

This is a reduced version of an IOBC document containing the full
original English text
Copyright IOBC/WPRS 1997

IOBC/WPRS
Commission "IP-Guidelines and Endorsement"

OILB/SROP
Commission "Directives de PI et Agrément"

GUIDELINES FOR INTEGRATED PRODUCTION OF ARABLE CROPS IN EUROPE

IOBC Technical Guideline III

First Edition

Wädenswil, Switzerland
12 - 13 April 1997

Edited by E.F. Boller, C.Malavolta & E.Jörg

IOBC wprs Bulletin
Bulletin OILB srop Vol. 20 (5) 1997

The IOBC/WPRS Bulletin is published by the International Organization for Biological and integrated Control of Noxious Animals and Plants, West Palaeartic Regional Section (IOBC/WPRS)

Le Bulletin OILB/SROP est publié par l'Organisation Internationale de Lutte Biologique et intégrée contre les Animaux et les Plantes Nuisibles, section Régionale Ouest Paléarctique (OILB/SROP)

Copyright IOBC/WPRS 1997

Address General Secretariat:

INRA – Centre de Recherches de Dijon
Laboratoire de Recherches sur la Flore Pathogène dans le Sol
17, Rue Sully – BV 1540
F-21034 Dijon Cedex, FRANCE

ISBN 92-9067-090-8

Preface

We are pleased to present here the Technical IOBC Guidelines III on Integrated Production of arable crops that has been approved by the Commission on April 13, 1997. They are an integral part of the basic IOBC document on Integrated Production principles published as IOBC/WPRS Bulletin Vol. 16 (1) 1993.

The purpose of these guidelines is to define the basic requirements of IP in arable crops in such a generalized way that these rules can be applied in all geographic regions covered by WPRS. These general rules should be of help to regional IP organisations that wish to review their own regional guidelines and to define the necessary technical details at the regional level in accordance with IOBC principles.

This document could only be established thanks to the most fruitful international collaboration of more than 30 persons directly or indirectly involved in the development of Integrated Production in their respective countries. Given the complexity of the task this final result of many discussions looks back to a longer history. A first draft of an international document on arable crops was established already in 1993 by a small group of persons including Philippe Girardin (F), Fritz Häni (CH), Vic Jordan (UK) and Adel El Titi (D). This first document was expanded and completed at Wädenswil, Switzerland on November 30, 1996 by a panel of experts invited by the Commission that included Mario Carvalho (P), Padruot Fried (CH), Fritz Häni (CH), Carl-Anders Helander (S), Carlo Malavolta (I) and Adel El Titi (D). We would like to extend our thanks to all these colleagues that invested a considerable part of their free time in the preparation of the basic framework.

Thanks must also go to many known and unknown colleagues that participated in consultations of our Commission on advanced drafts of the guidelines, especially Jesus Avilla (E), Carlos Cantero (E), J.P. Gendrier (F), Philippe Girardin (F), Vic Jordan (UK), Lukas Keller (CH), Kiriaki Kalburtji (GR), Jan Kren (CZ), Jytte Lauridsen (DK), Edward Majewski (PL), Sue Ogilvy (UK), Carl Age Pedersen (DK), Tapio Poutala (FIN), Andreas Schwarz (CH) and Vincent Van Bol (B).

We express our gratitude to Jesus Avilla, Mario Carvalho, Jean-Paul Gendrier, Erich Jörg and Carlo Malavolta for the translation and help in the manuscript preparation. We finally thank David Royle, President of IOBC/WPRS, and the WPRS Executive Committee for continued encouragement and support of the work in progress.

Ernst F. Boller
Editor and Convenor
of Commission

Carlo Malavolta
Co-Editor
Member of Commission

Erich Jörg
Co-Editor
Member of Commission

Guidelines for Integrated Production of Arable Crops

IOBC Technical Guideline III

This document sets out general principles, minimum standards and guidelines for the Integrated Production (IP) of Arable Crops. It is intended as a framework for the formulation of specific national and regional IP-guidelines and standards and to promote their harmonisation of throughout Europe.

The requirements for Integrated Production in arable crops defined in this document are based on the IOBC principles of Integrated Production and Technical Guidelines I and II published in the IOBC/WPRS Bulletin Vol. 16 (1), 1993, that are integral part of this document.

I. OBJECTIVES

- To promote production systems that respect the environment, are economically viable, and sustain the multiple functions of agriculture, namely its social, cultural and recreational aspects
- To secure a sustainable production of healthy crops of high quality and with a minimum occurrence of pesticide residues
- To protect the farmers' health while handling agro-chemicals
- To promote and maintain a high biological diversity in the agro-ecosystems concerned and in surrounding areas
- To give priority to the use of natural regulating mechanisms
- To preserve and promote long-term soil fertility
- To minimise pollution of water, soil and air.

II. REQUIREMENTS

To achieve these objectives, a farmer practising Integrated Production must fulfil a certain number of requirements that apply to the entire surface of the farm as follows:

1. Commitment of the farmer

The requirements for the farmer (member of the regional IP-organisation) are defined by the IOBC Technical Guideline I that is summarised as follows:

The farmer or responsible farm manager must:

- Be professionally qualified to manage the farm according to IP principles
- Undertake basic training and education in IP and participate actively in the regular updating courses offered by the IP organisation
- Be a member of an officially recognised IP association
- Make complete farm records demonstrating essential farm operations such as fertilisation, pesticide applications, soil management, irrigation, according to the rules of the IP association.

2. General requirements for arable crops

The basic requirements for all annual crops are defined by the IOBC Technical Guideline II that must be considered in regional guidelines. The following precisions address specific requirements of individual crops not covered by Guideline II. They apply to all crops and are not repeated in the crop specific tables:

Biodiversity and ecological infrastructures

The ecological farm infrastructures (= ecological compensation areas) have to cover at least 5% of the entire farm surface excluding forests. Headland attractants (flowering field margins) should be established as reservoirs of pest antagonists. Areas of linear elements (e.g. flowering border strips, hedges, ditches, stone walls) and non-linear elements (e.g. groups of trees, ponds, haystacks) being present on the farm or to be established should be combined in a manner to obtain spatial and temporal continuity as a prerequisite for the enhancement of faunistic diversity and for the maintenance of a diverse landscape.

Choice of cultivars

Cultivars must be selected that provide a good general health status and are resistant/tolerant against at least one major disease.

The use of GMOs (= genetically modified organisms) in IP programs may be permitted as long as the consequences of their use are not violating the IP principles defined by IOBC. The final decision on the appropriate application of GMOs has to be taken on a case by case basis.

Crop rotation

The following rules need to be considered for the crop rotation elements (but might have to be modified if more additional crops not covered in this guideline are incorporated in the crop rotation):

Fields with crops for seed production must be excluded from IP programs if the specific requirements of seed production, but need to be taken into account in the crop rotation.

Cereals may occupy not more than 67% in the rotation. Each cereal crop species counts as a different crop. Winter cereals, except oats, must follow at least one non-host break crop for key cereal pathogens.

Sugar beet, or any alternative Chenopodiaceae crops, not to be grown more than 1 year in 4. In cases of negative results from a nematode analysis the frequency may be reduced to 1 year in 3.

Potatoes not to be grown more than 1 year in 4.

Maize not to be grown more than 1 year in 2. Continuous cropping of maize is not permitted.

Legumes must show a minimum interval of 2 years between 2 different legumes.

Dry peas not to be grown more than 1 year in 7.

Faba beans and soybeans not to be grown more than 1 year in 4.

Cruciferous crops must not be grown more than 1 year in 4. Crops that are grown to reduce nematode populations are not considered part of the rotation.

Sorghum must not occupy more than 50% in the rotation. Sorghum may only follow sorghum on sandy soils.

Sunflowers not to be grown more than 1 year in 4.

Alfalfa must not be followed by a legume crop. The following crop should have high N requirements.

The following crops must not follow each other: soybean, oilseed rape, sunflowers. Each year of fodder crops (i.e. alfalfa, clover, grass-mixtures or natural pasture within the crop rotation) counts as one crop.

To minimise nitrate leaching and to facilitate the management of pests, diseases and problem weeds, winter and spring crops should be alternated in humid areas.

Methods for the design of a multifunctional crop rotation, developed by the Research Network on Integrated and Ecological Arable Farming System for EU and associated countries (Concerted Action AIR3 - CT920755), may be taken into account.

Irrigation

Irrigation guidelines must be established at the regional level, with due consideration to winter cover and amount of water applied, in order to prevent water overuse, nutrient leaching, soil erosion and salinity.

Soil protection

In regions with high leaching risk an appropriate soil cover (with adequate N uptake capacity) must be maintained before spring crops. In very sloping areas soil protection is achieved also with contour cultivation and/or terraces.

In irrigated areas an appropriate soil cover must be considered in winter in order to reduce leaching and erosion.

Low intensity cultivation is preferred. Deep ploughing (25 - 30 cm) is permitted only in exceptional cases.

Farm machinery should be chosen in order to:

- reduce soil compaction and to preserve organic matter;
- improve the efficiency and effectiveness of mechanical weed control and agrochemical applications;
- reduce fuel consumption.

Nutrient management

The supply of major nutrients must rely on data from chemical soil and/or plant analyses carried out at defined intervals (3-5 years). The use of adequate techniques that quantify the nutrient needs is mandatory.

Crop protection

The suppression of key pest and diseases should be primarily achieved by the choice of optimum elements within the crop rotation giving due consideration to environmental risks and economic aspects. Weed management should be achieved, as far as possible, by an appropriate crop rotation.

Each regional IP-organisation must establish an updated list of:

- key pests ,diseases and weeds;
- at least 2 key antagonists (such as carabid beetles and parasitoids) that should be protected and promoted during the whole rotation;
- preventive (indirect e.g. cultural methods) and curative (direct control) measures to be used in the IP program.

Risk assessment

- The official forecasts of pest and/or disease risks must be taken into consideration;
- Differences in varietal susceptibility have to be taken into account;
- For pests, diseases and weeds, official economic threshold levels defined for the region must be respected;
- Greatest possible use must be made of existing and validated forecasting models for pest and deseases.

Plant protection methods

- Biological, biotechnical*, physical or agronomic plant protection methods must be preferred to chemical methods if they provide satisfactory control. (*Biotechnical control methods are defined in entomology as highly specific procedures that influence the behaviour or development of pests without direct biocidal activity such as mating disruption, sterile insect technique, deterrents, selective traps and certain IGR);
- The choice of agrochemicals - given an adequate efficacy of the products- must consider their toxicity to humans, risk of resistance development, unintended negative side effects on beneficials and pollution potential for the environment (soil, water, air, residues, etc.);
- Regional IP guidelines must provide a list of pesticides permitted without restriction and of products permitted but with restricted use in IP programs.

SPECIFIC CROP GUIDELINES FOR INTEGRATED PRODUCTION

WINTER CEREALS (wheat, barley, oats, rye, triticale)

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION	As diverse as possible to restrict/limit pathogens and weed selection, and to balance nutrient uptake	Winter cereals, except oats, must follow at least one non-host break crop for key cereal pathogens. This rule applies to arable surfaces larger than a minimum specified for mixed farms by the regional organisation
CULTIVARS	Use within-farm diversification and/or variety mixtures especially for animal feed	Select cultivars with the highest resistance to key diseases while quality and yield requirements are met.
CULTIVATION	Reduced tillage intensity (depth and frequency) is preferred in accordance with the specific field problems. Use combined operations where appropriate. The soil cultivation system should leave plant residues on the surface whenever feasible	Tillage operations must be correctly timed. Tillage regimes must meet erosion control requirements whenever possible and avoid soil compaction
SOWING ASPECTS	Calibrate equipment to ensure accurate seed rate, placement, depth and seed cover. Sowing periods should be adjusted to local conditions in order to minimise pest, disease and weed pressure, and to make optimum use of water availability.	The sowing period must be defined by the local organisation.
NUTRIENT MANAGEMENT	Key nutrients should be supplied to maintain soil nutrient status at recommended levels, and in relation to rotational demands.	Nitrogen must not be applied in autumn in order to avoid leaching. In (Mediterranean) areas where climatic conditions require it, N applications must match plant up-take (in this case only organo-mineral fertilisers to a maximum of 50 kg/ha are permitted). The allowed period and quality (type) of N applications must be specified by the regional organisation.
CROP PROTECTION - WEEDS	Mechanical control methods are preferred. Control efficacy exceeding 80% is not required (except for specific weeds, e.g. <i>Galium aparine</i> , <i>Alopecurus myosuroides</i> , etc.). Where possible, limit herbicide use to key problem weeds and selected areas. Post-emergence herbicides should be preferred.	The use of plant growth regulators is not permitted. Herbicide application must be based on damage thresholds or risk prediction criteria where possible.
- PESTS	Justification for control should consider the value and loss probability over the rotation	The major pests per region have to be named and appropriate strategies developed. Pesticides permitted only as a last resort.
- DISEASES	Crop and cultivar diversity, resistant cultivars and rotations should reduce root and stem-based diseases sufficiently to avoid fungicide use.	For control of diseases, fungicides must be used in accordance with proven thresholds, models or forecasting systems considering medium resistance cultivars.

SPRING CEREALS

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
Apply the guidelines for winter cereals to spring cereals where applicable.		Before spring cereals, an appropriate autumn green cover or catch crop is mandatory (to minimise nitrate leaching and erosion).

WINTER OILSEED RAPE

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION		Cruciferous crops must not be grown more than 1 year in 4. Cruciferous cover-crops that are grown to reduce nematode populations are not considered to be part of the rotation.
CULTIVARS	Select cultivars with resistance to disease and with high branching capability, to achieve yield potential at low seed rates and compensate for damage caused by pests.	Cultivars susceptible to pests and diseases most prevalent in areas grown are prohibited.
CULTIVATION		
SOWING ASPECTS	Sowing time should be adjusted to the specific regional conditions. Early sowing will reduce competition from weeds and volunteers. Seed rate should be appropriate for location and sowing date to avoid too dense a canopy.	
NUTRIENT MANAGEMENT	Nitrogen to be applied on two occasions between early spring and flower-bud stage.	Fertilisers not to be applied when soil is at field capacity.
CROP PROTECTION - WEEDS - PESTS - DISEASES	Where possible, use mechanical weed control between GS 19 and early spring. Against grass weeds, use post emergence herbicides at early seedling development according to damage thresholds. Establish border strips with early flowering species to attract antagonists and deviate pests. Crop and cultivar diversity, and the use of resistant cultivars should limit disease.	The use of plant growth regulators is not permitted. Pesticides must only be used when infestation levels exceed economic thresholds. Fungicides must be used in accordance with available disease prediction schemes.

SPRING OILSEED RAPE

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
Apply the guidelines for winter oilseed rape to spring crops where applicable.		Before spring crop an appropriate autumn green cover or catch crop is mandatory (to minimise nitrate leaching and erosion).

SUGAR BEET

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION	As diverse as possible. Use nematode - resistant/neutral plants as catch crops. Avoid meadows or leys as a pre-crop.	Sugar beet or any alternative <i>Chenopodiaceae</i> crops/weeds not to be grown more than 1 year in 4. In cases of negative results of a nematode analysis the frequency may be reduced to 1 year in 3.
CULTIVARS	Select cultivars suited to the site with resistance/tolerance to soil-borne diseases or pathogen vectors. Cultivar diversity and appropriate mixtures should be considered.	Highly susceptible cultivars not to be grown.
CULTIVATION	Shallow ploughing, non-inversion tillage and direct drilling are acceptable. Measures minimising erosion (course seedbed, mulching etc.) should be used where necessary. Soil tillage and sowing to be done when soil moisture is appropriate.	Deep ploughing (> 25 - 30 cm) only permitted where leys are a pre-crop.
SOWING ASPECTS	Choose sowing date to obtain even establishment and to avoid bolting. Sowing date should be adjusted to regional conditions to reduce bolting risks	
NUTRIENT MANAGEMENT	In case of N supply > of 50 kg/ha, nitrogen should be applied on 2 occasions; 75% near sowing with the remainder before the phenological stage defined by the regional guidelines (e.g. 6th - 8th leaves). Selective placement (the root area) is the preferred option. In sub-arctic regions, all nitrogen can be applied pre-planting.	
CROP PROTECTION - WEEDS - PESTS - DISEASES	<p>Preferably, weed suppression should be directed to the row area. If herbicides have to be applied on the entire surface, use low doses and low volume sprays (100-200 l/ha)</p> <p>Choice of active ingredients should not target all dominant weed species (residual weeds as trap crop for soil pests).</p>	<p>The adoption of a "period threshold" is required (2-8 weeks post emergence)</p> <p>Pre-sowing/pre -emergence weed control is permitted as an overall treatment only with broad-leaf herbicides.</p> <p>Flea beetles (<i>Chaetocnema</i> spp.) and other pests may only be treated according to damage thresholds. No insecticides are allowed against Collembola. No nematicides are allowed.</p> <p>Fungal leaf diseases, and vectors of virus diseases may only be treated according to prediction models or thresholds. The use of tolerant (resistant) varieties is the control strategy for Rizomania.</p>

POTATOES

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION		Potatoes not to be grown more than 1 year in 4 to limit disease and nematode infestation.
CULTIVARS	Select cultivars with a broad spectrum of resistance to major virus diseases and "field resistance" to late blight. Use cultivar diversity within the farm.	In nematode-infested fields, grow cultivars of high resistance to one or more of the nematode species or their dominating pathotypes.
CULTIVATION	Ploughing is the current technique of soil cultivation, for "optimal" seedbed preparation and weed control.	
NUTRIENT MANAGEMENT	Application of fertilisers should be synchronised with uptake pattern and tuber development.	Nutrient supply based on soil nutrient status and crop requirements, considering both growth and disease aspects. Nitrogen supply pre-planting not to exceed 75% of the total supply. In sub-arctic regions, all nitrogen can be applied pre-planting
CROP PROTECTION - WEEDS	Priority should be given to mechanical weed control. Post-emergence herbicides are permitted in exceptional circumstances.	The use of persistent, leachable and broad spectrum herbicides is not permitted. Pre-emergence herbicides are not permitted.
- PESTS	Aphicides (with least side-effects) may be used according to national/regional recommendations for seed potatoes, but at reduced dose (50%). For the control of Colorado Beetle biological methods (e.g. <i>B. thuringiensis</i>) should be preferred.	No nematicides are allowed The use of slug baits may only be used in exceptional cases. Insecticides against Colorado Beetle must be used only according to threshold levels.
- DISEASES	For Rhizoctonia, seed treatment is permitted if more than 20% of tubers have sclerotia. For Late Blight the use of resistant cultivars is the most appropriate preventive measure. Highly susceptible cultivars should not be grown.	Fungicide treatment must be based on forecasting models.

MAIZE

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION	In humid areas, maize should not occupy more than 33% of the rotation.	Continuous cropping of maize is not permitted. Maize not to be grown more than 1 year in 2.
CULTIVARS	In areas prone to frit fly, select cultivars with rapid seedling emergence and development. Black rust-tolerant cultivars should be used in areas prone to severe disease.	
CULTIVATION	No-tillage or reduced cultivation intensity (shallow ploughing and non-inversion regimes) are recommended.	In erosion prone areas, deep ploughing is not permitted.
SOWING ASPECTS		Soil cover must be established during the winter before establishing the maize crop.
INTERCROPPING	With sufficient precipitation, intercropping maize stands with soil covering plants is recommended (crops such as grass or clover-grass or tolerated weeds).	
NUTRIENT MANAGEMENT	Split application of N is preferred. The first application of mineral nitrogen should be made during the 4th-leaf stage, the second at the 8th- leaf stage. Use techniques that quantify needs for N.	Timing of liquid manure must be adjusted to peak nitrogen uptake (from the 6th-leaf stage) and may only be applied by injection or spray hoses.
CROP PROTECTION - WEEDS	Effective weed control is only essential during the 2nd -10th-leaf stage (period threshold). If herbicides are applied, row application and micro-dosage are preferred.	The use of persistent, leachable and broad spectrum herbicides is not permitted. No total surface herbicide applications are permitted pre-emergence.
- PESTS	In areas with severe and frequent European Corn Borer or Mediterranean Corn Borer (<i>Sesamia nonargioides</i>) attacks, crop residues should be minutely chopped and ploughed under before pupae formation. Other maize pests may be controlled in exceptional circumstances according to threshold levels. Strips of flowering species (e.g. sunflowers) are recommended around corn fields as attractants for beneficial organisms.	For the control of Corn Borers, only biological agents (e.g. Trichogramma), biotechnical methods (where available such as confusion technique) or insecticides without effect on beneficial organisms are allowed and must be used in accordance with threshold levels.
- DISEASES		No fungicides are allowed except for seed dressing.

DRY PEAS

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION		Minimum interval between peas of 6 years in the rotation; minimum interval of 2 years between 2 different legumes.
CULTIVARS	Leafless cultivars are recommended	
SOWING ASPECTS	Sowing date as early as possible. Sufficient seed density (80-100 seeds per m ²) to obtain optimal stability of crop.	
NUTRIENT MANAGEMENT		No nitrogen supply except in the sub-arctic regions where the amount of N fertiliser equalling 1/4 of the total N uptake can be applied as starter N. Growth regulators are not permitted
CROP PROTECTION - WEEDS - DISEASES - PESTS	Mechanical weed control recommended until occurrence of tendrils. Post-emergence herbicides should be preferred. Fungicides should not be applied except for seed dressing.	The decision for a post-emergence application of herbicide must consider the risk potential for the following crop. Pest control, with selective pesticides, only in accordance to threshold levels. Appropriate slug baits are only permitted in emergency situations

FABA-BEANS

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION		Minimum interval of 3 years in rotation; interval of 2 years between 2 different legumes.
SOWING ASPECTS AND CULTIVARS	Sowing date as early as possible (summer cultivars).	
NUTRIENT MANAGEMENT		No nitrogen supply except in the sub-arctic regions where the amount of N fertiliser equalling 1/4 of the total N uptake can be applied as a starter N. Growth regulators are not permitted
CROP PROTECTION - WEEDS - DISEASES - PESTS	Mechanical weed control recommended. Post-emergence herbicides preferred Fungicides should not be applied except for seed dressing Aphid control, with selective aphicides, should be an exception and be based on forecasting systems.	The decision for a post-emergence application of herbicide must consider the risk potential for the following crop. Slug control with appropriate baits is only permitted in emergency situations

SOYBEANS

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION		Minimum interval of 3 years in the rotation; interval of 2 years between 2 different legumes.
SOWING ASPECTS AND CULTIVARS	In heavy soil and prone to fungal diseases, late sowing date and resistant cultivars are preferred. Reduced tillage or no-tillage is recommended.	
NUTRIENT MANAGEMENT		Nitrogen supply and growth regulators are not permitted.
CROP PROTECTION - WEEDS - DISEASES - PESTS	Mechanical control to be preferred. If post-emergence herbicides are applied, row application and micro-dosage is recommended.	The decision for a post-emergence application of herbicide must consider the risk potential for the following crop. Fungicides are not permitted except for seed dressing. Insecticides are not permitted.

SORGHUM (GRAIN AND FODDER)

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION		Not more than 50% in the rotation. Sorghum must not follow sorghum except on sandy soils
CULTIVARS	Avoid late cultivars on heavy soils to respect soil structure	
CULTIVATION	Reduced intensity is recommended particularly in areas prone to erosion. Good preparation of seed-beds.	
SOWING ASPECTS	Soil cover is advised during winter (natural or by cover-crop)	Rate and period have to be regionally defined to optimise emergence and weed control
NUTRIENT MANAGEMENT		Liquid manure to be applied at peak nitrogen uptake, but only before shooting
CROP PROTECTION - WEEDS - DISEASES - PESTS	If herbicides are applied, micro-dosage post emergence treatments are recommended	Fungicides are not permitted except for seed dressing . Only 1 aphicide treatment is permitted. No other insecticides permitted
IRRIGATION		The maximum water volume has to be regionally defined to optimise use according to needs

SUNFLOWER

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION	It is recommended to grow sunflowers not more than 1 year in 5.	Not to be grown more than 1 year in 4.
CULTIVARS	Avoid late cultivars on heavy soils to protect soil structure. Cultivars resistant to stem breaking and to fungal diseases are preferred.	
CULTIVATION	Reduced intensity is recommended, particularly in areas prone to erosion.	
SOWING ASPECTS	Soil cover is advised during winter (natural or by cover-crop). At least 75 cm row distance is preferred to facilitate mechanical weed control.	Rate and period have to be defined at regional level to optimise emergency and weed control
NUTRIENT MANAGEMENT	Localised input of nitrogen is preferred during growing season.	Liquid manure to be applied at peak nitrogen uptake. Nitrogen input period before the 4th leaf stage.
CROP PROTECTION - WEEDS - PESTS - DISEASES	If herbicides are applied, micro-dosage post-emergence treatments are recommended as well as row application if row distance is >75 cm.	Insecticides are not permitted In dry conditions fungicides are only permitted for seed dressing.
IRRIGATION		The maximum water volume to be regionally defined to optimise use according to needs.

ALFALFA

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION	Alfalfa should be considered as a beneficial crop in the rotation.	Alfalfa must not be followed by a legume crop. The following crop should have high N requirements.
CULTIVARS		
CULTIVATION		Alfalfa breaking must be done in periods with minimum leaching risks.
SOWING ASPECTS	Sowing period defined to get good establishment.	Rate and period have to be regionally defined to optimise establishment.
NUTRIENT MANAGEMENT	Solid manure should be applied before, and liquid manure after, establishing the crop according to its nutrient content.	

ALFALFA (continued)

CROP PROTECTION - WEEDS - PESTS - DISEASES		No herbicides are permitted except for seed-bed cleaning and <i>Rumex</i> problems. Insecticides are not permitted (exceptions to be clearly defined by the regional organisations) . Fungicides are not permitted.
IRRIGATION		The maximum water volumes and period to be regionally defined to optimise quality and duration of the crop.
MISCELLANEOUS	Avoid soil with drainage problems.	

FODDER CROPS (legumes, grass, leys)

FUNCTION	PREFERRED OPTIONS	STRICT RULE OR PROHIBITION
ROTATION	Ley should be considered as a beneficial crop in the rotation. Spring crops should follow the ley.	Leys not to be followed by a legume crop. The following crop should have high N requirements
CULTIVARS AND CROP SPECIES	Mixing grass and perennial legumes is preferred to reduce the need for nitrogen input. A high biodiversity (plant species richness) is desirable.	
CULTIVATION AND SWARD MANAGEMENT	Cutting intensity should be adjusted to maintain stable plant communities, and high fodder quality to reduce the necessity for concentrate import	Ley breaking must be done in periods of least leaching risks.
SOWING ASPECTS	Sowing time should be adjusted to minimise needs for herbicide use and to minimise leaching	
NUTRIENT MANAGEMENT	Solid manure should be applied before, and liquid manure after ,establishing the crop.	
CROP PROTECTION - WEEDS - PESTS AND DISEASES	Problem weeds should be controlled by appropriate timing of the cut.	Herbicides are not permitted (Regional organisations have to define clearly the exceptions to this rule). Insecticides and fungicides are not permitted