Wetlands and Agriculture

Relevance of Good Agricultural Practice and Wetland Management Guidelines for harmonizing the Wise Use of Wetlands and Agriculture

Wageningen International

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agriculture, nature and food quality

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1. Introduction

The Conference of Contracting Parties to the Ramsar Convention meeting in 2002 in Valencia adopted Resolution VIII calling for guidelines to enhance the interaction between agriculture, wetlands and water resources management.

Resolution VIII.34 requests among others to establish a framework for identifying, documenting and disseminating good agriculture-related practice and to use that framework for the possible development of wetland type specific management guidelines to:

- enhance the positive role that sustainable agricultural practices may have vis-à-vis the conservation and wise use of wetlands;
- minimize the adverse impacts of agricultural practices on wetland conservation and sustainable use goals; and
- include examples based on wetland-type specific needs and priorities that take into account the variety of agricultural systems.

As a first step towards the development of these guidelines a scoping document[1] on agriculture-wetland interactions was produced and published. This scoping document explores the nature of wetland-agriculture interactions through the application of the drivers, impacts, pressures, state changes, impacts and responses (DPSIR) framework.

The main conclusions of the scoping document are:

- Ecosystem services tend to be skewed towards provisioning services at the expense of regulating, supporting and cultural services.
- Main drivers operating towards the over-exploitation of ecosystem services are natural resource dynamics, market demands and government policies.
- To design response strategies aimed at balancing ecosystem services the DPSIR analyses need to be conducted in detail for each site and case.

The scoping document further concludes that site specific guidance is needed to address the loss of ecosystem services through over-exploitation of provisioning services.

In view of this the scoping document proposes the following response strategies:

- Reduce pressures from agriculture and negative state changes and impacts by diversifying provisioning services.
- Diversify demands on wetlands so that different ecosystem services can generate income especially through Payment for Environmental Services (PES).
- Manage basin level land use to facilitate the maintaining of ecosystem services.
- Make agricultural services more sensitive to ecosystems and their requirements.
- Redirect the drivers of change to meet specific needs in ways that do not create negative state changes.
- Any combination of these strategies.

[1] Scoping Agriculture Wetland Interactions; FAO Water Report 33, Rome 2008

The scoping document recommends a number of actions to move to sustainable agriculture-wetland interactions including diversifying the provisioning services, diversify demands on ecosystem services from wetlands, manage basin-wide land use and make agriculture more sensitive to ecosystems and their services. These activities need to be undertaken *in situ* and at basin scale. However, for these actions to be applied, knowledge needs to be developed in a number of areas, especially:

- Determine the carrying capacities of wetlands under different agro-ecological and socio-economic conditions in order to identify the ecological bounds for different provisioning uses;
- Identify Good Agricultural Practices (GAPs) in wetlands or basins for agriculture as the primary provisioning service, practices to address negative pressures and state changes (especially for indirect agriculture-wetland interactions) and maximize production in a sustainable manner;
- Identify GAPs for secondary provisioning services, where agriculture is assigned a secondary role in a wetland and is subservient to regulating or cultural services – primarily for *in situ* interactions;
- Develop regulating services, especially hydrological ones, as the primary ecosystem services in wetlands;
- Enhance biodiversity and cultural services as a secondary livelihood support or supplement to the income for wetland agriculture.

Additionally the scoping document recommends compiling a compendium of guidelines for Good Agricultural Practices (GAPs) for *ex situ* and for *in situ* interactions where agriculture is assigned either a primary role or a secondary role.

The following document presents the outcomes of a first analysis of guidelines for Good Agriculture Practice. This first analysis has found no Good Agriculture Practice guidelines that differentiate between *in situ* and *ex situ* situations; the guidelines analyzed are applicable to both situations.

For the purpose of this research an internet search has been conducted using the terms: “good agriculture in wetlands”, “responsible water resource management on farm level” “wetlands and agriculture” etc. The analysis has been carried out on a global, regional, national and local scale.

The main conclusion of the first analysis is that the development of Good Agriculture Practice guidelines to support sustainable wetland – agriculture interactions need to be based on the ecosystem services that are assigned to a specific wetland.
The study of good agricultural practices (GAPs) found that these are driven by consumer concerns (particularly food safety concerns) and are not explicitly intended to maintain or restore ecological condition. Very few make specific reference to wetlands. The study concludes that there is already a wealth of information available. The only real example of environmental policy driving change in agricultural practices is the EU Water Framework Directive. In general however the GAPs studies do contribute to achieving better environmental conditions (including improved water quality) and access to GAPs is required to support decision-making. It is recommended to use the methodology applied in

the EU Water Framework Directive to formulate guidelines for GAPs that support sustainable agriculture-wetland interactions.

The designation of primary, secondary and tertiary services to be provided by a wetland needs to take place at a basin level and can vary between provisioning, regulating, cultural or supporting services. In every case be it *ex situ* or *in situ*, the scope and intensity of agriculture need to be harmonized with the other eco-system services assigned to the wetland. This is in line with the recommendations of the Comprehensive Assessment [2] which focuses on the provisioning services and the need to make them ecologically sensitive, with attention to agro-ecological opportunities, multiple-cropping systems, and achieving diversity within agricultural landscapes.

In order to avoid overlap with existing guidelines and avoid inventing the wheel again existing guidelines of the Ramsar Convention plus other processes and agreements relevant to balance the relation between agriculture, ecosystem management, water resource management have been analysed. The result of this analysis is presented in chapter 7.

2 Direct and Indirect Interactions.

As indicated above Agriculture Wetland interactions can either occur in *situ* or *ex situ*. Direct interactions that occur *in situ* include among others growing rice in rice paddies, aqua-culture, agriculture in flood plains, agriculture on peatlands, and (dairy) farming in the fen meadows in North Western Europe. The impact of *in situ* agriculture differ from complete transformation of wetlands (some types of aqua culture) to forms of agriculture that are adapted to the a-biotic and biotic conditions the specific wetland offer like harvesting natural resources produced by the wetland. Good Agriculture Practice Guidelines are relevant for *in situ* agriculture as they often provide guidance to the use of nutrients and pesticides and to sustainable use of water resources.

Indirect interactions of agriculture take place at a basin level outside the wetlands and include water abstraction, nutrient pollution, erosion, pollution with residues of pesticides and other chemicals, sedimentation, changes in the water dynamics and changes in ground water levels.

The scoping document presents the following theoretical model for the various interactions.

[2] Comprehensive Assessment of Water Management in Agriculture. 2007. *Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture* London: Earthscan, and Colombo: International water Management Institute.

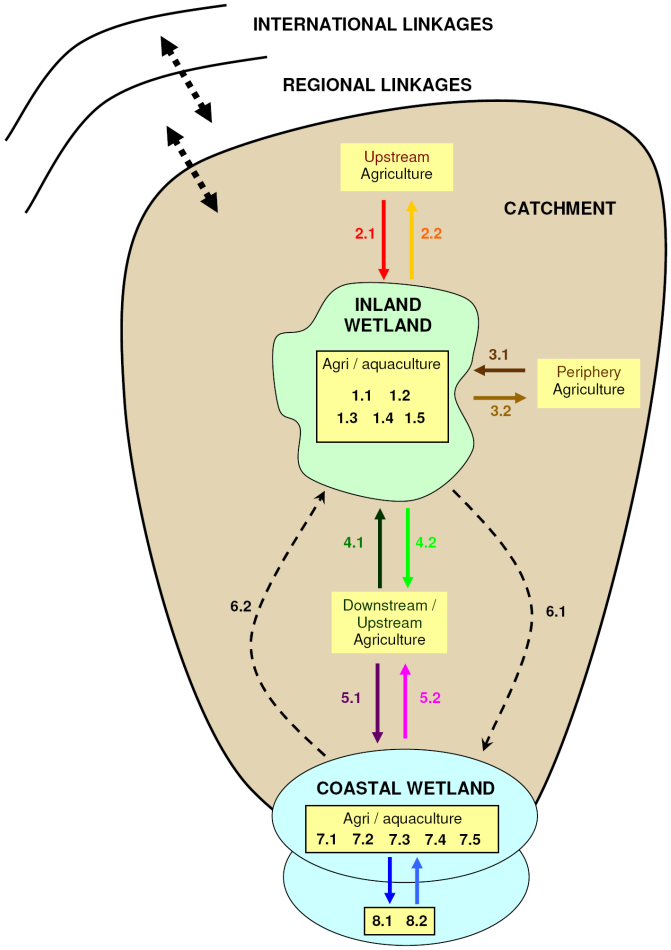

Figure 1

KEY to Figure 1

1. Wetland Agriculture (DIRECT In situ) interactions
   - 1.1 Complete transformation of wetland ecosystem to agricultural use
   - 1.2 Partial transformation of wetland ecosystem to agricultural use
   - 1.3 Agricultural use of wetlands without transformation of ecosystem (e.g. limited / sustainable eco-agriculture).
   - 1.4 Enhancement of wetlands / creation of additional wetlands (often used for agric)
   - 1.5 Reversion to natural wetland

2. Upstream Agricultural activity (INDIRECT) interactions (from distant catchment)
   - 2.1 Upstream agricultural activity influencing wetland ecosystem & wetland agric downstream
   - 2.2 Wetland ecosystem influencing upstream agricultural activity

3. Periphery Agricultural activity (INDIRECT) interactions (from local catchment)
   - 3.1 Periphery agricultural activity influencing wetland ecosystem (e.g. irrigation water, fringe drainage)
   - 3.2 Wetland ecosystem influencing periphery agricultural activity (e.g. flooding)

4. Downstream Agricultural activity (INDIRECT) interactions
   - 4.1 Downstream agricultural activity (incl. wetland agric) influencing wetland upstream (or wetland agriculture upstream)
   - 4.2 Wetland ecosystem influencing downstream agricultural activity (e.g. flooding, constant supply of water, water purification)

5. Coastal-Upstream Agricultural activity (INDIRECT) interactions
    5.1 Influence of immediately upstream (wetlands & non-wetland agric) on coastal wetland
    5.2 Influence of coastal wetland on upstream non wetland agricultural activity

6. Coastal wetland – inland wetland (INDIRECT) interactions
    6.1 Influence of inland wetland (natural or altered by agric) on coastal wetland
    6.2 Direct influence of coastal wetland (natural or altered by agric) on inland wetland

7. Coastal Wetland Agriculture (DIRECT / In situ) interactions
    7.1 Complete transformation of wetland ecosystem to agricultural use
    7.2 Partial transformation of wetland ecosystem to agricultural use
    7.3 Agricultural use of wetlands without transformation of ecosystem (e.g. limited / sustainable eco-agriculture).
    7.4 Enhancement of wetlands / creation of additional wetlands
    7.5 Reversion to natural wetland

8. Coastal Wetland Agri / aquaculture – other coastal wetlands (INDIRECT) interactions
    8.1 Influence of adjacent / upstream coastal wetlands
    8.2 Coastal wetland aqua / agriculture influencing adjacent coastal wetland functioning

Source: Scoping Agriculture Wetland Interactions; FAO Water Report 33, Rome 2008.

3 Good Agricultural Practices

GAP guidelines for *in situ* agriculture like aqua culture, rice production and cattle breeding in wet meadows and floodplains were not taken into consideration in this study. Besides the negative impact agriculture might have on the ecological services of wetlands also examples of positive agriculture wetland interactions exist. In these circumstances agriculture is adapted to the conditions of the wetlands and these specific forms of agriculture have often “produced” specific biodiversity and landscape features which are worthwhile to protect. For instance the high diversity of meadow birds in the fen meadows in the Netherlands is related to the specific agricultural use of these meadows. The protection of the breeding habitat of these meadow birds can only be maintained if the traditional agricultural use on which the presence of these meadow birds relies can be continued. With the increasing value attributed to biodiversity and cultural historic services agriculture is nowadays often assigned a secondary role and is subservient to protecting the landscape and biodiversity while farmers get paid for the “production ‘of meadow birds.

According to the FAO the term Good Agricultural Practice can refer to any collection of specific methods, which contribute to desired goals. However, these goals can be very diverse and often are not well-defined and explicit resulting in many competing definitions of what methods constitute “Good Agriculture Practices” Hence, whether a practice can be considered “good” will depend on the standards applied. Each country or even each region can design its standards for Good Agricultural Practice based on the specific features of agriculture and the physical and social environment in which the agricultural activity takes place.

According to the FAO GAP applies available knowledge to addressing environmental, economic and social sustainability for on-farm production and post-production processes resulting in safe and healthy food and non-food agricultural products. Many farmers in developed and developing countries apply GAP through sustainable agricultural methods such as integrated pest management (IPM), integrated nutrient management (INM) and

conservation agriculture. These methods are applied in a range of farming systems and scales of production units, as a contribution to food security and environmental protection, facilitated by supportive government policies and programs.

As much as possible the guidance on good agricultural practice has been analysed per farming system focusing on the interaction of the given farming system with the specific wetland types.

The following two criteria were applied to determine whether a Good Agricultural Practice was relevant for inclusion into the research/data base:

- The information presented on the farming system
- The relevance for water resources and wetlands

3.1 Integrated Pest Management

Integrated Pest Management is one of the possible methods of Good Agriculture Practice and is aimed to prevent the leaching of residues of pesticides to ground – and surface water.

Integrated Pest Management (IPM) is an environmentally sensitive approach to pest management that relies on a combination of concepts. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

IPM takes advantage of all appropriate pest management options including, but not limited to, the judicious use of pesticides. In contrast, *organic* food production applies many of the same concepts as IPM but limits the use of pesticides to those that are produced from natural sources, as opposed to synthetic chemicals.

IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls. In practicing IPM, growers who are aware of the potential for pest infestation follow four-tiered concepts or steps. The four steps include:

1. Set Action Thresholds
Before taking any pest control action, IPM first sets an action threshold, a point at which pest populations or environmental conditions indicate that pest control action must be taken. Sighting a single pest does not always mean control is needed. The level at which pests will either become an economic threat is critical to guide future pest control decisions.

2. Monitor and Identify Pests
Not all insects, weeds, and other living organisms require control. Many organisms are innocuous, and some are even beneficial. IPM programs work to monitor for pests and identify them accurately, so that appropriate control decisions can be made in conjunction with action thresholds. This monitoring and identification removes the possibility that pesticides will be used when they are not really needed or that the wrong kind of pesticide will be used. See also for identification of pests:

3. Prevention

As a first line of pest control, IPM programs work to manage the crop to prevent pests from becoming a threat. In an agricultural crop, this may mean using cultural methods, such as rotating between different crops, selecting pest-resistant varieties, and planting pest-free rootstock. These control methods can be very effective and cost-efficient and present little to no risk to people or the environment.

4. Control
Once monitoring, identification, and action thresholds indicate that pest control is required, and preventive methods are no longer effective or available, IPM programs then evaluate the proper control method both for effectiveness and risk. Effective, less *risky* pest controls are chosen first, including highly targeted chemicals, such as pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. If further monitoring, identifications and action thresholds indicate that less risky controls are not working, then additional pest control methods would be employed, such as targeted spraying of pesticides. Broadcast spraying of non-specific pesticides is a last resort.

3.2 Integrated Crop Management

Integrated Crop Management applies for a part the same techniques as Integrated Pest Management but has a wider focus and focuses more than IPM on maintaining healthy soil conditions, encouraging natural pest predators, and establishment of crop and soil conditions that suppress pest, disease and weed development. It among others promotes crop rotation as a way to achieve healthy soil conditions. ICM includes the use of more selective chemical pesticides, more precise application techniques, improved biological control methods, disease resistant crop varieties, more reliable pest, disease, weed, and nutritional forecasting, rapid diagnostic methods for plant diseases and establishment of natural habitats for natural enemies of pests.

3.3 Agri-environmental indicators

For each of the cases the (potential) impact of the guidance on the following agri-environmental indicators taken from OECD publications on the subject is analysed. The OECD distinguishes the following indicators:

- Soil
- Water
- Air
- Biodiversity
- Landscape and ecosystem functions

Some remarks:

1. OECD uses the Driving Force-State-Response (DSR) framework as used in the scoping document. This framework takes into account the specific characteristics of agriculture and its relation to the environment; the consideration of agriculture in the broader context of sustainable development; and the work already underway in OECD Member countries and other organizations. The DSR framework consists of a vast array of human-environmental interactions, as illustrated in Figure 1, involving different feedbacks and linkages. For example, soil sediment run-off

from agricultural land into river systems may impair recreational activities such as fishing, although the rivers (i.e. the natural system) may easily be able to absorb the sediment.

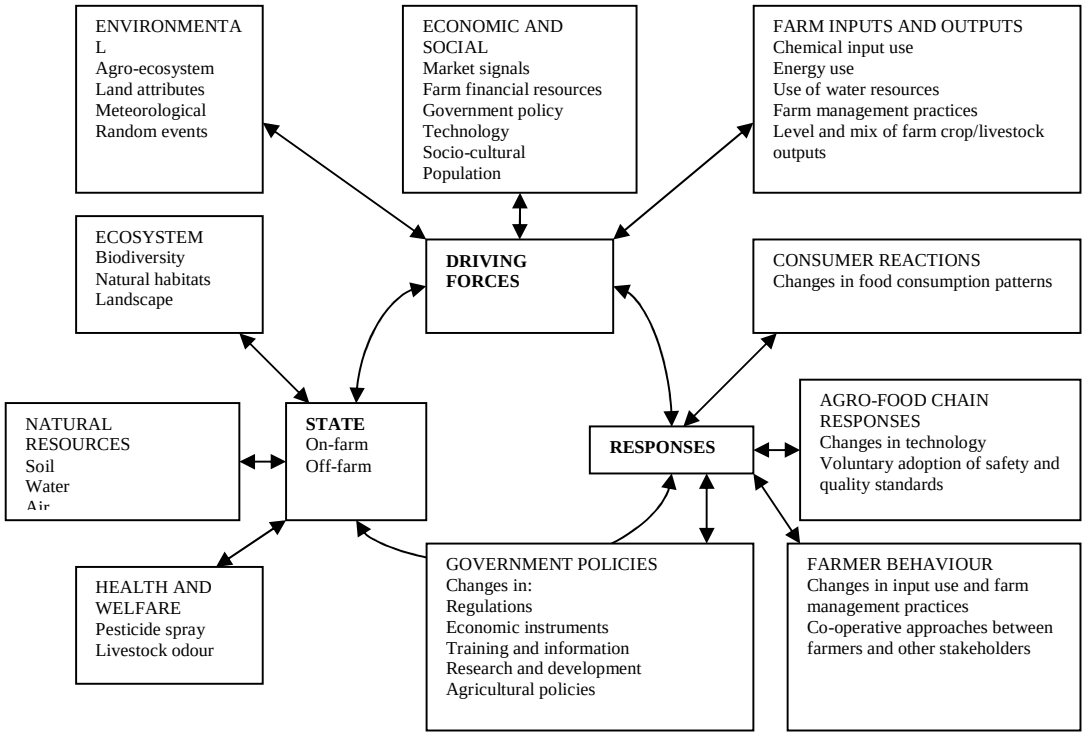

Figure 2: The OECD Driving Force-State-Response framework to address agri-environmental linkages and sustainable agriculture

2. Indicators in Figure 2 may refer to on-farm and off-farm effects of agriculture. Agriculture-wetland interactions probably mostly concern off-farm effects of agriculture, except when agriculture itself is wetland agriculture (e.g. rice, aquaculture systems).
3. Note that conceptual model of agriculture-wetland interactions used in the Scoping Document (Figure 1) is partly based on spatial arrangements, distinguishing between *in situ* interactions and interactions caused by upstream/downstream/periphery activities. Interactions defined by OECD are organized around 'Themes', such as Soil, Water, Air, Biodiversity, etc.

Wetland types.

The analyses also aimed to make an assessment of to what extent the given GAP's were relevant for specific wetland types. Because the GAP's identified were too generic and never wetland specific, this appeared to be impossible.

4 Recommendations

The analysis of the selected GAP guidelines shows that although a lot of attention is given to the relation of agricultural activities with the qualitative and quantitative aspects of water in none of the cases identified specific reference is made to the protection and wise use of wetlands.

It goes without saying that guidelines aiming to reduce the use of water, to limit the use of pesticides and insecticides and to make farmers aware of the sound processing and application of fertilizers and chemicals support sustainable water resource management and have a positive impact on the quality of the wetlands downstream.

It is however recommended to continue collecting and analyzing GAPs with a focus on Integrated Pest Management, Integrated Crop Management and Integrated Nutrient Management in view of its specific application for wetlands. It is recommended to extend the analyses to *in situ* agriculture. It is recommended to process these guidelines into a database and make this data base available for decision makers and wetland managers across the world to support sustainable wetland-agriculture interactions. (See 6)

GAPs are often voluntary and developed by farmers organisations, supermarket chains or food processing industries to address consumer concerns about the quality of food and the environmental impact of agriculture. In many countries GAPs are laid down in legislation and regulations.

Protecting and promoting diverse landscapes including healthy wetlands is an important contribution to sustainable agriculture as diverse landscapes provide habitat for natural pest predators. Also healthy soil conditions with rich soil biodiversity may help to suppress pest and disease development. More selective chemical pesticides and more precise application techniques reduce the leaking of residues to ground and surface water.

None of the guidelines identified provide the wetland specific guidance needed to balance the agriculture and agricultural water use with the protection and wise use of wetlands. GAPs do not per se contribute to the protection of wetlands as GAPs do not regulate the extent of agriculture taking place. In other words; if agriculture expands into wetlands while applying GAP the result will still be that the wetlands are being destroyed. The impact of agriculture on wetlands is a result of the extent of the activity and the intensity per unit area.

Based on this first and incomplete analysis it is concluded that there is a need for guidelines with specific reference to the protection and wise use of wetlands. The scope of these guidelines should relate to the interactions shown in figure 1 and should be wetland type specific and for each of the interactions presented.

In order however to be specific more information about the resilience of the various wetland types is required which requires information about the biological, chemical and physical characteristics per wetland type. Given the wide variety of wetland types across

the world it is first of all needed that these characteristics are set per wetland type per (global) eco-region. Based on these characteristics thresholds can be set which provide guidance to the monitoring of the quality of wetlands and provide a tool for designing measures to balance ex situ agricultural use with the protection and wise use of wetlands.

The methodology applied in the EU Water Framework Directive to assess the ecological status of water bodies provides useful guidance on how to assess the resilience of wetlands. The aim of the EU Water Framework Directive is to achieve "Good Ecological Status" of all water bodies[3]. In the frame of the Water Framework Directive the EU countries have to come up with a typology of all water bodies and for each of these types of water bodies the biological and chemo-physical characteristics are defined. In order to define "Good Ecological Status" of these water bodies reference water bodies are identified and their biological and chemo-physical parameters are described. Based on the comparison of the reference water body and the situation in a specific water body measures need to be designed to achieve "Good Ecological Status". This includes measures to balance agriculture with achieving the "Good Ecological Status".

The method needs to be adapted to wetlands and to the application in other part of the world but it is worthwhile to test the applicability as a method to assess the resilience of wetlands and define the services to be provided without destroying the key characteristics. It is recommended to start this process in a selected number of basins in which various wetland types are present and agriculture is an important form of land use.

5 Selection of GAPs

Introduction

In the following section a selection of Good Agriculture Practice Guidelines relevant for wetland management is presented. These GAP's have been identified based on an inernet search using terms "good agriculture practice" ,"wetlands" and "water resources management"

Selection of GAPs

Name: The Code of Good Agricultural Practice for the Protection of Soil
Reference: http://www.defra.gov.uk/farm/environment/cogap/pdf/soilcode.pdf
Level: National-UK
OECD theme: soil
Farming systems: generic
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
This Soil Code (the Code of Good Agricultural Practice for the Protection of Soil) is a practical guide to help all farmers and growers avoid causing long-term damage to the soils which they farm. The Code also provides general guidance on practices which will maintain and increase the ability of soil to support plant growth. It complements advice given in the Water Code and the Air Code (the Codes of Good Agricultural Practice for the Protection of Water and of Air) and the Code of Practice for the Safe Use of Pesticides on Farms and Holdings. Focus is on England.

Name: The Code of Good Agricultural Practice ('the Code') for the Prevention of Pollution of Water
Reference: http://www.ruralni.gov.uk/cogapwaterpoll_cmb.pdf

[3] The EU has published a guidance document on the relation between Wetlands and Water bodies.

Level: National-Northern Ireland (?)
OECD theme: water
Farming systems: generic
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
The Code of Good Agricultural Practice ('the Code') for the Prevention of Pollution of Water is a practical guide for farmers, growers, contractors and others involved in agricultural activities. The Code covers the main agricultural activities that can give rise to pollution of water. It describes some of the management practices that can be adopted to minimise the risk of causing pollution. Focus is on England.

Name: Sustainable Agriculture Standard
Reference: http://www.rainforest-alliance.org/agriculture/documents/SAN_Sustainable_Agriculture_Standard_%20February2008.pdf and
http://www.rainforest-alliance.org/agriculture.cfm?id=standards
Level: farm level
OECD theme: soil, water, landscape, biodiversity, air
Farming systems: 100 crops, especially annual vegetables and perennial plantation crops
Wetland type: not specified
Prescriptive/voluntary: prescriptive
Summary:
The Sustainable Agriculture Network (SAN) is a coalition of independent non-profit conservation organizations that promote the social and environmental sustainability of agricultural activities by developing standards. The Certification Organism certifies farms that comply with SAN's standards. SAN fosters best management practices across agricultural value chains by encouraging farmers to comply with SAN standards and by motivating traders and consumers to support sustainability.

Name: Development of Good Agricultural Practice to improve food safety and food quality in Indonesian vegetable production
Reference: http://documents.plant.wur.nl/ppo/agv/hortin.pdf
Level: Indonesia
OECD theme: soil, water
Farming systems: vegetables
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
This is a report of a research project aimed at the development and testing a certifiable protocol for the improvement of safe production and product quality of vegetables in Indonesia. This report describes the development of GAPs for vegetable production in Indonesia in cooperation with farmers, traders and government.

Name: Integrated Farm Assurance (IFA) Standard – GLOBALGAP (formerly EuroGAP)
Reference: http://www.globalgap.org/cms/front_content.php?idart=34
Level: Global?
OECD theme: soil, water, landscape, biodiversity, air
Farming systems: crops, livestock and aquaculture farms
Wetland type: not specified
Prescriptive/voluntary: prescriptive/voluntary
Summary:
GLOBALGAP (formerly known as EUREPGAP) has established itself as a key reference for Good Agricultural Practices (G.A.P.) in the global market place, by translating consumer requirements into agricultural production in a rapidly growing list of countries – currently more than 80 on every continent. The new GLOBALGAP standard version integrates all agricultural products into a single farm audit. Producers of different crops and livestock can now avoid multiple audits to meet various

market and consumer requirements. The website contains a series of documents to apply the standard for one product.

Name: Guidelines for Good Agricultural Practice (GAP) of Medicinal and Aromatic Plants
Reference: http://www.inaro.de/Deutsch/ROHSTOFF/industrie/HEILPFL/GAPengl.htm
Level: EU
OECD theme: soil, water
Farming systems: cropping systems
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
The guidelines for »Good Agricultural Practice of Medicinal and Aromatic Plants« are intended to apply to the growing and primary processing of all such plants as traded and used in the European Union. Hence, they apply to the production of all plant materials used in the food, feed, medicinal, flavouring and perfumery industries. They also apply to all methods of production including organic production in accordance with the European Union regulations.

Name: The Code of Good Agricultural Practice for the Protection of Air
Reference: http://www.defra.gov.uk/farm/environment/cogap/pdf/aircode.pdf
Level: National UK
OECD theme: air
Farming systems: livestock
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
This Code of Good Agricultural Practice for the Protection of Air (Air Code) is a practical guide to help farmers and growers avoid causing air pollution from odours, ammonia and smoke, or from greenhouse gases which cause global warming. It will help you to minimise and dispose of your wastes in ways which reduce the risk of causing nuisance or annoyance from air pollution.

Name: Sustainable tea
Reference:
http://www.unilever.com/Images/es_2003_Sustainable_Tea_Good_Agricultural_Practice_Guidelines_for_small_farmers_tcm13-5308.pdf
Level: Global?
OECD theme: soil, water, landscape, biodiversity
Farming systems: tea production
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
This guide is produced under the Unilever Sustainable Agriculture Initiative to provide some guidance on the farming practices which will support sustainable tea production. Sustainable agriculture is productive, competitive and efficient, while at the same time protecting and improving the natural environment and conditions of local communities.

Name: Guide to dairy good farming
Reference: http://www.fao.org/docrep/006/y5224e/y5224e00.htm#Contents
Level: Global?
OECD theme: soil, water,
Farming systems: dairy farms
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
This guide attempts to provide a generic framework for individual on-farm quality assurance programmes, focusing on both consumer safety and the image of the dairy sector. The objective of the guide is to provide a farmer-orientated guide to practices that are achievable all over the world

covering those areas that are essential to manage. The approach taken in this guide is to: (1) highlight relevant areas on dairy farms that need to be managed; (2) identify the objectives in dealing with each of these areas; (3) identify GAP; and (4) suggest control measures that can be implemented to achieve the objectives.

Name: The Code of Good Agricultural Practice for the Prevention of Pollution of Water, Air and Soil
Reference: http://www.ruralni.gov.uk/code_of_good_agricultural_practice_2008_cmb-3.pdf
Level: National Northern Ireland -UK
OECD theme: soil, water,
Farming systems: mainly dairy farms but also pollution due to pesticides is addressed
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary:
The code is for farmers, growers, contractors and others involved in agricultural activities. This code is about how you can help to avoid polluting water, air and soil. It sets out good management practices you can use on farms. Focus is on Northern Ireland and EU legislation.

Name: The Combat against Desertification and the Conservation of Water: The Zai system of Water Harvesting in Mali
Also known as **Saai** (Burkina Faso); **Tassa** (Nigeria, Morocco, Sudan); conservation farming (Zambia)
Reference:
http://www.iwmi.cgiar.org/africa/West/projects/Adoption%20Technology/RainWaterHarvesting/23-Zai.htm
Level: Sub-Sahara
OECD Theme: soil, water
Farming system: dry land farming, crops.
Wetland type: not specified
Prescriptive/voluntary: Voluntary (indigenous)
Summary:
The Zai system of water harvesting is a method whereby farmers dig little potholed in the soil which store and retain rainwater and which at the same time are used to seed or plant their crops in. It is popular in the sub-Saharan region and has proven to be an effective method to overcome periods of drought.

Name: Water Quality Guidelines; New Zealand and Australia
Reference: http://www.mfe.govt.nz/publications/water/anzecc-water-quality-guide-02/index.html
Level: National
OECD Theme: Land, Water Biodiversity
Farming system; mainly dairy farming
Wetland type: All inland wetland types
Prescriptive/voluntary: Voluntary
Summary:
The Water Quality Guidelines are used as a set of tools to assist regional and state governments in assessing and managing water quality. The guidelines should be modified and tailored to local conditions in accordance with the responsibilities and requirements for water resource management on the local level. Possible actions include the elaboration of Action Plans for water management in dairy farming in cooperation with farmers organisations.

Name: Water Wise on the Farm, England.
Reference: http://www.environment-agency.gov.uk/commondata/acrobat/geho0307blvhepweb_432285.pdf
Level: national
OECD Theme: Land, Water

Farming system: all farming systems
Wetland type; not wetland specific
Prescriptive/voluntary: Voluntary
Summary:
The “Water Wise on the Farm” guidelines outlines five simple steps for carrying out a water audit and developing a water management plan. The aim is to reduce the loss of water in agriculture and to reduce the loss of soil, nutrients and other farm inputs as diffused pollution by analyzing the water use at farm level and make water use accountable. This can be done by conducting a water audit.

Name: Swedish Campaign to Enhance Water Quality; Focus on Nutrients; Sweden
Reference:
http://www.sjv.se/home/amnesomraden/cropsenvironmentwater/actionprogrammeforreducingnutrientlosses.4.d1afd31104979e5ae80003562.html
Level: National
OECD Theme: Land and Water
Farming system; dairy farming, crop farming.
Wetland Type; Not wetland specific
Prescriptive/Voluntary: Voluntary
Summary:
Focus on Nutrients is the largest single undertaking to reduce the losses of nutrients to air and water from agriculture. It is a joint venture between the Swedish Board of Agriculture, the County Administration Board and the Federation of Swedish Farmers. One of the key issues is to set up farm based nutrient balances. Part of the campaign are trainings and study tours.

Name: The Flood Preventive Function of Paddy Fields and Rice Cultivation
Reference: http://www.maff.go.jp/inwepf/en/about/sap2005.htm
Level: International
OECD Theme: land and Water
Farming system; Rice farming (Paddy fields)
Wetland type: Not specific
Prescriptive/voluntary: Voluntary
Summary
The Flood Prevention Function of Paddy Fields and Rice Cultivation highlights the important role well managed paddy fields play in replenishing ground water and in preventing erosion and land slides. It has been demonstrated that abandoned paddy fields have a lower permeability and thus abandoned paddy fields are a contributing factor to increased flooding problems and increased chances of land slides and soil erosion. The International Network for Water and Ecosystem in Paddy Fields promotes sustainable management of paddy fields combined with the ecological services paddy fields provide.

Name: The Water Framework Directive
Reference: http://ec.europa.eu/environment/water/water-framework/index_en.html
Level: International (EU)
OECD: Water, Land. Biodiversity
Farming system; all farming systems but mainly dairy farming, vegetable and crop production
Wetland type: all wetland systems
Prescriptive/voluntary: Prescriptive
Summary:
The Water Framework Directive aims to maintain and/or restore the good ecological status of all surface water bodies across the EU by setting quantitative and qualitative thresholds for the bio-chemical and physical parameters of water bodies. Each EU member state has to set thresholds for good ecological status per type of water body. Per catchment an Integrated Basin Management Plan has to be elaborated including a program of measures that sets out how the good ecological status has to be achieved before 2015. A separate guidance document on the relation between Wetlands and the Water Framework Directive is available.

http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidance_wetlands/_EN_1.0_&a=d

Name: Common Agricultural Policy (CAP)
Reference: http://ec.europa.eu/agriculture/publi/capexplained/cap_en.pdf; http://eur-lex.europa.eu/en/legis/latest/chap_03_split01.pdf
Level: International (EU)
OECD: Land, Water and Biodiversity
Farming system: dairy farming, arable mainly
Wetland type: not specified; all wetland types
Prescriptive/voluntary: Prescriptive for EU countries
Summary:
Agri-environment schemes are part of the CAP and they encourage farmers to provide environmental services which go beyond following good agricultural practice and basic legal standards. Aids may be paid to farmers who sign up voluntarily to agri-environment commitments for a minimum period of five years. Longer periods may be set for certain types of commitment, depending on their environmental effects. It is obligatory for Member States to offer such agri-environment schemes to farmers.

Name: Agriculture, Water and Ecosystems
Reference: www.swedishwaterhouse.se
Level: Global
OECD theme: Water
Farming system: not specified
Wetland type: not specified
Prescriptive/voluntary: voluntary (policy recommendations)
Summary:
The Swedish Water House in collaboration with among others IWMI and SIWI has produced a policy brief with a set of recommendations to enhance the balance between food production and the availability of water. One of the main recommendations is to look at the resilience of ecosystems and set critical thresholds for the functioning of ecosystems and their provision of a variety of ecosystem services in order to prevent irreversible shifts. The solutions and recommendations presented will be considered by looking at (1) local scale ecosystem-oriented approaches, (2) catchment-scale approaches, and (3) strategic management.

Name: Guidelines for Sustainable Manure Management in Asian Livestock Production Systems
Reference: http://www-pub.iaea.org/MTCD/publications/PDF/TE_1582_web.pdf
Level: Regional (Asia)
OECD theme: soil, water, air
Farming systems: intensive livestock systems
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary: This manual includes information about trends in livestock production and animal manure management in Asia, systems approach to sustainable manure management, production and composition of manure, manure management during housing and storage, processing and handling of manure to reduce pollution and improve nutrient utilization, field application and utilization of manures, and the main conclusions and recommendations from an experts meeting. The manual is aimed at all levels of administrative and technical personnel involved in the management of manure in livestock systems and environmental sustainability in Asia.

Name: Sustainable Soil Management
Reference: http://attra.ncat.org/attra-pub/PDF/soilmgmt.pdf
Level: National (USA)
OECD theme: soil
Farming systems: arable
Wetland type: not specified

Prescriptive/voluntary: voluntary
Summary: This publication covers basic soil properties and management steps toward building and maintaining healthy soils. Part I deals with basic soil principles and provides an understanding of living soils and how they work. Part II covers management steps to build soil quality on your farm.

Name: Protecting water quality on organic farms
Reference: http://attra.ncat.org/attra-pub/PDF/om-waterquality.pdf
Level: National (USA)
OECD theme: water
Farming systems: arable
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary: This publication discusses practices in organic farming that protect and practices that fail to protect water quality. Organic farmers can use the guidelines provided to modify management to suit their soil, climate, and farming conditions.

Name: Code of Practice for Nutrient Management (with emphasis on nutrient use)
Reference: http://www.fertresearch.org.nz/default.aspx
Level: National (New-Zealand)
OECD theme: soil, water
Farming systems: not specified
Wetland type: not specified
Prescriptive/voluntary: voluntary
Summary: This Code of Practice considers fertiliser use within the broader context of nutrient management. With this approach, a nutrient budget is the basis for developing a nutrient management plan. This Code assists in achieving that, placing the planning within the context of a farm management system. It is primarily intended as a guide for nutrient advisers and consultants, but is also useful for land managers (farmers and growers) who want to know more about nutrient management planning and the best nutrient management practices for their production system.

Name: Managing Agricultural Resources for Biodiversity Conservation: A Guide to Best Practices
Reference: http://www.ukabc.org/agbioguide.pdf
Level: Global
OECD theme: biodiversity, landscape and land ecosystem functions
Farming systems: not specified
Wetland type: not specified
Prescriptive/voluntary: voluntary
The Guide is developed in the frame of a GEF project and is meant to provide guidance to biodiversity planners as a response to the decision of the Third Conference of Parties of the Convention on Biological Diversity to establish a programme of work on Agricultural Biological Diversity. The Guide to Best Practices ws produced as a response to the lack of attention given to agrobiodiversity under the CBD. Issues addressed in this Guide include the protection of Farm Genetic Resources, Principles for Conserving Agricultural Ecosystem Services and Conserving Biodiversity and Agricultural Landscapes. The guide adopts a structure for looking at agrobiodiversity that has emerged from expert meetings and the CBD's liaison group on agrobiodiversity: of farm genetic resources, ecosystem services, knowledge systems, and landscape level issues. The guide presents short case studies from many different countries (e.g. Brazil, Russia, Nigeria, Vietnam, etc.)

Name: Good Agricultural Practice For Vegetable Farming (GAP-VF)
Reference: http://www.ava.gov.sg/NR/rdonlyres/44DF2A66-B23F-40E2-B419-E5A10C0B8377/9678/GAPVF.pdf
Level: National (Singapore)
OECD theme: soil, water
Farming systems: vegetable cropping
Wetland type: not specified

Prescriptive/voluntary: prescriptive
Summary: The Good Agricultural Practice for Vegetable Farming (GAP-VF) is a set of consolidated practices or COP formulated by the Agri-Food and Veterinary Authority of Singapore (AVA) for on-farm safe and quality vegetable and foodcrop production. This code of practices is based on concept of Hazard Analysis of Critical Control Points (HACCP) and quality management principles with emphasis in the following six key areas: Farm location, Farm structure, Farm environment (soil/water), Farm maintenance (hygiene and cleanliness), Farming practices/ methods/ techniques (pesticide and fertilizer applications, pest and disease management, postharvest handling), Farm management (farm records, traceability, staff training).

6 Proposed structure GAP database

Information about Good Agriculture Practices related to the wise use of wetlands and water resources can be stored in a data base to facilitate easy access. As an example the following structure is proposed.

Name and source	**Zai System of Water Harvesting**
Level	National, Burkina Faso and Mali.
OECD Environmental Indicator	Soil (erosion) Water (water conservation)
Farming system	Cereal-root crop mixed
Generic or Site Specific	Generic
Wetland type	-
Prescriptive/ Voluntary	Voluntary
Summary description The Zai system of water harvesting is a method whereby farmers dig little potholed in the soil which store and retain rainwater and which at the same time are used to seed or plant their crops in. It is popular in the sub-Saharan region and has proven to be an effective method to overcome periods of drought.	

Name and source	**Water Quality Guidelines** http://www.mfe.govt.nz/publications/water/anzecc-water-quality-guide-02/index.html
Level	National; New Zealand and Australia
OECD Environmental Indicator	Land, Water Biodiversity
Farming system	mainly dairy farming
Generic or Site Specific	Specific
Wetland type	All inland wetland types
Prescriptive/ Voluntary	Voluntary
Summary description The Water Quality Guidelines are used as a set of tools to assist regional and state governments in assessing and managing water quality. The guidelines should be modified and tailored to local conditions in accordance with the responsibilities and requirements for water resource management on the local level. Possible actions include the elaboration of Action Plans for water management in dairy farming in cooperation with farmers organisations.	

7. Guidance Documents on Agriculture and Wetlands

The existing guidelines, hand books and resolutions adopted in recent years by the Conference of Contracting Parties of the Ramsar Convention cover a wide variety of issues predominantly focusing on drawing attention to the services wetlands provide in addition to their importance for biodiversity and nature protection. Much attention is given to the determination, allocation and management of water for wetland ecosystems, through the necessary supporting institutional arrangements, policy and legislation and decision-making frameworks. The involvement of stakeholders in decision making procedures in particular is highlighted in nearly each of the handbooks and resolutions.

Also pointers for review of water sector policies are provided in order to better integrate the protection, conservation, management and wise use of wetlands into integrated water resources management and river basin management.

Despite the impact and important role wetlands play for agriculture only in a limited number of cases reference is made to agriculture let alone that guidance is provided to improve the balance between agriculture and the wise use of wetlands.

Most relevant handbooks for the GAWI topic are:

- Handbook 2; Wetland Policies
- Handbook 3; Legal Frameworks
- Handbook 4; River Basin Management
- Handbook 12;Water Allocation

Useful information about matters of water allocation and water management is also provided by Resolution IX Annex C: “An Integrated Framework for the Ramsar Convention's water-related guidance.”

Ramsar Handbooks relevant for agriculture-wetland interactions

Hand book 2 on Wetland Policies states:
The seriousness of the continuing loss of wetlands demands a new approach to wetland management. A major portion of the wetland area in settled areas has been converted from its natural state to **support alternative land uses including agriculture**, urbanisation, industry, and recreational pursuits. Since the public generally benefits from wetlands, conservation efforts can be justifiably supported by government-funded or sponsored incentives. The National Wetland Policy can be a tool to foster implementation of new and better economic and sectoral incentives and to retire factors and disincentives that lead to wetland decline.

The handbook holds further guidelines for Contracting Parties relating to the identification of current and future supply and demand for water.

Handbook 3 on Legal Frameworks provides guidance to contracting Parties to review its legal and institutional frameworks to ensure that these are generally compatible with the wise use obligation. The review should cover laws and institutions not only at the national level, but also at the sub-national and supra-national (i.e., regional economic integration

organizations) levels. These technical guidelines are intended to provide practical support for carrying out such a review.

Handbook 4 on River Basin Management provides "Guidelines to assist Contracting Parties to minimise the impacts of land use projects on wetlands and their biodiversity".
The Hand book further promotes integrated land use plans for each river basin as a means to minimise the impact of different activities and land uses on the river and wetland systems as well as local residents

Ramsar Handbook 12; Guidelines for allocation and management of water for maintaining the ecological functions of wetlands. The handbook provides a decision making framework for the allocation of water. Through stakeholder participation the various water uses and users within the catchment should be defined along with the objectives for water allocation, which should include the desired ecological character of wetlands.

The "Guidelines for the allocation and management of water for maintaining the ecological functions of wetlands" (Valencia, 2002) and its supporting technical paper, provide guidance on policy, legislation and institutional arrangements specifically related to determination and allocation of water for maintaining wetland ecosystems. It deals very specifically, in its Annex and the supporting Technical Paper, with the determination of water requirements for maintenance of wetland ecosystems, and addresses the allocation of water for this purpose. Implementation (for example, design of operating rules for environmental water releases from dams) is not addressed in detail, but is the subject of additional guidance proposed for COP9 (Kampala, 2005).

Resolution IX.3 INSTRUCTS the Ramsar Secretariat to promote and implement, in cooperation with Contracting Parties, innovative means of financing the protection of wetlands including protecting and rehabilitating catchment areas for regulating water flows and improving water quality, taking into account the critical role of ecosystems; and supporting more effective water demand and water resource management across all sectors, especially in the agricultural sector.

8. Organisation for Economic Co-operation and Development (OECD):

The OECD has launched various initiatives to support sustainable agriculture in the member states including a more balanced allocation of water through the Agriculture and Water Initiative. The report "Agriculture and Water: Sustainability, Markets and Policies" states:
"Agricultural production and input subsidies, especially water, continue to misalign farmer incentives and aggravate overuse and pollution of water across most OECD countries".

The major challenge is to ensure that water resources used by agriculture are best allocated among competing demands to efficiently produce food and fibre, minimise pollution and support ecosystems, while meeting social aspirations under different property right arrangements and institutional systems and structures. In order to achieve this, the workshop report holds tasks for policy makers, researchers and the OECD secretariat to tackle this issue.

Further the OECD has developed guidelines for the Design and Implementation of Effective Agri-Environmental Policy Measures. The document deals with the question

when and to what extent government intervention is required when it comes to the question on how to influence actual land use practices. When all possible combinations of public and private net benefits are considered, it turns out that the situations where positive or negative incentives are justified are quite limited. There are a substantial number of options that require either no action or some other form of action that goes beyond acting directly on land managers.

When the question about government intervention is positively evaluated the possible content and topics to deal with when elaborating a guidance document on the design of agri-environment measures is presented.

By the end of 2008 the OECD plans to produce a report on: *Policies and Approaches for Sustainable Water Supply and Use in Agriculture*. The document will take a forward-looking perspective in identifying the implications for water resource use of different agricultural production and irrigation management scenarios and will examine the scope for the use of market mechanisms. It will review current policies, taking into account different systems of property rights and market institutions, and the diverse objectives of water management among countries.

The project will then identify possible market-based instruments and other policy approaches for sustainable water resource management by agriculture.

9 UN-Economic Commission for Europe

The UN-ECE has analysed the possibilities of introducing Payments for Ecosytem Services in Integrated Water Resources Management.

“Payments for ecosystem services (PES)” means a contractual transaction between a buyer and a seller for an ecosystem service or a land use/management practice likely to secure that service”.

The UN-ECE Report holds recommendations for:

- Basic conditions for setting up PES and the core principles of PES.
- Stakeholder involvement
- Types of PES and financial arrangements
- Legal and institutional frameworks
- Information needs and monitoring
- Awareness raising, communication and capacity building
- Research needs
- Financing

The document provides a flow chart on decision making for setting up a PES scheme and provides an integrated framework for analyzing the impact of a given project.

The document presents evaluation methods for ecosystem values both for use (direct and in-direct like ground water recharge, carbon sequestration, storm protection etc.) and non – use values.

10 Food and Agriculture Organization (FAO)

Wetland Characterization and Classification for Sustainable Agricultural Development (FAO, Harare, 1998)

The proceedings of the workshop under the above mentioned name promotes the characterization and classification of wetlands for sustainable food production through environmentally sound development and management techniques.

FAO - Netherlands Partnership; Sustainable development and Management of Wetlands; Wetland contributions to livelihoods in Zambia; Rome 2004

Key findings

- It is not possible to give wetland users at all sites generic prescriptive advice for wetland management. Strategies to optimize benefits need to meet site-specific requirements and challenges; and the strategies may need adjusting from season to season as well as across wetland landscape.
- The extent of use of the wetlands for cultivations varies by wealth class, perhaps a reflection of the capacity of the better to afford some resources required to exploit wetlands . Therefore, while the poor might have equal access to the wetland resources, the extent of the benefits they can derive is influenced largely by the inputs they can afford.

11 European Union; the Common Agricultural Policy

The EU has introduced cross compliance as a leading principle for direct payments to farmers. Farmers are eligible for direct payments if:

• **Good agricultural and environmental condition**: All farmers claiming direct payments, whether or not they actually produce from their land, must abide by standards to be established by the Member States. This new requirement is a consequence of the introduction of the SPS and is intended to avoid the abandonment of agricultural land (and its environmental consequences)

• **Statutory management requirements**: Farmers must respect other cross compliance standards called statutory management requirements set-up in accordance with **19** EU Directives and Regulationsrelating to the protection of environment; public, animal and plant health; animal welfare

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