regulated, and distortions resulting from dumping removed.
- > Multilateral agreements on supply management are needed to restrict the overproduction of commodity crops and ensuing low prices on world markets.
- > The power of transnational corporations in the global food system must be curbed through multilateral agreements and cooperation.

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Useful websites

- ➔ Agenda 21 www.un.org/esa/sustdev/documents/agenda21/index.htm
- ➔ Food and Agriculture Organization (FAO) www.fao.org
- ➔ FAO: The Right to Food Guidelines www.fao.org/righttofood/
- ➔ Centre for Information on Low External Input and Sustainable Agriculture www.leisa.info
- ➔ Consultative Group on International Agricultural Research (CGIAR) www.cgiar.org
- ➔ IIED: Sustainable Agriculture, Biodiversity and Livelihoods (SABL) www.iied.org/NR/agbioliv/index.html
- ➔ Millennium Ecosystem Assessment www.millenniumassessment.org/en/index.aspx
- ➔ UN Convention on Biological Diversity www.cbd.int
- ➔ UN Framework Convention on Climate Change <http://unfccc.int>

²⁰See the website of the Forum for Food Sovereignty at www.nyeleni2007.org.