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Integrated Production

Principles and Technical Guidelines

3rd Edition, 2004

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Foreword
3rd edition

Twelve years ago, for the first time, IOBC published the conceptual framework of Integrated Production as it developed during the past two decades as one possible solution of a sustainable agricultural production system. This basic concept has raised international interest and recognition and has provided the basis for the development of technical guidelines and for the endorsement activities of the Commission.

The experience gained during these 12 years indicates that the basic content of the concept is still valid and does not require modifications. However, the IOBC position concerning total food quality, as published in April 2001 on the Internet, (www.iobc.ch), and major international developments in the food sector make it necessary to adapt certain elements of the technical guidelines and endorsement procedure. Therefore, IOBC/WPRS Council and its IP Commission decided to publish this 3rd edition in order to provide an up-dated document for their future work.

Whereas the definition and objectives remain almost unaltered, substantial changes have been made in the Technical Guideline II which addresses the general agronomic aspects of Integrated Production programs. Total quality, as perceived by IOBC, addresses not only the market-oriented high product quality, but also the consumers' desire for high standards with respect to food safety, production methods respecting environment and animal welfare, and fair trade. IOBC's traditional areas of competence are in the agronomic and ecological aspects of sustainable crop production and are the basis of the high IOBC standards. However, in this updated document we have incorporated elements of wider international standards to achieve a necessary formal compatibility with respect to food safety, farm workers' welfare, animal welfare, and standardised inspection procedures. The modern IOBC approach in the judicious planning of plant protection measures is reflected in the new Appendix 5 and is an important step forward in the continuous improvement of sustainable production technology.
This document is the definitive reference for IOBC Members and IOBC Working Groups and is binding for regional IP-organisations seeking or having received IOBC endorsement.

We would like to extend our thanks to all persons that have supported the work of the Commission in the past and provided important suggestions for improvement. Without that fruitful feedback, the preparation of this new edition would not have been possible.

Copenhagen and Dijon, April 3, 2004

Prof. Peter Esbjerg
President IOBC/WPRS

Dr. Claude Alabouvette
Secretary General IOBC/WPRS

IOBC/WPRS Council

Foreword

(1st edition, 1993)

The past four decades have seen fundamental changes in European agriculture. The decline in the number of farmers demonstrates diminishing financial viability associated with serious problems for the rural society and landscape. Overproduction, endangerment of wild species and pollution of ground and surface water are now identified as major constraints of intensive farming. These and other problems became increasingly important for policy makers, farmers and society and led to a fundamental re-orientation in agriculture. Only environmentally safer, sustainable patterns of landuse can cope with the present challenge. They can be targeted by replacement of polluting agrochemicals, in particular pesticides and fertilisers, by environmentally safer and sustainable technologies.

IOBC/WPRS has always been addressing these goals. Council, Commissions, Working and Study Groups direct their activities to the development and implementation of such ecosystem based concepts in crop protection. Therefore, the present changes fit completely into the traditional strategies of IOBC. However, the identified constraints in the implementation of Integrated Pest Management on the course of IOBC/WPRS research activities had clearly shown the necessity to take all relevant farming activities into account. This has been the basis for adopting the systems approach supported by the various research activities on **Integrated Production/ Integrated Farming.**

Taking into account these developments IOBC/WPRS Council decided to define clearly its position regarding concept and implementation of IP/IF. These efforts started at the end of the 1960s and beginning of the 1970s and led to the establishment of a Commission on "Integrated Production" in 1977 with IOBC/WPRS endorsement procedures for IP organisations in apple production. In September 1990 Council reactivated that Commission with the task of formulating a basic document which

- defines Integrated Production/Integrated Farming
- describes the underlying strategy
- establishes technical guidelines and standards for implementation.

The Commission started its activities in March 1991 and provided the first draft of this basic document 12 months later. It was reviewed by an *ad hoc Panel* of Experts representing Council and relevant horizontal Working Groups. The final version of the document was approved by IOBC/WPRS on November 1992.

Definition, principles of the endorsement procedures and Technical Guidelines I and II are officially put into effect by publication of this document. It has already been brought to the attention of all IOBC/WPRS units and will be made available to all interested parties outside IOBC/WPRS. The present document provides both the conceptual platform for IOBC/WPRS activities and the basis for IOBC endorsement procedures for farmers' organisations seeking IOBC/WPRS recognition and associated product certification. By

defining the rules of Integrated Farming and by recognising the achievements of organisations and their members implementing Integrated Production/Integrated Farming as a sustainable form of agricultural production IOBC/WPRS establishes the next milestone of its own tradition.

Executive Committee and Council sincerely hope that this document might help to clarify aspects in need of clarification and to accelerate the dissemination of Integrated Farming. IOBC/WPRS invites all concerned organisations, institutions and authorities to co-operate in this common responsibility to overcome present constraints of our agriculture.

On behalf of IOBC/WPRS we extend our thanks and appreciation to the members of the Commission and to all participating colleagues for their efforts to make this document available.

Padova and Montfavet, December 21, 1992

Prof. R. Cavalloro
President

Dr. S. Poitout
Secretary General

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pp. 1 - 12

Integrated Production: Principles and Technical Guidelines

(This document is an integral part of IOBC Guidelines I, II & III)

I. Introduction

The development and implementation of ecosystem-based technologies in plant protection have been important objectives of the IOBC since its foundation in 1956. IOBC has become a leader in this field and in the field of environmentally sound production strategies in agriculture as a result of pioneering research and development activities of IOBC Working Groups during the last three decades.

The evolution from biological control concepts to Integrated Pest Management (IPM) and finally to a holistic systems approach was certainly not accidental. On the contrary, it was a logical response to progress developing concepts and scientific standards, which have been important milestones in the history of IOBC. Following these developments, it became necessary to define clearly the IOBC's philosophy, principles and practical rules of the systems approach, formerly called Integrated Production (IP) / Integrated Farming (IF).

To this end, an important step was the decision of IOBC/WPRS Council in 1990 to reactivate the **IOBC Commission on "IP Guidelines and Endorsement"** (hereafter called "Commission"). The Commission had the task of establishing a framework of general IP standards to comply with the official IOBC principles set down in the declarations of "Ovronnaz" (1976) and "Veldhoven" (1991). This task covered philosophy, strategy and technical requirements for implementation, inspection and product certification.

A basic document setting out the **"Definition and Objectives of Integrated Production (Integrated Farming)"** was established by the Commission on March 6 1992 at Wädenswil / Switzerland in close co-operation with IOBC/WPRS Council, Executive Committee and an *ad hoc* Panel of Experts representing the horizontal IOBC Working Groups. In this document explanatory texts after each objective and principle identified precisely the intentions of IOBC and provided guidance for the formulation of more specific technical documents (Guidelines) needed for practical implementation. During the preparation phase, this document has been widely analysed, discussed, improved and finally approved in the present form by all IOBC bodies involved. Hence, it is the reference for IOBC Members and Working Groups and is binding for all regional IP-organisations seeking or having received endorsement by the IOBC. Furthermore, it was intended to support and accelerate the development of Integrated Farming for the benefit of producers, consumers and the environment

The *"Definition and Objectives of Integrated Production/ Integrated Farming"* are published here in full and in summary form. Although it is difficult to condense all the IP principles in to a few lines without over-simplifying or even misinterpreting their original content, IOBC has decided to adopt this approach in order to facilitate communication with the non-professional public at large. The original English text serves as reference whenever ambiguous interpretations might occur.

Within this conceptual basis, IOBC has established an **Endorsement procedure** for regional IP-organisations practicing a sustainable production system according to IOBC standards and seeking an international recognition of their achievements.

The Commission publishes two general technical guidelines:

Technical Guideline I defines the legal status of the IP-organisations seeking IOBC endorsement and describes minimum requirements to be fulfilled by organisations and their members.

Technical Guideline II provides the general agronomic rules and minimum requirements, clearly defined as mandatory rules/prohibitions (or "must" items), to be met by all farmers participating in IP programs endorsed by IOBC, on all types of farms and in all geographic regions.

Recommendations (or "should" and "could" items) are given, whenever needed, to point out optional solutions that go beyond the mandatory minimum and to indicate desirable directions of improvements.

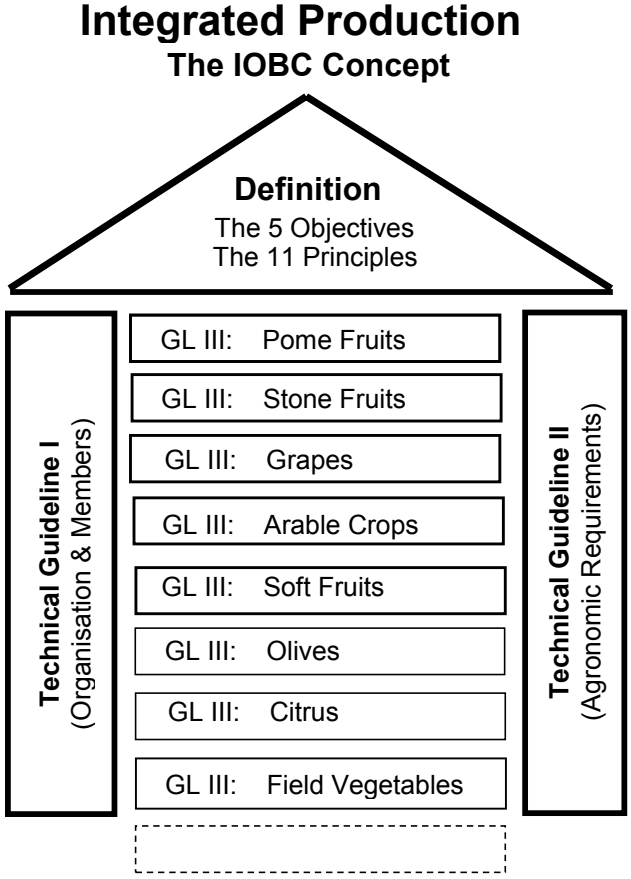
Crop Specific Technical Guidelines III are not presented here. They are prepared on the basis of Guidelines I and II and specify the minimum requirements and recommendations in individual crops. They are prepared and published by the Commission in close collaboration with respective crop specific IOBC Working Groups and/or *ad hoc* expert panels. Their objective is to provide guidance to regional farmers' organisations wishing to establish their own guidelines and IP programs according to IOBC standards. In principle, they do not specify in detail those aspects that can only be defined taking into account the specific regional situation. However, they do indicate the precise points where regional guidelines have to apply clear and precise rules.

There is general agreement that Technical Guidelines should be revised at intervals of not less than 5 years in order to allow for continuity.

The Commission would like to take this opportunity to thank all members of the IOBC/WPRS Executive Committee, of Council and of the *ad hoc* Panel of Experts for their most constructive co-operation and support during the preparation and final approval of this document. Special thanks are extended to those colleagues who provided help in the translation of the individual documents that will be published separately. We thank David Royle, former president of IOBC/WPRS, for critically reading the final draft and improving the linguistic aspects of this 3rd edition.

II. The IOBC Concept of Integrated Production

The conceptual framework of Integrated Production (IP) was redefined and published in its present form for the first time in 1993, incorporating new developments in the field of sustainable agriculture since the first IOBC endorsements in 1978 (El Titi, Boller & Gendrier 1993). The basic concept is quite simple, as shown in the following figure:



The definition, objectives and principles of IP provide the conceptual roof resting on two technical pillars, namely the two general technical guidelines defining (I) the general standards for the organisation and its members, and (II) the general agronomic requirements valid for all crops. Within this construction are the crop specific guidelines III that define in greater detail the requirements in each crop. The overall aim of these documents is to provide a framework for the formulation of regional or national guidelines and standards and to aid harmonisation of these concepts and guidelines at an international level. The crop specific guidelines so far established are pome fruits (3rd edition 2002), stone fruits (2nd edition 2003), grapes (2nd edition 1999), arable crops (1st edition 1997), soft fruits (1st edition 2000), olives (1st edition 2002), citrus (1st edition 2004), field grown vegetables (1st edition published in 2005). Each of these has been produced in close collaboration with the respective IOBC working groups and international *ad hoc* expert panels.

In the context of sustainable production, the strategies in the field of **product quality/food safety** and **plant protection** are among the key elements of the overall IOBC concept; we therefore add specific chapters to these topics (see appendix section).

Some organisations have addressed certain topics and problems. These include general admission criteria for obtaining IOBC endorsement, the problem of national guideline structures that respect particular situations at the regional and local level, the establishment of adequate contracts with individual members, lists of sanctions, and the adequate choice of pesticides in plant protection schemes. The Commission has started to develop tools to deal with these aspects and has incorporated several in the appendix section. It is emphasised that all relevant documents (including this one) and tools concerning IOBC-endorsed Integrated Production systems are published in full on the internet page of the Commission:

www.iobc.ch

The Definition

IOBC Definition of Integrated Production

Short Version

Integrated Production/Farming is a farming system that produces high quality food and other products by using natural resources and regulating mechanisms to replace polluting inputs and to secure sustainable farming.

Emphasis is placed

- *on a holistic systems approach involving the entire farm as the basic unit,*
- *on the central role of agro-ecosystems,*
- *on balanced nutrient cycles, and*
- *on the welfare of all species in animal husbandry.*

The preservation and improvement of soil fertility, of a diversified environment and the observation of ethical and social criteria are essential components.

Biological, technical and chemical methods are balanced carefully taking into account the protection of the environment, profitability and social requirements.

III. Objectives and Principles

Objectives of Integrated Production

INTEGRATED PRODUCTION IS A FARMING SYSTEM WHICH: –

- INTEGRATES NATURAL RESOURCES AND REGULATION MECHANISMS INTO FARMING ACTIVITIES TO ACHIEVE MAXIMUM REPLACEMENT OF OFF-FARM INPUTS

  These objectives address the basic intentions of a sustainable agriculture. An intelligent management and careful utilisation of natural resources can help to substitute for farm inputs such as fertilisers, pesticides and fuel. Total or partial replacement of these materials not only reduces pollution but also production costs and improves farm economics.

- SECURES SUSTAINABLE PRODUCTION OF HIGH QUALITY FOOD AND OTHER PRODUCTS THROUGH ECOLOGICALLY PREFERABLE AND SAFE TECHNO-LOGIES

  IP aims at high quality agricultural products mainly through ecologically sound techniques that are safe for human health. Total quality evaluation of the agricultural products considers, as significant criteria, not only their specific internal and external characteristics and food safety (= produce quality), but also all sustainable methods of crop production (=ecological quality), adequate standards in animal production (= ethical quality), and adequate working conditions of the farm workers (= social quality).

- SUSTAINS FARM INCOME

  Farm products produced with a high level of ecologically safe, ethically sound and socially acceptable quality must generate justified “added values”. Sustainable agriculture and marketing have to apply the principle of fair trade to the largest possible extent.

- ELIMINATES OR REDUCES SOURCES OF PRESENT ENVIRONMENTAL POLLUTION GENERATED BY AGRICULTURE

  Pollution of agricultural origin has to be reduced or eliminated whenever and wherever this is feasible.

- SUSTAINS THE MULTIPLE FUNCTIONS OF AGRICULTURE (MULTIFUNCTIO-NALITY)

  Agriculture has to meet the needs of the entire society, including those requirements that are not directly connected with the production of food and fibre. Diversified landscapes, wildlife conservation, colonisation and cultivation of remote areas as well as maintenance of local cultural traditions are some of the non-agricultural environmental and recreational values provided by operational farms.

The Principles of Integrated Production

1) IP IS APPLIED ONLY HOLISTICALLY

IP is not merely a combination of Integrated Pest Management and additional elements such as fertilisers and agronomic measures to enhance their effectiveness. Instead, it relies on ecosystem regulation, on the importance of animal welfare and on the preservation of natural resources.

2) EXTERNAL COSTS AND UNDESIRABLE IMPACTS ARE MINIMISED

Detrimental side-effects of agricultural activities, such as nitrate or pesticide contamination of drinking water, or erosion sediments in waterways, impose enormous costs to society. These external costs are normally not reflected in budgets for agricultural expenditure and must be reduced.

3) THE ENTIRE FARM IS THE UNIT OF IP IMPLEMENTATION

IP is a systems approach focusing on the entire farm as the basic unit. When practised on isolated individual areas of the farm IP is not compatible with a holistic approach postulated above. Important strategies, such as balanced nutrient cycles, crop rotations and ecological infrastructures, become meaningful only if considered over the entire farm.

4) THE FARMERS' KNOWLEDGE OF IP MUST BE REGULARLY UP-DATED

The farmer plays a key role in IP systems. His/her insight, motivation and professional capability to fulfil the requirements of modern sustainable agriculture are intimately linked to his/her professional abilities acquired and updated by regular training.

5) STABLE AGROECOSYSTEMS MUST BE MAINTAINED AS KEY COMPONENTS

Agro-ecosystems are the basis for planning and realisation of all farm activities, particularly those with potential ecological impact. They are the visible expressions of the holistic concepts and provide both natural resources and regulation components. Stabilisation means the least possible disturbance of these resources by farm activities.

6) NUTRIENT CYCLES MUST BE BALANCED AND LOSSES MINIMISED

"Balanced" in this context means targeting maximum reduction of nutrient losses (e.g. leaching), a cautious replacement of those amounts leaving the farmed area through sales of commodities, and recycling of farm materials.

7) INTRINSIC SOIL FERTILITY MUST BE PRESERVED AND IMPROVED

The intrinsic fertility of soil is the production capability of the soil without external interventions under given site conditions. Accordingly, fertility is a function of balanced physical soil characteristics, chemical performance and balanced biological activity. The soil fauna is an important indicator of soil fertility.

8) IPM IS THE BASIS FOR DECISION MAKING IN CROP PROTECTION

Integrated Pest Management (IPM) applies to noxious species of phytophagous animals, pathogens and weeds. Noxious species are those causing more losses than benefits. In the context of sustainable agriculture

emphasis within plant protection is placed on preventive (”indirect") measures, that must be utilised to the fullest extent before direct measures are applied (=control). „Control" means management of the pest population to maintain it below that level that causes economic losses. Decisions about the necessity to apply control measures must rely on the most advanced tools available, such as prognostic methods and scientifically verified thresholds. The instruments of direct plant protection are the last resort if economically unacceptable losses cannot be prevented by indirect means.

9) BIOLOGICAL DIVERSITY MUST BE SUPPORTED

Biological diversity includes diversity at the genetic, species and ecosystem level. It is the backbone of ecosystem stability, natural regulation factors and landscape quality. Replacement of pesticides by factors of natural regulation cannot sufficiently be achieved without adequate biological diversity. Stable agro-ecosystems in which flora and fauna are diversified provide important ecological services to the farmer covered by the term “Functional Biodiversity”.

10) TOTAL PRODUCT QUALITY IS AN IMPORTANT CHARACTERISTIC OF SUSTAINABLE AGRICULTURE PRODUCT QUALITY.

QUALITY MUST NOT ONLY BE DEFINED BY THE CONVENTIONAL EXTERNAL AND INTERNAL PRODUCT QUALITY PARAMETERS BUT ALSO BY THOSE PRODUCTION, HANDLING AND SOCIAL CRITERIA NOT VISIBLE TO THE COMSUMERS.

Farm commodities produced at a high total quality level do not only exhibit high standards in conventional and measurable parameters such as external and internal quality. They also have to meet the requirements of quality traits that are not visible to consumers: namely, the quality of production (= ecological quality), the quality of animal rearing, holding, transportation and slaughtering procedures (= ethical quality), and adequate working conditions of the farm workers according to the UN-Charter of the International Labour Organisation (= social quality).

11) ANIMAL PRODUCTION ON MIXED FARMS

ANIMAL DENSITY MUST BE MAINTAINED AT LEVELS CONSISTENT WITH OTHER PRINCIPLES

Animal density per ha farmland has a major impact on the nutrient balance of the farm. Purchased animal feed and animal manure have important effects on nutrient cycles, edaphic diversity and environment.

- THE WELFARE OF ALL SPECIES OF FARM ANIMALS MUST BE TAKEN INTO CONSIDERATION

  Holding conditions of farm animals, transportation and slaughtering procedures have to consider the basic behavioural needs and welfare of the individual species and have to fulfil advanced (national or international) requirements.

****

These definitions, objectives and principles were approved by a special *ad hoc* expert panel of IOBC/WPRS on March 6, 1992. They were endorsed and put into effect by the IOBC/WPRS Executive Committee on May 16, 1992. Improvements in precision in the objectives of “Total Quality” and “Sustainable farm income”, and in principles no. 9, 10 and 11, respectively, were introduced in the 3rd edition 2004.

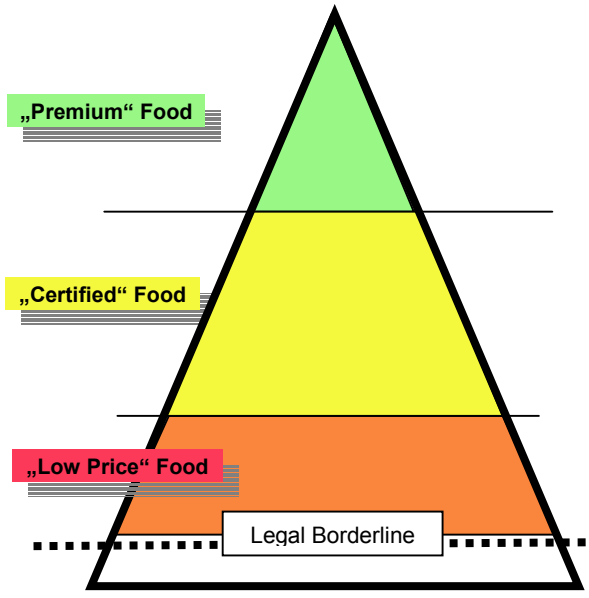
IV. Total Quality in Sustainable Production

Interpretation of the meaning of food quality has seen major changes due to food scandals and major protests within the consumer community. Perfect external food quality, acceptable taste, (internal food quality), and cheap price seem to be no longer the dominant yardsticks applied by an increasing number of critical consumers. Sectorial definition of food quality is replaced by a notion of total quality reaching beyond conventional food quality aspects. Quality aspects become more and more linked to food safety and to an "added value" basket of indirect and invisible food quality criteria vaguely described as "healthy environment", "animal welfare" and "fair trade".

IOBC has always tried to maintain a holistic view of its activities and has always perceived food quality in a larger context, as confirmed in its press release of April 18, 2001:

"Whereas, in most cases, the market takes care of the **external quality** of agricultural products, sustainable production systems endorsed by IOBC consider **4 additional quality traits** of products, production and/or processing procedures, and working conditions. They are largely invisible to the consumers but provide the essential components of the overall quality of food and fibre:

- **Internal Product Quality** *(chemical, physical, organoleptic)*
- **Ecological Quality** *of production and handling*
- **Ethical Quality** *of production, handling and attitude of people involved*
- **Socio-economic Quality** *of production, handling and working conditions of people involved."*



If all conceivable quality aspects, (identified in the food sector at the point of sale), are piled up on a virtual table we get something like a cone- shaped pyramid representing total quality. This pyramid has a large portion of lower quality food at the bottom and a small portion of highest quality food at the top.

As shown in the diagram, we can divide this "Total food quality pyramid" into different layers (or quality strata):

- Low price food at the bottom,
- Standard food with "certified labels"
- "Premium Label" food with highest total quality standards at the top.

The legal borderline is separating low price food from food that does not meet certain legal requirements (e.g. with respect to hygiene, food safety and other quality aspects).

There are three distinct phases in the food sector:

- P**rimary production,** covering the food production process as the "Pre-Farmgate" phase, up to the point where the "products" have been harvested and prepared as "produce" for sale. Integrated production concepts, as developed by IOBC, are focussing on this primary production phase and cover especially the pre-harvest aspects.
- Further **handling and processing** of agricultural products can be carried out at the farm level, (e.g. vinification of grapes; pressing of olive oil; baking farm bread), or as "Post-Farmgate" produce by specialised organisations. IOBC does not include this processing phase in its normative activity, but considers such on-farm activities in its endorsement procedure if processed farm products are certified.
- The **distribution** phase covers the distribution, purchase and sale patterns of produce. Aspects of fair trade are addressed in this phase.

If attention is focussed on primary production or the "Pre-Farmgate" phase of food production, it becomes apparent that the definition of food quality depends largely on the position from which food quality is perceived.

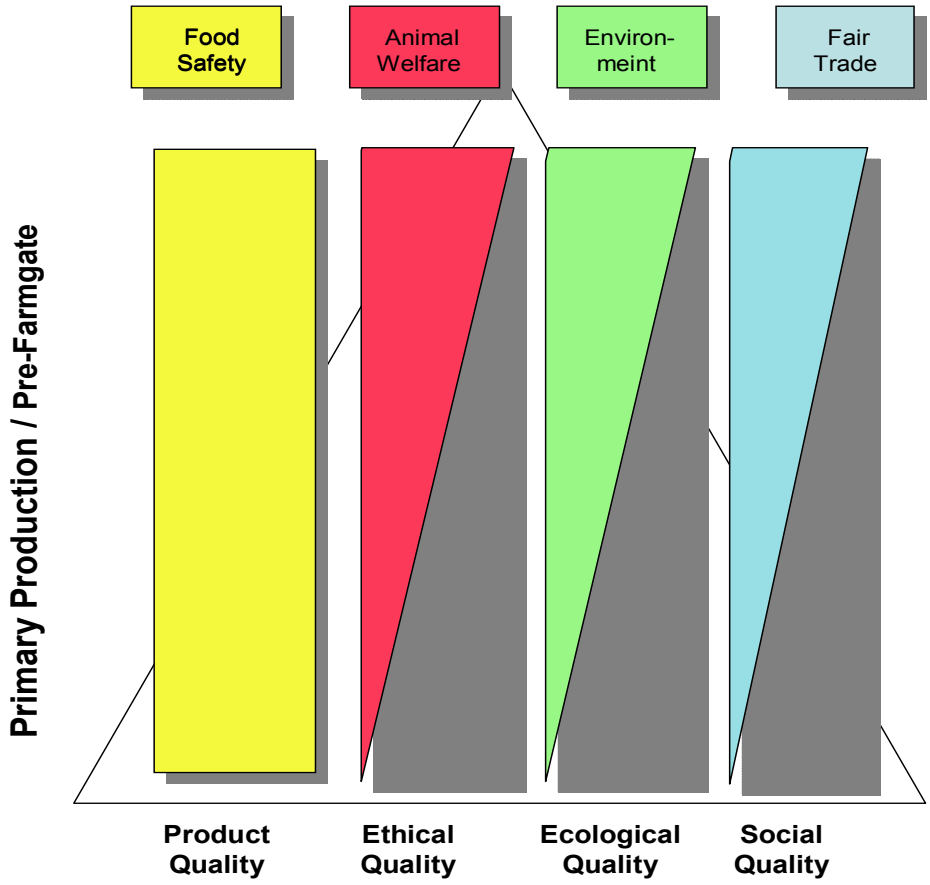
The general, vaguely described quality aspects perceived by the public at large, (e.g. "appealing visual appearance", "no unhealthy residues", "meat production respecting animal welfare", "food production respecting the environment" and "food produced and marketed respecting fair trade"), are translated at the professional level into more precise terms, such as:

- **Product quality,** (or quality of produce**),** covering external and internal quality traits of the produce at the point of sale, including the aspect of **food safety**.
- **Production quality** covers in a more precise form the general notion of environment and animal welfare. Key elements are, e.g., **ecological criteria** of production or the technical aspects of animal production respecting basic rules of **animal welfare**.
- **Ethical quality** addresses, e.g., the general ethical attitude of the farmer with respect to the production procedures applied at the farm and the compliance with basic rules of correctness with respect to farm labour. Ethical aspects are especially important in animal production considering animal welfare.
- **Social quality** addresses compliance with the basic rights, health and welfare of workers as defined by the United Nations' International Labour Organisation (ILO).

Food scandals had and continue to have a significant effect on **food safety** aspects. It is interesting to note that food safety aspects of product quality are not only receiving great attention but are in fact improved and strict rules implemented at practically all levels of the food quality pyramid, (see diagram below). On the other hand, it can be assumed that low price food has probably the lowest quality standards with respect to the consumers' "basket of added values", i.e. environment, animal welfare and fair trade, (represented by ethical, ecological and social components of total food quality). Therefore, highest total quality standards can be expected in well-managed production systems representing advanced systems of sustainable agriculture.

The consumers‘ food quality criteria

and their positioning in the Quality Pyramid



As perceived by the public at large, the premium food sector covering all aspects of total food quality is well represented by organic (biological) agriculture. It is surprising that no other sustainable production system has obviously achieved the same reputation nor generated similar added value at the farm level. While worldwide production costs in agriculture increase and produce prices fall there seems to be neither room nor motivation to invest more than the absolute minimum into the consumers' "added value basket" at the farm level.

V. The Position of the IOBC Standard in the Food Quality Pyramid

There are presently (2004) three established international "Pre-Farmgate" standards addressing all components of total quality in the food sector, (mentioned in chronological sequence): Organic (biological) agriculture, IOBC, and, most recently, level 3 of Integrated Farm Assurance (IFA/ EUREP). It is interesting to note that all three standards have been developed by the private or non-governmental sector.

The documented position of these standards is shown in the diagram below.

Organic agriculture standards fall into the premium segment. These have a long tradition and a high reputation.

The **IOBC standards** also look back on a long tradition. They are defined by the basic document "Integrated Production: Principles and Technical Guidelines" (3rd edition 2004, this document), by the crop specific IP-guidelines III and in the IOBC endorsement procedure by the "Admission Criteria for Organisations seeking IOBC Endorsement". The "Admission Criteria" are positioned at the interface of the "Certified Food" and "Premium Food" segments and function as the first general entry scenario for candidate organisations. A detailed analysis, using crop specific evaluation tools, assists in the decision about the successful endorsement of the candidate organisation (see chapter IV). During a 3-year experimental period, the IOBC endorsed organisation has the opportunity to improve suboptimum points of the program and to position its label at a higher level in the Premium Food segment.

With this clear policy established in the early 1990s, IOBC has always resisted all attempts to lower its standards. IOBC will pursue this policy in the future to assist motivated farmers to develop their sustainable farming systems based on advanced scientific and technical knowledge. Furthermore, high total quality standards must be maintained to generate added-value at the farm level and to justify adequate prices of the produce at the farmgate.

Level 3 of the Integrated Farm Assurance Scheme (IFA) of EUREP-GAP (2004) starts to cover a middle range of the total quality pyramid. With its modular approach this specific program has the potential eventually to develop standards positioned at higher quality levels.

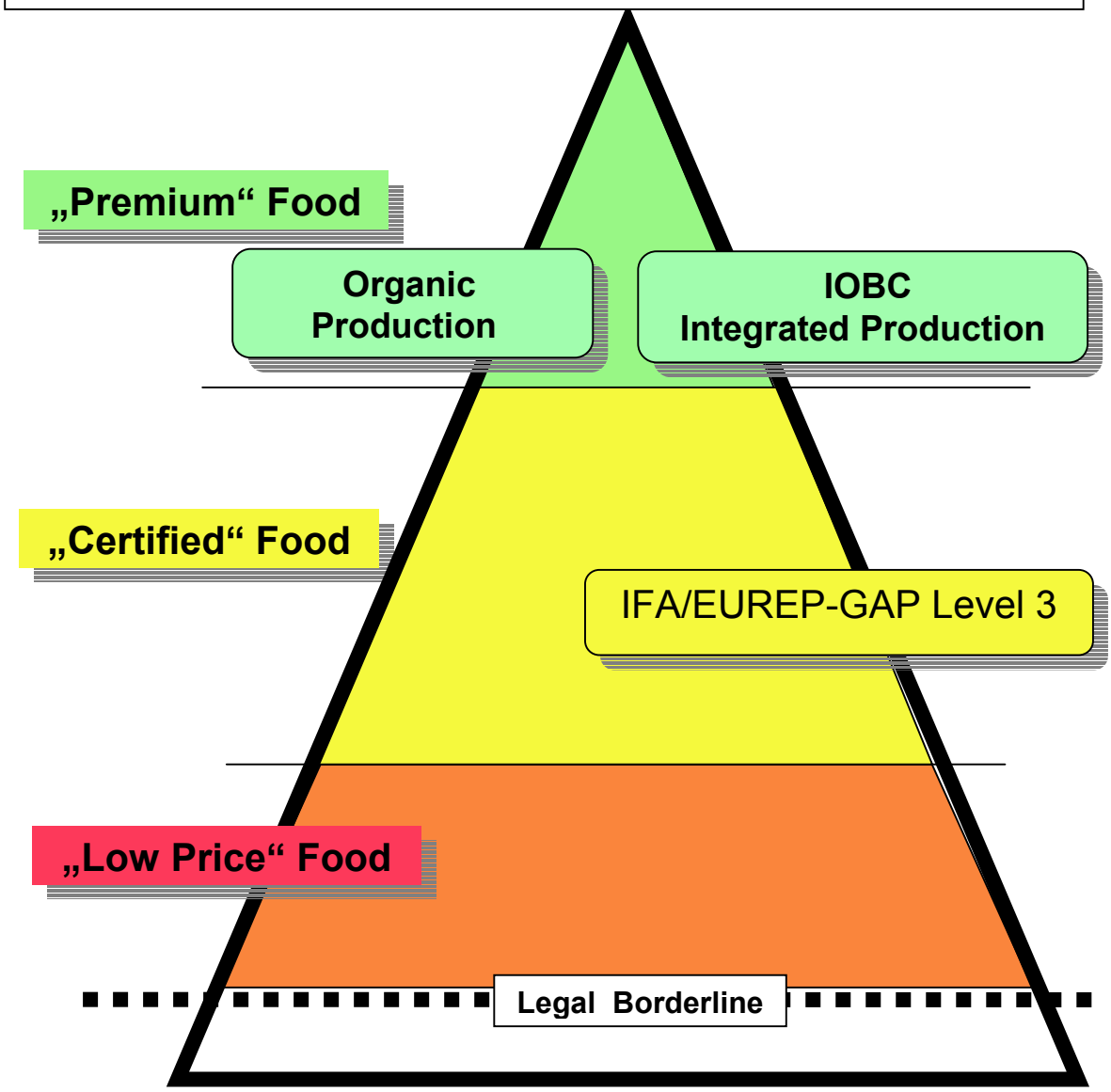
VI. The IOBC Endorsement Procedure

The IOBC/WPRS Commission on "Integrated Production Guidelines and Endorsement" operates world-wide an endorsement procedure for regional IP-organisations working according to IOBC standards.

All published IOBC documents concerning the IOBC concept of Integrated Production, crop specific IP-guidelines, the endorsement procedure and evaluation schemes used by the Commission in the endorsement procedure, are available in full text on the website of the Commission (www.iobc.ch).

In close collaboration with IOBC working groups, the Commission has established a Tool Box with updated tools to assist in the practical implementation of Integrated Production schemes

The position of three international pre-farmgate standards in the total quality pyramid



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IOBC Commission on Integrated Production Guidelines and Endorsement

Technical Guideline I

General Requirements for Organisations and their Members practicing Integrated Production according to IOBC Standards

(3rd edition, 2004)

The IOBC/WPRS document on "Definition, Objectives and Principles of Integrated Production" is an integral part of this document which will be revised at intervals of not less than 5 years to allow for continuity. However, IOBC reserves the right to make short-term modifications whenever the need arises.

This Technical Guideline I has the objective of assisting regional organisations to develop their own Integrated Production guidelines and schemes according to IOBC principles and standards. Together with the Appendices 1, 2 and 3, it provides basic elements of the IOBC procedures for organisations seeking IOBC endorsement. Furthermore, IOBC has developed and publishes regularly updated tools to provide technical support to interested parties. They are published on the website of the Commission (www.iobc.ch) and are hereafter referred to as "Tool Box".

IOBC does not endorse nor certify individual farmers practising IP, rather their organisations. Exceptions are made in certain individual cases:

- grape and wine producing farms or companies operating more than 500 ha of vineyards, subjecting the entire grape production to IOBC endorsed programs and selling all table grapes and/or wine with own labels

- fruit and/or field vegetable farms or companies operating more than 500 ha, subjecting the entire production surface to IOBC endorsed programs, and selling all products with own labels.

1. Requirements for Organisations

The basic requirements for organisations seeking IOBC endorsement are summarised below. The minimum requirements for the inspection and evaluation of members are defined in Appendix 2 and 3 of this document.

1.1 Before organisations can apply for endorsement by IOBC they must have an operational (track) history of **at least 2 years** practising IP according to IOBC principles and standards.

1.2 Organisations seeking IOBC endorsement must fulfil all entry requirements detailed in the "Admission Criteria for Organisations seeking IOBC Endorsement" and contain in their IP programs no items that are declared "unacceptable" in the crop specific IOBC evaluation schemes (as published on the internet at www.iobc.ch).

1.3 Organisations must show an organisational structure recognised by the respective national civil law.

1.4 The pursuit of IP principles according to IOBC standards has to be clearly declared as the objective in the statutes and/or by-laws of the organisation.

1.5 The organisation realises IP by a set of appropriate rules and guidelines. Details of possible guideline structures are given in Appendix 1. These have to distinguish clearly between supervised mandatory requirements and recommendations. The IOBC Commission recommends adopting a rating or bonus-malus system (Guideline type 3).

1.6 The organisation must apply an adequate inspection system meeting international standards. The minimum requirements of the control system and the requirements for the structure of the inspection protocols (= checklists) are given in Appendix 2.

1.7 The organisation must provide a mandatory introductory course for new members starting IP activities. Additional courses for the systematic education and transfer of new knowledge to their members have to be realised to the largest possible extent.

1.8 The organisation must develop and operate an internal evaluation system that monitors and evaluates regularly the activities and achievements of their members. Possible solutions for such a monitoring instrument ("radar") is given in the Tool Box.

1.9 The organisation must sign a written contract with each individual member. The contract should contain the points listed in the "Admission Criteria for Organisations seeking IOBC endorsement" and in the model contract given in the Tool Box. The relevant points are summarised as follows:

The member agrees by signing the contract:

- to understand and accept the rules and guidelines of the organisation;
- to apply the IP program by his/her free will and by his/her own risk;
- to practise IP on the entire surface of the farm or of the given crop for which IOBC endorsement has been applied for by the organisation;
- to participate in a mandatory introduction course and regular training;
- to accept a successful transition period, (of at least 2 years), before certification;
- to make only true and complete farm records;
- not to abuse certificates and/or labels endorsed by IOBC;
- to apply on the farm at least the minimum requirements concerning farm workers, as outlined in the international declaration of the ILO (www.ilo.org) , especially abolition of child labour, of forced labour, the provision of wages above the minimum existence level, the workers' right to organise themselves, and provision of adequate living quarters on site that are habitable and have the basic services and facilities.
- to allow access to the farm and all pertinent infrastructures by authorised inspectors of the IP-organisation and of certified inspection bodies.

1.10 The organisation must establish a Technical Committee in charge of the technical management of the program It should operate an appropriate auditing committee and establish a legally binding procedure to resolve disputes. These procedures must contain a list of defined sanctions for each type of transgression committed by individual members. The formal requirements for the list of sanctions are outlined in Appendix 3.

1.11 Organisations seeking or having received IOBC endorsement must prepare and submit to the Commission's secretariat, each year by the end of February, an up-dated list of members that have successfully participated in the program endorsed by IOBC. These

members will have passed through a successful transition period of 2 years. New members in transition must be listed separately.

1.12 IOBC decides on the extension of an endorsement on an annual basis. Before this extension, the organisation must submit, by the end of February, documents completed according to IOBC specifications. They concern the IP-program valid for the forthcoming growing season and must indicate clearly where modifications have been made.

1.13 The endorsed organisation must keep the records of each individual member for at least 3 years. The member files contain at least a copy of:
- the contract,
- the farm records,
- the inspection reports,
- the data analysis of the inspection protocol according to the "radar" system (see Tool Box),
- other documents and information concerning the member.

Representatives of the IOBC Commission must have full access to these files upon request.

1.14 The organisations must help in every possible way to facilitate the supervision of the endorsed organisations' activities by the authorised delegates of IOBC.

2. Requirements for the Farmer (Member)

The farmer or the responsible farm manager must:

2.1 be qualified professionally to manage the farm according to IP principles;

2.2 sign a contract with the IP organisation that defines the member's duties;

2.3 take farm records according to rules established by the IP-organisation and make them available anytime to the authorised control and evaluation officers;

2.4 attend an introductory course organised by his/her IP-organisation and successfully complete a preparatory transition period of at least 2 years before certification;

2.5 follow regularly the training courses offered by the organisation in order to fulfil the IOBC requirement of permanent professional training.

3. Worker health, safety and welfare at the farm level

According to the objectives and principles of the IOBC standard for Integrated Production the aspects of social quality of the farm operation must be taken into account. By signing the IOBC-conform contract the member agrees to comply with the basic elements concerning workers' health and safety, as requested by international and/or national standards of governmental agencies or the food industry. Furthermore, minimum requirements defined by the International Labour Organisation (ILO, a unit of the United Nations (www.ilo.org)) are fulfilled, especially the abolition of child labour, of forced labour, the provision of wages above the minimum existence level, the workers' right to organise themselves, and provision of adequate living quarters on site that are habitable and have the basic services and facilities.

The regional organisation should delegate the supervision of compliance to a qualified and neutral external inspection body.

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IOBC Commission on Integrated Production Guidelines and Endorsement

Technical Guideline II

General IOBC Guidelines valid for all farms participating in IOBC endorsed programs

(3rd edition 2004)

This guideline defines the general operational requirements to be fulfilled at the farm level and to be considered in the definition of crop specific guidelines III which address individual farm sectors. The documents on "Definition and Objectives of Integrated Production" and "Technical Guideline I" (version 2004) are an integral part of this document.

Revision of this basic document will be made in intervals not shorter than 5 years in order to allow for continuity. IOBC reserves the right to make important additions at shorter intervals should the need arise.

1.0 General Aspects

In recent years, concerns and needs of consumers, retailers, growers and food processors for safe food of good quality have generated a number of international standards. They cannot be ignored in this 3rd edition of IOBC standards.

Standards in the food industry are defined either by legal national or international governmental regulations or by voluntary agreements reached within the private sector. Most of them focus on product quality, especially the food safety aspects. Through their inspection schemes they implement a multitude of inspection criteria addressing the safety of fresh produce. Other standards expand the safety focus by agronomic components and define the specific interpretation of Good Agricultural Practice (GAP). A limited number of recent standards add, to a varying degree, components of the "added value" basket, (environment, animal welfare, fair trade), and move into higher quality categories (see chapter IV on "Total Quality in Sustainable Production").

IOBC concepts and guidelines established since the early 1990s define the general crop specific criteria of advanced sustainable production systems. Up to now these documents have been taking for granted, (and were hence omitting), many basic elements concerning legal compliance and Good Agricultural Practice. Also, they did not elaborate in detail the specific requirements for external and internal product quality, including food safety aspects.

Increasing international awareness about the transparency of standards, traceability, competitive benchmarking, certified inspection procedures and so on, is also increasing pressure on the farmer to comply with the prevailing technical standards in the market. IOBC has taken this development into account during the preparation of this 3rd edition of its normative documents. The "compatibilisation" of IOBC standards with those prevailing in the market is not intended to erode and lower the traditionally high IOBC standard by stating the obvious. It is to assist the grower to minimise redundant and/or contradicting inspection activities on the farm. Therefore, in our 3rd edition we incorporate a number of relevant elements derived from published and internationally applied food safety schemes and GAP criteria to increase this inspection compatibility.

1.1 Good Agricultural Practice (GAP) and Integrated Production Standard

Basic and relevant elements of **GAP-standards** that are identified in internationally accepted checklists as "must" items, must also be taken into account in IOBC-endorsed IP guidelines and should be listed in the inspection protocols (= checklists). The IOBC Technical Guideline II and the crop specific IOBC Technical Guidelines III do not and cannot mention all published "must" rules of Good Agricultural Practice, but will present selected requirements that seem to be of special relevance to Total Quality.

1.2 Food Safety Aspects

Basic and relevant elements of **food safety management procedures** that are identified in internationally negotiated and accepted standards, (e.g. Global Food Safety Initiative www.globalfoodsafety.com), as "must" items, should be taken into account in IOBC endorsed IP guidelines and listed in the respective inspection protocols (= checklists). The IOBC Technical Guidelines II, as well as the crop specific IOBC Technical Guidelines III, do not and cannot mention all published "must" rules of Food Safety Management but will present selected requirements that seem to be of special relevance to Total Quality.

It is **strongly recommended** that IOBC-endorsed organisations discuss with their members and assist in the implementation of HACCP (Hazard Analysis Critical Control Points, as defined by the Codex Alimentarius). This approach consists of identifying and preventing problems occurring with respect to food safety. HACCP involves the systematic assessment of all steps involved in a food production operation to identify all microbiological, chemical and physical hazards. It identifies critical control points, where, if control is not achieved, the safety and quality of the product can be compromised.

1.3 Traceability Aspects

All participants of the production process are responsible for the quality of the final produce and, if appropriate, for the determination of (pollutant) residue levels.

Members must ensure that traceability is possible through their production process, and that there is a system in place to pass this 'traceability' link to the next point in the supply chain when the produce becomes independent of the member's control. All farm products certified and labelled by an IOBC-endorsed organisation must be traceable to the registered farm where it has been grown.

1.4 Self evaluation

Each member farm has to complete once per year the inspection protocol (= check-list) of the endorsed organisation. The result of this self-evaluation should be available at the farm inspection, and an appropriate correction plan implemented.

2.0 Biological Diversity and Landscape

The biological diversity at all 3 levels (genetic, species, ecosystem) must be increased actively. It is one of the major natural resources of the farm to minimise pesticide input.

2.1 Ecological infrastructures (ecological compensation areas).

These must cover at least 5 % of the **entire farm surface** (excluding forest). Existing ecological infrastructures on the farms must be preserved. 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 etc.), being present or to be planned on the farm should be combined in such a manner as to obtain spatial and temporal continuity. This continuity is a prerequisite for the enhancement of faunistic diversity and for the maintenance of a diverse landscape. (Practical examples on the evaluation of ecological quality, their functions, establishment and maintenance are given in the Tool Box). The surface of ecological infrastructures with low production intensity and without pesticide/fertilizer input should eventually increase to 10%. The 5% rule need not necessarily be applied to an individual farm in areas with predominantly small farms, with highly scattered properties, and where a surface of 5% or more of a common and homogeneous agro-climatic unit (e.g. municipal district), has been set aside as ecological infrastructures by official and well documented regional programs. In this case, it has to be shown that the ecological infrastructure areas are well distributed in time and space in the municipal area, thus providing a guaranteed continuity.

2.2 List of options

IP guidelines must provide a **list of at least 5 ecological options** for the active enhancement of biological diversity. At least 2 appropriate options have to be selected as "must" by the individual farmer. Examples of such option lists are given in the Tool Box.

2.3 Field size

The **lateral** dimension of an individual field should be considered as an important element in functional biodiversity, to provide ecological reservoirs and to secure connectivity with adjacent ecological infrastructures (see Tool Box).

2.4 Buffer zones

between crop areas and sensitive off-crop areas, (such as surface waters, springs, important ecological infrastructures, heavily travelled roads), must respect legal regulations. If no official regulation exists buffer zones must be at least 3 m wide, but preferably wider.

3.0 Site Selection

Only fields suitable for sustainable production of a particular crop must be chosen. Every field must be identifiable to allow for proper recording.

For new cultivation sites there must be a risk assessment of documented food safety, operator health and environment that takes into account prior use of land, type of soil, erosion potential, quality and level of ground water, availability of sustainable water sources, and impact on and of the adjacent area. When the assessment identifies a non-controllable risk that is critical to health and/or the environment, the site must not be used for production. There should be a corrective action plan, setting out the measures to minimise all identified (and controllable) risks in new agricultural sites.

Crops must not be grown in fields without adequate buffer zones, (see point 2.4), adjacent to sensitive and/or problem areas (e.g. surface water and springs, highways, waste dumps, infested crops, hibernation areas of pests and diseases).

4.0 Site Management

4.1 Crop Rotation

Crop rotation is mandatory for arable crops, vegetables and mixed farming systems. Systems must be chosen to avoid problems, especially with soil-borne pathogens and pests and to

maintain soil fertility. A rotation should include at least 4 different crops. An individual crop considered as part of the rotation should cover at least 10% of the arable land. Several crops of minor importance can be included, up to a total of 10%. In general, a single crop can cover only 50% of the surface. For specific crops, (e.g. field grown vegetables), guidelines III define the maximum proportion of the surface occupied by a specific crop and/or cropping interval (year or crop cycle).

In mountainous regions and in areas with special conditions, exceptions to the 4-crop rule can be tolerated based on specific official regulations. IP guidelines should specify the maximum portion of individual crops in the rotation.

4.2 Soil Fertility and Management

Intrinsic soil fertility must be preserved and improved. Cultivation techniques must be appropriate for soil type, cropping, topography, erosion risk and climate in order to sustain and improve soil fertility.

Sustaining and improving soil fertility must be achieved by:

- definition of an optimum humus level according to the characteristics of the location and its maintenance by appropriate measures;
- maintaining a high diversity of fauna and flora species. The use of bioindicators, (earth-worms, cellulose decomposing organisms, predatory mites etc.), is to be encouraged;
- optimising bio-physical soil properties, (e.g. aggregate size and stability, conductivity), to avoid compaction. The sequence of annual crops should be adjusted to meet these demands;
- maintaining the longest possible soil protection by crop or non-crop cover;
- arranging for the least possible soil disturbance (physical and chemical).

Farm machinery should be chosen in order to reduce soil compaction and to preserve organic matter, to improve the efficiency and effectiveness of mechanical weed control and agrochemical applications, and to reduce fuel consumption.

4.3 Soil protection

Low intensity cultivation is preferred. In regions with leaching and erosion risks, an appropriate soil cover, (with adequate N-uptake capacity), must be maintained. In very sloping areas, soil protection can also be achieved with contour cultivation and/or terraces. Measures to avoid or to control soil erosion should be defined for each crop based on the erosion potential specific to the region and farm. Where erosion damages are visible, a plan for corrective actions must be established and implemented.

4.4 Soil Fumigation

Chemical fumigation/disinfection is not allowed.

5.0 Cultivars, seeds, rootstock and cultivation systems

5.1 Choice of cultivars

Existing official national lists of varieties must be considered.

Annual crops: Cultivars should be chosen that provide a good general health of produce and that are resistant or tolerant to major diseases and pests. The cultivars chosen should meet the specified requirements of the market, (e.g. quality standards including taste,

visual appearance, shelf life, agronomic performance and minimum dependence on agro-chemicals).

Perennial crops: Cultivars and rootstock must be adapted to local conditions. Disease resistant or tolerant varieties should be chosen if they are available and commercially acceptable.

5.2 Seed quality and health status

A seed record/certificate of seed quality, variety purity, variety name, batch no. and seed vendor must be kept available.

All propagation material must be inspected by the grower to be free of pests and diseases. Infested material must not be used. Purchased material must be accompanied by a plant health certificate and kept available for subsequent inspection. Alternation and mixtures of cultivars are recommended, where appropriate.

5.3 Cultivation

5.3.1 Annual crops

Sowing/planting aspects:

Timing can help to secure healthy crop development, to limit the negative impact of weeds, pathogens and pests and to minimise nutrient losses.

Density: Defined average yield expectations should be obtained by lowest possible crop densities. Crop specific guidelines III specify circumstances in which crop density can reduce pest and disease problems.

Systems under consideration:

Protected crops heated by non-renewable energy sources are not compatible with the principles of a sustainable production system, as defined by the IOBC definition. Non-soil cultures and certain protected crops heated by renewable energy sources can be examined by IOBC on a case by case basis. These cultivation systems can have the potential to achieve interesting results in specific aspects, (e.g. biological and integrated plant protection, avoidance of nutrient leaching).

Fields for seed production: Fields with crops for seed production can be excluded from IP programs if the specific requirements of seed production deviate significantly from IP rules. However, their crop specific characteristics must to be taken into account in the crop rotation. It is strongly recommended that plant health quality control systems be operational for private or in-house nursery propagation.

5.3.2 Perennial crops:

The cultivation system, including planting pattern, training and pruning, has to respect the optimum physiological status of the crop plant. New plantations should adopt locally adapted cultivation systems that allow integrated plant protection principles and measures to enhance biodiversity to be integrated optimally.

5.4 Genetically Modified Organisms (GMOs)

In general, GMOs must not be used. Exceptions to this rule can be permitted by IOBC on a case-by-case basis. IOBC-endorsed organisations must inform the IOBC endorsement office of any developments relating to the production or use of products derived from genetic modification. The final decision on the appropriate application of GMOs by an IOBC-endorsed organisation will be taken by IOBC.

6.0 Nutrition

6.1 Nutrient requirement

Basically, plant nutrients have to be provided via the soil.
A nutrient allocation plan for each crop on a plot[1] level and over an entire rotation is required.

Off-farm fertilizer input has to compensate the real exportation and unavoidable technical losses and aim

- in annual crops at a rotational balance;
- in perennial crops at annual balance.

6.2 Assessing nutrient requirements

Major nutrient analysis of the soil is the basis for assessing nutrient needs, (except N). Soil analysis is not mandatory where there is no fertiliser input. Foliar analysis can be applied as complementary test method.

The regional organisation has to provide the necessary information, adequate tools and regulations. Soil analyses for the major elements, P, K, Mg, must be carried out at defined intervals (i.e. 3-10 years according to the crop). An adequate description of the techniques applied, (i.e. interpretation criteria including the target range of desirable nutrient reserves of P, K and Mg, sampling techniques, analytical procedures), is mandatory. Uptake and demand criteria for major nutrients must be established and this information made available to the members.

The chemical content of at least NPK in all inorganic and organic fertilizers used on the farm within the last 12-month period must be known and documented.

Hidden nutrient sources such as importation through polluted air (N), animal feed and mineralization potential of organic soil components have to be taken into account.

The maintenance of a small unfertilised area ("fertiliser window") in each major plot[1]/field is encouraged.

6.3 Nitrogen supply and timing

The use of nitrogen needs particular care because nitrogen leaching and evaporation have significant environmental consequences. N - requirements should be covered by Leguminosae, (biological N-fixation), to the largest possible extent while preventing any danger of leaching.

N supply and timing must be matched to meet crop demand. The nitrogen fertilization of the specific crops must be established in annual crops on the basis of Nmin systems and/or plant analyses. In certain perennial crops, (e.g. grapes), a robust visual evaluation of green leaf colour can provide useful indications of the need for a limited N application.

Regional organisations have to define for each crop the **maximum nitrogen input,** (expressed in kg N/ha/year or crop rotation component), and specify in perennial crops the time-window of adequate N application. Wherever feasible, the splitting modus should be defined for each crop. Mere references in guidelines to existing official recommendations are not acceptable.

6.4 Supply of other major nutrients

Excess of phosphate must be avoided as small quantities of phosphate are sufficient to cause over-enrichment of surface waters. Phosphate from agricultural land is mostly translocated by erosion of small soil particles.

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[1] Plot: several individual lots with the same crop can be grouped to a larger plot.

Any input of P and K, (up to 10%), over the amount indicated by the soil analyses must be justified. The replacement of mineral P-input through enhancement of the activity of pertinent soil organisms (e.g. mycorrhiza) is to be encouraged.

6.5 Organic manures

Organic fertilizers are preferred. Organic manures or compost can help to improve soil fertility by increasing organic matter content, improving nutrient and water retention, and reducing erosion. The methods of accounting for organic N sources over a period of 3 years must be supplied by the regional organisation and applied.

Organic manures must contain only the lowest possible load of heavy metals and other toxicants and meet the legal regulations. More severe limitations for heavy metal and other toxicants exceeding minimum legal requirements are to be encouraged. **Untreated** human sewage sludge must not be applied to farmland. Any use of **treated** human sewage sludge on land destined for agricultural use must be in accordance with updated versions and internationally applied "Codes of Practice for the agricultural use of Sewage Sludge". Existing "Codes of Practice for the Control of Microbial Hazards" give further guidance.

6.6 Safe and efficient application of fertilisers and manures

Organisations must establish lists of measures to reduce technically unavoidable nutrient losses by leaching, erosion and evaporation, (e.g. ground cover or timing of soil cultivation). Manures and fertilizers must not be applied to logged water, frozen soil, or steep ground where there is a risk of run-off. Slurry should not be applied within 10m of a watercourse or 50m from a well, spring or borehole that supplies water for human consumption or for use in farm dairies.

Application machinery must be kept in good condition. Regular servicing and annually verifying calibration, (quantity per time and per area), must be carried out by the qualified farmer or a specialised company.

6.7 Storage of fertilizers

Storage conditions and safety precautions for fertilizers must fulfil the basic requirements of Good Agricultural Practice (GAP). Solid fertilizers, manures and plant nutrients must be stored in a clean, dry location where there is no risk of water contamination. Inorganic and organic fertilizers must not be stored with fresh produce and plant propagation material. Where possible, fertilizers should not be stored with pesticides. If it is not possible to store fertilizers separately, they should be clearly separated and labelled.

7.0 Irrigation

7.1 Water requirement of the crops

All measures must be taken to minimise water loss and to optimise product quality.

Irrigation is only justified if the available water does not satisfy the crop's requirements. The calculated water amount must not exceed field capacity. Irrigation scheduling systems should be used where available. The regional organisation should provide to the farmers the specific information concerning the requirements of different crops, soil types and climatic conditions, making utmost use of available information systems. Irrigation should utilise, whenever possible, local data on reference evaporation rates calculated by means of local meteorological stations.

The irrigation plan needs to be established individually for each plot. The amount of applied water has should be recorded in the farm records. The irrigated area showing a water deficit should be not less than 30% of the total surface under irrigation.

7.2 Irrigation methods

The most efficient and commercially practical water delivery system should always be used to ensure best utilisation of water resources. Whenever possible, a combination of irrigation with fertilisation, (fertigation), should be considered.

Consideration should be given to a water management plan to optimise water usage and reduce waste, e.g. irrigating at night, maintenance to reduce leakage, collection of rainwater from roofs, etc.

7.3 Water quality and supply

Irrigation water has to be shown to be of adequate quality and must not contain polluting elements, (exceeding the official tolerance levels), and pathogens relevant to the crop. The regular analysis of the water quality with respect to heavy metals, N, and Na/Cl content etc., is recommended.

The use of untreated sewage water for irrigation/fertigation is prohibited. Where treated sewage water is used, water quality must comply with the WHO-Guidelines 1989 on "Safe Use of Wastewater and Excreta in Agriculture and Aquiculture".

Irrigation water should be obtained from sustainable sources, (i.e. sources that supply enough water under normal conditions). The installation of measuring devices in every plot for registering the amount of water applied is to be encouraged.

8.0 Integrated Plant Protection

8.1 Principles of Integrated Plant Protection

The Principles of Integrated Plant Protection have to be applied. They are described in detail in Appendix 4 and can be summarised as follows:

"**Preventive** (indirect) **measures** and **observations in the field** on pest, disease and weed status must have been considered **before intervention with direct plant protection measures** takes place".

Each IP guideline endorsed by IOBC must contain, in the chapter dealing with plant protection issues, a short introductory statement explaining clearly the basic philosophy of integrated plant protection pursued by the organisation.

8.1.1 Prevention (= indirect plant protection)

The prevention and/or suppression of key pests, diseases and weeds should be achieved or supported among other options especially by the

- choice of appropriate resistant/tolerant cultivars;
- use of an optimum crop rotation, (where applicable);
- use of adequate cultivation techniques, (e.g. stale seedbed technique, sowing dates, sowing densities, undersowing …..);
- use of balanced fertilisation, (especially nitrogen) ,and irrigation practices;
- protection and enhancement of important natural enemies by adequate plant protection measures;
- utilisation of ecological infrastructures inside and outside production sites to enhance a supportive conservation biological control of key pests by antagonists.

8.1.2 Risk assessment and monitoring

Pests, diseases and weeds must be monitored with adequate methods and tools to determine whether and when to apply direct control measures.

Scientifically sound warning, forecasting and early diagnosis systems should be utilised. They are important for decisions about when direct control measures are necessary. The official forecasts of pest and/or disease risks, where available, must be taken into consideration and greatest possible use of them must be made

Robust and scientifically sound threshold values are essential components for decision making. For pests, diseases and weeds, officially established threshold levels defined for the region must be taken into account before treatments. Empirical threshold values should be replaced by more scientifically sound parameters. Differences in varietal susceptibility, where known, must also to be considered .

8.1.3 Direct plant protection methods

Where indirect plant protection measures are not sufficient to prevent a problem and forecasts and threshold values indicate a need to intervene with direct plant protection measures, priority must be given to those measures which have the minimum impact on human health, non-target organisms and the environment.

8.2 The choice of direct plant protection methods (= control)

Biological, biotechnical[2] and physical methods must be preferred to chemical methods if they provide satisfactory control.

All agrochemicals used must fulfil the basic requirements of GAP. All plant protection products applied must be officially registered or permitted by the appropriate governmental organisation in the country of application and final destination of produce. Where no official registration scheme exists reference is made to the FAO Code of Conduct on the Distribution and Use of Pesticides.

The plant protection product applied must be appropriate for the target, as indicated on the product label, or for officially approved off-label uses. All pesticide applications must comply with the statutory conditions regarding the specific crop, maximum permitted total dose, maximum number of treatments, spray intervals and latest time of application, as indicated on the product label or authorised off-label uses. Since label doses are maximum doses approved by the registration authorities, reduced dosages are possible, (especially in herbicides).

The choice of pesticides in *sustainable production schemes* and their classification into ‘permitted’, ‘permitted with restrictions’ and ‘not permitted’ categories must consider:

- Their toxicity to man
- Their toxicity to key natural enemies
- Their toxicity to other natural organisms
- Their pollution potential for the environment (soil, water, air)
- Their ability to stimulate pests and diseases
- Their selectivity
- Their persistence
- Their potential to develop resistance in target

[2] Biotechnical control methods are defined in applied entomology as highly specific procedures that influence the behaviour or development of pests without direct biocidal activity, such as mating disruption, deterrents, sterile insect technique

- Incomplete or missing information
- The necessity of use.

Regularly updated data on the eco-toxicological profiles of pesticides are compiled by IOBC and published in the "Tool Box" of the Commission.

Weed management should be achieved, as far as possible, by non-chemical methods.

Chemical soil disinfection is not allowed.

Where the risk of resistance against a plant protection measure is known and where the level of pests, diseases or weeds requires repeated application of plant protection products in the crops, the regional organisations have to provide clear recommendations or mandatory requests for an anti-resistance strategy to maintain the effectiveness of the products.

8.3 Lists to be compiled by regional organisations

8.3.1 What lists?

Each regional IP-organisation must establish for each crop:

(a) A restrictive list of key pests, diseases and weeds that are economically important and require regular control measures in the region concerned;
(b) A list of the most important known site-specific natural antagonist(s), with information on their importance in each crop. The protection and augmentation of **at least 2 antagonists** must be mentioned as a desirable objective in advanced sustainable production systems;
(c) A list of preventive and highly selective direct control measures to be used in the IP program ("green list").
(d) A list of pesticides to be used with restrictions ("yellow list").

8.3.2 How to do it: establishing "green" and "yellow lists".

Available indirect and highly selective direct plant protection measures, (such as biological and biotechnical methods), must be compiled by the IOBC- endorsed regional organisation in a "**green list**". These lists are established according to Appendix 5 and models given in the "Tool Box" of the IOBC Commission.

A critically selected group of plant protection products that do not qualify for the "green list" but should be available to the grower despite certain negative aspects, (especially for reasons of resistance management or earmarked for exceptionally difficult cases), must be compiled by IOBC- endorsed regional organisations in a **"yellow list"**. These listed products are permitted only for precisely identified indications with clearly defined restrictions. The specifics of "yellow" lists are explained in Appendix 5.

8.4 Application and recording of pesticides

It is strongly recommended that the application to the lowest possible area, (e.g. band spraying, spot treatments), is limited.

The use of best application techniques available to minimize drift and loss is highly recommended.

There must be documented evidence on the mode of application according to label instructions and that the application has been accurately calculated, prepared and recorded. Spraying during windy weather conditions when wind velocity is exceeding 5m/sec, at temperatures above 25°C, and relative humidity below 50%, is not recommended. Buffer

zones of adequate size between treated crop areas and sensitive off-crop areas, (surface water, springs, ecological infrastructures), must be observed, (see point 2.6).

The impact on the environment must be minimised by calculating the dose/ha required for a given phenological stage of the crop. In three-dimensional crops, existing models to calculate canopy volume and leaf surface should be used to the fullest extent.

Small untreated areas, (zero treatment or "spray windows"), should be maintained in each crop and in each major plot/field except for arthropod pests, diseases and weeds declared as "highly dangerous/ contagious" by national authorities.

The official pre-harvest intervals to minimise pesticide residues must be followed and should, if possible, be extended. They must be recorded for all applications of crop protection product and evidence should be provided that they have been observed. In situations with continuous harvesting, systems must be in place in the field to ensure fail safe compliance, (e.g. warning signs).

8.5 Efficient and safe storage and handling of pesticides

The basic requirements of Good Agricultural Practice (GAP) with respect to storage, safe handling and disposal of pesticides, and for the operation and maintenance of spray equipments, must be fulfilled and outlined in detail in IOBC endorsed regional IP guidelines.

8.5.1 Safety and Handling

There must be adequate facilities for measuring, mixing and filling the products. Adequate emergency facilities, such as running water, eyewash facilities, first aid box and emergency procedures, must be provided to deal with potential operator contamination. The emergency plan must include a list of emergency telephone numbers and the location of the nearest telephone. Operators must have appropriate protective clothing and equipment for all operations involving chemicals.

8.5.2 Safe Application and Training

All sprayer operators must have appropriate training and hold, where relevant, the appropriate certificate of competence. Operators on training for the certificate of competence must be supervised during pesticide application by a certificate holder and must be within sight and sound of the supervisor.

8.5.3 Storage

Pesticides must be stored in accordance to local regulations, in a locked room and separated from other materials. Keys and access to the pesticide store must be limited to workers with formal training in the handling of pesticides. Pesticides must only be stored in their original package. Only pesticides that are approved for use on the crops must be stored in the same room; crop protection products used for purposes other than application on crops according to IOBC endorsed IP programs must be clearly identified and stored separated from “green” and “yellow list “products.

8.6 Spray equipment

The equipment must be kept in a good state of repair. It should be verified annually by a competent person for correct operation and calibration. Adequate functioning of the equipment must be verified before each treatment. A thorough technical service of the equipment, (especially manometers and nozzles), must be carried by an authorised service at least every 4 years. The purchase and use of spraying equipment producing the least drift and pesticide loss should be encouraged. The use of aircraft is forbidden, except for situations

where access to the plot is impossible because of exceptional weather conditions, or if plot topography allows no other way of spraying.

8.7 Disposal of surplus mix, obsolete pesticides and empty containers
Under normal circumstances surplus spray mix should not occur. However, if surplus should occur, disposal must comply with local regulations. Surplus ?mix or tank washings must either be sprayed onto a designated untreated part of the crop or disposed of by a registered waste contractor. When surplus mix or tank washings are applied over an untreated part of the crop, the maximum authorised dose must not be exceeded. Applications onto designated fallow land should demonstrate that this is legal practice and that there is no risk of surface water contamination.

The safe disposal of obsolete pesticides must be planned and recorded. They must only be disposed of through an approved chemical waste contractor. Empty pesticide containers must be rinsed with water three times and the rinse water returned to the spray tank. Empty containers must not be re-used but should be crushed or perforated to prevent re-use.

8.8 Pesticide residues
Legislation and/or food market requirements concerning pesticide residue analyses must be fulfilled.

9.0 Harvest

Harvest practices should fulfil the general requirements for product quality, food safety and traceability established by national or international standards. Some selected “must” items are listed below.

9.1 Produce quality
Products should meet not only the required market standards with respect to external and internal quality parameters but also the invisible criteria of production quality, ethical quality, (especially in animal production), and social quality (see chapter IV). Product quality must be high to demonstrate measurable and visual quality traits to the consumer.

The necessary measures to obtain optimum product quality at harvest should be defined for each crop taking into account actual national and international standards for external and internal quality. These parameters must be defined by regional organisations to evaluate in retrospect the proper physiological status of the particular produce.

9.2 Hygiene
All staff must be aware of the need to harvest, transport, store and pack produce with the utmost care having received basic training in personal hygiene requirements for handling of fresh produce.

A documented and up-dated risk assessment covering hygiene aspects of the harvest process and of produce handling operations must be made and hygiene procedures implemented.

Workers must be provided with clean fixed or mobile toilet facilities at all permanent sites and in the vicinity, (maximum 500m), of fieldwork.

Staff must have access to clean hand- washing facilities in the vicinity of their work.

10.0 Post-harvest Management and Storage

Post-harvest handling and storage practices should fulfil the general requirements for product quality, food safety and traceability established by national or international standards. Selected "must" items are listed below.

10.1 Hygiene

Workers must receive basic instructions in hygiene before handling fresh produce. There must be a documented and updated risk assessment that covers the hygiene aspect of the produce handling and storage operation. Implementation of hygiene instructions is adequately supervised.

Workers must be provided with clean toilet facilities and have access to clean hand washing facilities should occur in the vicinity of their work.

10.2 Post-harvest washing

The water used for washing final produce must have potable quality and recycled water must be filtered. At adequate intervals a water analysis must been carried out by an accredited laboratory at the point of entry into the washing machinery. The levels of the parameters analysed must be within accepted WHO thresholds or must be accepted as safe for the food industry by the competent authorities.

10.3 Post-harvest treatments

with pesticides and other chemical substances must, in general, not be applied to fresh produce for immediate consumption. If there is no alternative to ensure maintenance of good quality of produce destined for longer storage, a selected list of permitted treatments must be established and those eliminated that are in contradiction to the requirements of human health, sustainable production practices and consumers' expectations on natural and healthy food. The record of each treatment must include the justification for the application.

11.0 Animal production on mixed farms

Animal and crop production are interrelated components of mixed farms as operational units and cannot be separated with respect to Total Quality considerations.

11.1 Agronomic aspects

Animal density: A maximum livestock density of 2.0 Livestock Units (LU) /ha must be observed in order to avoid excessive amounts of manure that would offset balanced nutrient cycles (especially of P). A maximum density of 2.5 LU/ha can be tolerated if the farmer can prove that the N and P supply is balanced and that the excessive manure can be exported on a contract basis to another farm with less than 2.0 LU/ha. The minimum storage capacity for manure has to be defined in accordance to the regional climate to avoid environmental pollution under sub optimum weather conditions, (see also chapter 6.5).

Nutrition and medication: The nutrient content of animal feeds needs to consider the actual requirements of the animals especially with respect to phosphorous and trace elements. Antibiotic additives, nutritional, and hormonal growth enhancers are not allowed. All veterinary treatments should be recorded.

11.2 Animal welfare

Holding conditions for farm animals must satisfy at least national legal regulation. However, farms operating at higher quality levels need to consider ethical aspects, especially the welfare of the farm animals, as part of Total Quality. While no legally binding international standards are available as yet (2004) to define minimum requirements for aspects of animal welfare, most advanced national or commercial standards must be considered, whichever is higher. The active enhancement of animal welfare addresses aspects of optimum rearing, holding, transporting and slaughter conditions.

Where no regulations exist or national standards are low, animal production has to comply at least with the most recent mandatory requirements of level 3 of the Integrated Farm Assurance scheme defined by EUREP (www.eurep.org).

12.0 Workers' health, safety and welfare

Aspects of workers' health, safety and welfare are detailed in IOBC Technical Guideline I and in the "Admission Criteria for Organisations seeking IOBC Endorsement". The criteria are those outlined in the Declaration of the International Labour Organisation (www.ilo.org), an organisation of the United Nations.

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APPENDICES AND TOOLS

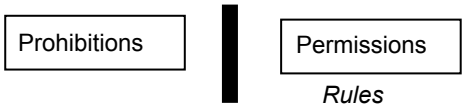
Appendix 1

Possible Structures of IP-Guidelines

(This document is integral part of IOBC Guideline I)

Basically there are three types of guidelines established by various organisations. All of them provide a valid basis for the implementation of IP but have certain advantages and disadvantages as follows:

1. Straight-forward system operating with strict permissions and prohibitions

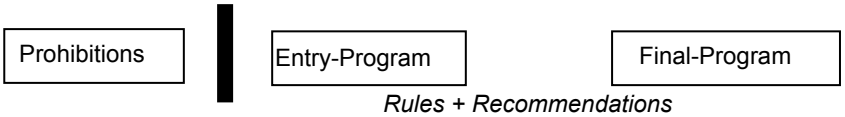


Advantages: Rules are clear-cut, prohibited items can be supervised and mistakes be identified. The system works on the basis that either everything is permitted that is not prohibited (list of prohibited items) or everything is prohibited that is not permitted (list of permitted items).

Disadvantages: The guidelines are very restrictive and do not provide guidance as to the intended development. They do not stimulate the farmer to explore new possibilities and to try new alternatives on the farm.

2. Combination of prohibitions, rules and recommendations

This frequently-used system sets a strict level of minimum requirements (prohibitions and obligatory rules). These often provide an entry-scenario (with lower requirements) and an end-scenario (with high requirements). The guidelines consist of a mixture of strict rules and recommendations.

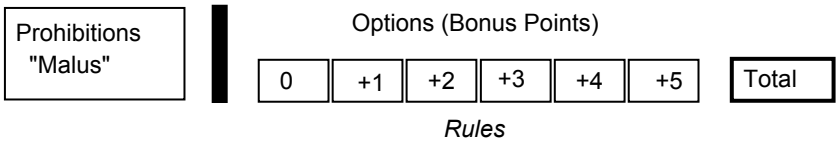


Advantages: Farms can enter a program without immediately fulfilling the high standards set by national or international agencies. The transition time between entering a program through the entry-scenario and reaching the goal can be defined, (e.g. 5 years), or left open.

Disadvantages: There is often a problem for the organisation in defining exactly when the farmer has reached the level of receiving certificates and labels. For the outside public and customers it is difficult to assess the quality of a label system and of a label product.

3. Rating systems (Bonus-Malus-System such as the Wädenswil model)

Strict prohibitions (malus points) define clearly the line between good and bad agricultural practice where farmers are either disqualified or qualified for certification. The inspected items exceeding significantly the level of mere GAP (good agricultural practice) consist of additional bonus points or options of possibilities that are ranked according to their ecological, ethical or social impact, (increasing bonus points given for more advanced solutions). The quality of programs depends on the minimum number of options or bonus points required by the label-organisation to be fulfilled by the member for obtaining certification.



Advantages: The rating system allows an evaluation of the farmers achievements in essential aspects of Integrated Farming. The farmer can position his farm management according to local possibilities and constraints and can compare the results achieved with other farms operating according to the same system. The farmer is stimulated to improve continuously by trial and error, by running his own experiments and by orienting himself on the highest possible objectives.

Disadvantage: The organisation has to invest more time and care in field inspections and in the proper analysis and evaluation of the farm records.

Guideline structures: National standards and regional characteristics

(From: IOBC/wprs Bull. 21 (1), 1998: Integrated Production in Europe)

With the implementation of ecologically based direct payments to farmers that are opting either for IP or organic farming, there is a need for the regulation and standardisation of IP guidelines by respective governments.
National guidelines that have to cover all geographic regions of a country will contain a large number of general recommendations in order to become applicable in all situations. This situation can lead to regional differences in technical details and rules open to legal challenge.

This problem can in most cases be solved with a flexible rating or bonus-malus system that can also be used to establish regional check-lists (= inspection protocols) that consider not only basic national requirements applicable in all regions but also the specific problems of the region concerned.

Practical examples show that such a rating system contains two parts:

– The **general national requirements** as „tronc commun“ defining the basic points that must be fulfilled by every grower participating in a national program.

  The catalogue of items defines clearly what minimum requirement must be fulfilled whereby failure in one single item will lead to the disqualification of the entire farm from the financial governmental support or certification (= malus). These national requirements can cover aspects of national importance such as reduction of nitrogen and phosphorous input, reduction of soil erosion and nutrient leaching by green cover in winter time, increasing biodiversity, reduction of pesticide and herbicide input, specific requirements in animal production, minimal social requirements etc.

– The **regional list of ecological options** as bonus system.
  Regional organisations can select from a national list of options additional ecological measures, (particular efforts), of specific interest for the region concerned.

  The responsible national agency will evaluate the suitability and severity level of the selected options, make necessary corrections, define the minimum number or type of options to be fulfilled by the farmer, and finally approve the regional guidelines. More detailed examples are given in the IOBC Toolbox on internet www.iobc.ch.

Appendix 2

Minimum Requirements for the Inspection and Evaluation of Farms operating according to IOBC IP-Standards

(This document is an integral part of IOBC Guideline I)

1. Principles

All farms certified by an IOBC- endorsed organisation must be supervised and their achievements monitored, evaluated and documented according to international rules.

The public at large has the right to assume that products and services provided under IOBC-endorsed labels are produced by farms bound to a strict inspection and evaluation system.

2. Inspection

2.1 Inspection Standards

Each IOBC-endorsed organisation, (hereafter referred to as "Organisation"), should use an adequate inspection and evaluation system organised according to EN 45011 or equivalent ISO norm. The inspection protocol of the inspection body must be approved by IOBC in the endorsement process.

IOBC-endorsed organisations must separate strictly their advisory and inspection activities. As a rule, inspection is carried out under contract by a qualified and certified inspection body. Where organisations seeking IOBC endorsement cannot employ the service of a certified outside inspection system but operate their own „in-house“ inspection that does not fulfil the requirements of EN 45004, it is then mandatory to sign a contract with a certified, neutral and qualified third party as supervisor of the organisation’s internal inspection operation. These supervisors must validate with their signature a declaration of conformity established by the organisation according to EN 45014.

Inspections are normally carried out by at **least two** independent persons.

2.2 Types of Inspection

2.2.1 Farm visits combined with advisory services during the transitory phase

All farms must be visited by qualified advisors of the organisation **at least once per year** during the specified **transition period.** These visits are not official inspections but have the quality of an internal audit with outside assistance and should be combined with advisory activities, (discussion of problems and their solutions). Sufficient time should be allocated for this important type of farm visit.

Farms having passed successfully the transition period must be visited by the advisory service for at least one additional year but preferably on a permanent basis. Advisory time can be reduced and the visit restricted to an internal audit. During these visits farm records are discussed and proposals for improvement made.

2.2.2 Policing inspection

After farms have successfully passed the transition period they must be inspected by an accredited and certified neutral inspection body..

2.3 Inspection procedures

2.3.1 The check-list (= inspection protocol)

The Organisation has to define clearly for the farm as a unit and each farm sector, (e.g. individual crops, animal production in mixed farms), the points to be checked by inspection on the farm and in the mandatory farm records. The corresponding **check-list** (= inspection protocol) should be published in an adequate format, (e.g. on the Internet). The check-list provides important information for the IOBC endorsement process and for the clients, (e.g. customers, retailers), because it is an important indicator of the Organisation's objectives, quality and credibility. The inspection protocols of each member must be kept for at least 3 years and be made available to IOBC upon request.

The **check-list,** (see also the "Tool-Box" to be found at www.iobc.ch), is the most important document of the inspection system and is up-dated according to needs. It must describe in detail the measurable parameters and general conditions of the farm management to be evaluated by inspections, (announced or unannounced). Check-lists must differentiate clearly between strict rules and prohibitions on one hand, and mere recommendations on the other hand. Bonus-malus-systems, (see Appendix 1), are useful check-lists *per se* that put different weights to recommended options according to their ecological impact.

Strict rules and prohibitions must be fulfilled without exceptions and transgressions (failures) occurring in this particular compartment of the check-list and must automatically trigger sanctions defined in the **list of sanctions** (see Appendix 3). The check-list should indicate clearly how many of the listed recommendations have to be fulfilled in order to receive certification by the IOBC- endorsed label organisation.

During the endorsement process IOBC proposes to candidate organisations the implementation of improvements in their inspection system whenever incomplete or vaguely described control measures of the organisation deviate from the principles and standards set by the Technical IOBC Guidelines I, II and III.

2.3.2 Farm inspection procedures

Certified inspection bodies operating the inspections under contract for the IP-organisation must describe their formal and certified inspection procedures following international standards. IOBC will evaluate the content of this inspection procedure during the endorsement process.

The inspection protocol must be signed by inspectors and farmer immediately after each inspection. The signature of the farmer indicates his agreement with the assessments made by the inspectors.

Disagreement with assessments made by the inspectors, (especially in cases where a certain transgression of the farmer leads to the loss of certification or more severe sanctions), must be re-examined within a specified time period by representatives of the mandatory Auditing Committee of the Organisation. In case of disagreement involving evidence on the farm, the inspectors must secure perishable material or other sensitive evidence in order to allow a second examination on site by representatives of the Auditing Committee.

3. Evaluation of farm records

Whereas a possible reduction in inspection intensity only concerns the physical presence of inspectors on the farm (field inspection), **all farm records must be analysed each** year in detail and evaluated irrespective of the intensity of field inspection.

3.1 Evaluation of farm records by the member (self evaluation))

Farm records cover activities of the farmer and elements of farm management that cannot be checked or measured by direct inspection. The completeness and truth of the statements made by the farmer in his farm records have to be ascertained in the written contract between farmer and Organisation as Contractors. Transgressions in this respect have to be followed by severe sanctions defined in a list of sanctions, (see Appendix 3).

The farm records have to be analysed by the farmer through the mandatory annual self evaluation, (see Technical Guideline II, point 1.4), that must be carried out either before the announced farm inspection or by a deadline specified by the organisation. It is recommended that this self-evaluation be organised in groups of adequate size and possibly in the framework of the annual professional training courses. The documents required in the self evaluation are the completed farm record protocols, (as required by the organisation), and the annual check list (inspection protocol).

3.2 Verification of the farm records by the organisation

Copies of this self evaluation, (plus copy of the completed and signed inspection protocol if inspection has taken place), are submitted to the organisation by a defined deadline and have to be evaluated by the organisation or appropriate service in terms of at least the following essential points:

- Completeness and plausibility of records taken
- Nutrient balance (N and P)
- All inputs of agrochemicals
- All disqualification criteria
- All criteria necessary for the mandatory monitoring activity of the organisation (see "Radar" in the Tool-Box).

3.3 Monitoring and statistical evaluation of farm records

IOBC requires that the results of the inspections, (or the internal audits), and of the organisation's verification of the farm records are adequately analysed and presented in a visualised fashion to the member, (see also "Radar" in Tool-Box on internet www.iobc.ch). All analysed and visualised data of the members are compiled and used for the visualisation of the achievements of the entire organisation on a year-to-year basis. This summarising evaluation and presentation is a component of the documents to be submitted to IOBC for the annual renewal of the endorsement certificate.

4. Confidentiality of observations and data collected by inspection

Inspectors and evaluation specialists are to be instructed to handle with discretion all observations made during the farm visits and all information obtained and collected. Data

obtained, processed and used for information and public relations work of the Organisation and of IOBC should be **coded** with respect to the identification of the member's **name and address**. The authorised officers of IOBC are subjected to the same principles of confidentiality but must have access to the uncoded and full information in pursuit of their own supervision of the Organisation’s activities.

Appendix 3

List of Sanctions

(This document is integral part of IOBC Technical Guideline I)

Each organisation endorsed or seeking endorsement by IOBC must establish a list of sanctions for transgressions and violations of rules and prohibitions established by the Organisation. The list of sanctions is complementary to the check-list as indicator of an organisation's quality and credibility. Accordingly it receives special attention in the IOBC endorsement procedure.

Severe sanctions, (e.g. permanent or temporary loss of membership with immediate exclusion from certification), have to be established for violations of rules covered by the contract between the Organisation and its individual members. Especially severe sanctions shall be applied to each type of fraud and violation of mutual trust.

Temporary sanctions, (exclusion of the farm from certification for the current growth season):

Strict rules and prohibitions defined by IOBC guidelines and incorporated in the inspection protocols must be fulfilled by each member in order to receive an IOBC-endorsed certification. IOBC strongly recommends that in advanced IP programs the rules and prohibitions are not diluted by the division into "major" and "minor" musts.

However, where an IOBC-endorsed organisation operates a carefully balanced and agronomically justified check-list containing "major" and "minor must" categories, (to differentiate between the severity of a rule and to add flexibility), the organisation should define clearly the requirements for fulfilment. All "major" obligations must be fulfilled and no exception granted. In case these rules and/or prohibitions are violated the entire farm sector involved, **and not only a field or plot,** will be eliminated from certification during the current growth season.

The organisation must define clearly how many of the "minor" obligations need to be fulfilled for achieving the status of a certified farm. This portion must depend on the ratio between major and minor musts in the check-list, and in no case fall below 80%.

Accidents and unforeseen problems

Facing an unexpected severe problem at the farm level, (e.g. special meteorological conditions, unexpected and/or highly dangerous pest or disease problem, specific physiological disorders of the crop), a farmer can **apply for permission** for an intervention not included in the IOBC endorsed program nor in the respective green and yellow lists. The Technical Committee of the Organisation can refuse or grant this permission after careful analysis of the situation. In the case of permission that is granted the entire plot of the crop concerned shall be eliminated from certification and labelling. **The same farmer cannot apply for another exception for at least 3 years.**

The Technical Committee of the organisation will prepare a specific list of control measures to be applied in such extraordinary cases. Following the logic of the green and yellow lists this emergency list might be labelled "orange".

Unique and obviously involuntary accidents, (e.g. use of wrong fertilizer or herbicide), reported by a farmer who has been successfully certified for at least 5 years can be examined and decided upon by the Technical Committee. In the case of acceptance the entire plot of the crop concerned will be eliminated from certification and labelling.

Pesticides used with restrictions

The proper use of pesticides in the yellow list is not considered a case of transgression subjected to sanctions. However, it is requested that the use of these products be strictly limited to situations where no valid and safer alternative is available. The frequency of use of "yellow" products by each member should be used as an interesting parameter in the monitoring program ("Radar").

Appendix 4

Integrated plant protection in the context of a sustainable agriculture

From: IOBC/wprs Bull. 21 (1) 1998. Integrated Production in Europe

E. F. Boller, J. Avilla, J.P. Gendrier, E. Jörg, C. Malavolta

Integrated Plant Protection looks back on a long history. In Europe, IOBC played a major role in its development and implementation. A closer examination of the relevant literature does, however, reveal that the concept was not always straightforward and was open to a considerable array of interpretations.

What is Integrated Plant Protection? How is it defined? These questions are frequently asked by politicians and farmers that are directly affected by the Common Agriculture Policy of the European Union, for example by Directive no. 2078/92 providing financial support for farmers participating in a program for sustainable agriculture. It is not surprising that the pioneering work of IOBC, already published in 1977, has almost been forgotten. However, it justifies re-examination to-day as this might help to clarify a certain confusion that is often observed in those political and professional circles that have not participated in the international collaboration provided by IOBC over many decades.

The basic IOBC document on ”Integrated Production – Principles and Technical Guidelines“, published in 1993, addresses that aspect of crop protection as part of the technical guideline I which outlines a general technical approach. It does not give background information on the rationale of the modern strategy that puts high priority on indirect preventive measures followed by direct control measures. The present contribution tries to close this important gap and describes the development from early definitions of Integrated Plant Protection to the present situation.

Integrated Plant Protection: The road is not the final destination

The starting point of our review is Table 1 on the evolution of plant protection methods, established in 1977 but still retaining its basic validity.

Some 20 years ago, scientists described four steps in the development of plant protection and concluded that integrated plant protection is the most advanced step that can be reached. They separated step 4 from step 5, (Integrated Production), by a solid line indicating a sort of final destination. However, a major improvement has been made in recent years as there is common agreement that plant protection has to be removed from this isolation and put into the context of all farm operations, (Boller *et al*. 1988, 1995; IOBC 1993). Therefore, we have replaced the solid line in the table by a broken one to emphasise that Integrated Plant Protection is and has to become an integral part of Integrated Production.

Table 1: The Evolution of Plant Protection Methods (modified from IOBC 1977)

1. Blind chemical control (Lutte chimique aveugle)	General, schematic and routine applications of the most potent pesticides; advice from industry
2. Chemical control based on advice (Lutte chimique conseillée)	Application of usually broad spectrum pesticides after consultation with an official advisory service
3. Specific control (Lutte dirigée) *Transitory phase*	Introduction of the concept of "economic threshold levels"; application of pesticides with no negative side-effects; protection of beneficial organisms
4. Integrated plant protection*) (Protection intégrée) *Dynamic phase*	Similar to specific control, but in addition integration of biological and biotechnical methods and methods of good agricultural practice; chemical control strongly regulated
5. Integrated agricultural production*) (Production agricole intégrée) *Open dynamic phase, further development possible in the whole world*	Similar to integrated plant protection, but in addition observance, integration and exploitation of all positive factors in the agro-ecosystem according to ecological principles

**) In the original table, step 4 was clearly separated from step 5 by a solid line. We have replaced it by a broken line to indicate that in the modern concept integrated plant protection is removed from its isolation and put into the context of all farm operations.*

Having reviewed this evolution of methods we now can proceed to our point of interest, namely Integrated Plant Protection in the context of Integrated Production. In this target area we can observe a high degree of vagueness and a multitude of opinions that have their roots in the definition of FAO (1967) and its later adaptation by IOBC that reads as follows:

Definition of Integrated Plant Protection
(FAO definition, modified by IOBC in1977)

All economically, ecologically and toxicologically defensible methods will be applied to keep damaging organisms below economic damage levels whilst conscious exploitation of natural control factors is emphasized.

This definition leaves is wide open to a spectrum of interpretations. Many illustrations in textbooks show Integrated Plant Protection as a large range of plant protection measures arranged around the crop, (e.g. Franz & Krieg, 1976). This suggests that we can make any given combination (= integration) of control methods according to our personal taste and declare it an integrated protection program. An extreme case found in the literature declares that "the principle (of integrated plant protection) consists of a combination of biological *and* chemical control methods", (Börner, 1981). Obviously, this view no longer reflects a modern concept of plant protection in the context of a sustainable agriculture.

The modern concept that evolved in the 1980s puts emphasis on the agro-ecosystem as one of the key elements of Integrated and Organic Farming.

A clear hierarchy of priorities replaces the free combination of control methods

It cannot be the main task of plant protection to repair damage caused by inadequate farming practices. Based on these considerations, IOBC has adopted a clear concept of priorities for plant protection in the context of a sustainable agriculture (IOBC 1993). The basic elements of this priority list are presented schematically in Table 2.

The holistic systems approach gives highest priority to *preventive measures* that can be summarised *as indirect plant protection***.** This first element includes (1) the optimal use of natural resources already in the planning stage of a new crop, (2) the elimination of all farm operations with negative impact on the agro-ecosystem, (i.e. causing or enhancing plant protection problems), and (3) the protection and augmentation of natural antagonists.

Monitoring and forecasting systems as an important second element provide the necessary instruments for a decision if and when the third element, namely

Direct plant protection (= control measures) has to be applied. Hence the use of pesticides is not *per se* an integral part of integrated plant protection but the last option when prevention alone does not produce acceptable results.

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Table 2: Plant protection in the context of sustainable agriculture
(integrated & organic farming)

Indirect Plant Protection (= Prevention)	**1.**	**Optimal use of natural resources** *e.g. crop adapted to local conditions; appropriate yield expectations; resistant varieties and clones; weed management with adequate intensity of competition to crop; mixtures of varieties and crops; optimal timing of sowing; optimal training systems; ecological compensation areas* (= system parameters)
	2.	**Farming practices without negative impact on the agro-ecosystems** *e.g. no surplus input of nutrients (especially N); optimal density of crop and foliage (ventilation); low intensity of tillage/cultivation and production methods protecting soil fertility; weed management (erosion control); habitat-management (green cover) to enhance biodiversity.*
	3.	**Protection and augmentation of antagonists** (beneficial arthropods, fungi, plants) *e.g. Assessing importance of individual antagonist species; inoculative releases; suppressive soils; habitat-management.*
Decision to apply direct control measures: **Monitoring & Forecasting Systems** *Epidemiology & forecasting models (time of occurrence & risk)* *Economic thresholds and tolerance levels*		
Direct Plant Protection (= Control)	**4.**	**Use of control measures acting exclusively upon target organisms** (pests, diseases, weeds) *e.g.* Biological and biotechnical: *Sterile-Insect Technique; repetitive release of selective parasitoids, predators, entomopathogens (e.g. viruses) and fungal antagonists, induced resistance; competitive plants, mycoherbicides and selective herbivores in weed control;* Selective chemicals: *Pheromones (e.g. mating disruption, oviposition deterrents)*
	5.	**Application of less selective measures**, where previous steps do not prevent economically unacceptable damage: Semi-selective pesticides: *e.g. Bacillus thuringiensis, insect growth regulators (IGR), sterol synthesis inhibiting fungicides;* Unselective pesticides: *short persistence*

Appendix 5

Green and yellow lists of plant protection measures:

French: **Liste verte et jaune des measures phytosanitaires**
Deutsch: **Grüne und gelbe Pflanzenschutzliste**
Italian: **Lista verde e gialla delle misure fitosanitarie**
Spanish: **Lista verde y amarilla de medidas fitosanitarias**

1. Purpose of green and yellow lists of plant protection measures

The "Green lists of plant protection measures" belong to the key documents of label organisations operating at high levels of sustainability. These documents are established each year by the competent service of the organisation and provide the necessary tool for the planning and implementation of Integrated Plant Protection activities at the farm level. A specific green list is established for each crop and for each geographic area with a comparable plant protection situation. Each green list can have a complementary yellow list of plant protection measures.

2. Green lists are more than pesticide lists

"Green" and "yellow" lists of agrochemicals have a relatively long tradition and became common tools in Integrated Production programs. However, the common practice to apply green and yellow categories exclusively to direct plant protection measures opens the door to misunderstandings. One such misunderstanding is the incorrect belief that the plant protection products and control procedures included in the green lists constitute *per se* the preferred plant protection option.

Taking into account the rationale presented in chapter 8.1 of the Technical Guideline II (Principles of Integrated Plant Protection), IOBC describes function and content of the green list as follows:

"The green list of plant protection measures is established and annually updated for a given cropping system and for a defined geographic area with a comparable plant protection situation. It is a technical document that covers all crop specific aspects necessary to plan and implement Integrated Plant Protection at the farm level, namely:

- *the list of key pests, diseases, weeds and physiological disorders;*
- *the two most important antagonists;*
- *the list of preventive measures;*
- *the monitoring tools and economic thresholds;*
- *the list of highly selective direct control measures (physical, biological, biotechnical, chemical) with no negative impact on human health, non-target organisms and environment.*

A green list can have a complementary and limited yellow list of pesticides to be used with restrictions."

3. Establishing the green lists

The structure of the green list should facilitate a logical sequential procedure of the plant protection activities as outlined in chapter 8.1.

a) The **title and site profile** covers e.g.:

- name of the organisation,
- title an year of validity
- crop
- geographic region or specific area
- level of precipitations annual and during 6 most important months of growth season

b) **Key pest organisms and antagonists**

The competent service of the organisation will collect or verify the information concerning key pests, diseases, weeds and physiological disorders and the relevant antagonists and introduce this information on top of the green list.

c) **List of options covering the preventive measures** that can be checked by the farmer.

The list might address the aspects outlined in chapter 8.1.1 of guideline II that reads as follows:

Prevention (= indirect plant protection)

The prevention and/or suppression of key pests, diseases, weeds and physiological disorders should be achieved or supported among other options especially by the

- choice of appropriate resistant/tolerant cultivars;
- use of an optimum crop rotation (where applicable);
- use of adequate cultivation techniques (e.g. stale seedbed technique, sowing dates, sowing densities, undersowing, adequate training and pruning systems);
- use of optimum fertilization (especially nitrogen) and irrigation practices;
- protection and enhancement of important natural enemies by adequate measures: inoculative release of antagonists;
- utilisation of ecological infrastructures inside and outside production sites to enhance a supportive Conservation Biological Control of key pests by antagonists.

d) **Monitoring and economic thresholds:**

Reference should be made to technical documents and information in possession of the farmer unless these details are given in the green list.

e) **List of direct plant protection methods**

List of plant protection measures, (control procedures and plant protection products), **without** negative impact on human health, non-target organisms and the environment. The choice of the appropriate measures is based on reliable and scientifically sound information sources, (e.g. the IOBC documents presented in the IOBC Tool Box).

Biological, biotechnical[1] and physical methods must be preferred to chemical methods if they provide satisfactory control.

[1] Biotechnical control methods are defined in applied entomology as highly specific procedures that influence the behaviour or development of pests without direct biocidal activity, such as mating disruption, deterrents, sterile insect technique

Pesticides included in the green list must satisfy criteria listed below and belong to the preferred option with respect to pesticides. Measures violating these criteria and hence requiring restrictions with respect to their application are listed in the yellow list.

Exception can be made for pesticides with a potential to develop resistance if a strict resistance management is imposed, (strict regulation of the permitted number of treatments, of a rotation of modes of action etc.) Where the risk of resistance against a plant protection product is known and where the level of pests, diseases or weeds requires repeated application of plant protection products, the regional organisations have to provide clear recommendations or mandatory requests for an anti-resistance strategy to maintain the effectiveness of the products.

The choice of candidate products for the green lists has to take into account and discard those with negative characteristics with respect to:

- Their toxicity to man*
- Their toxicity to key natural enemies*
- Their toxicity to other natural organisms*
- Their pollution potential for the environment (soil, water, air)*
- Their ability to stimulate pests and diseases
- Their selectivity
- Their persistence
- (Their potential to develop resistance in target)**
- Incomplete or missing information
- The necessity of use.

* *For these criteria reference is made to the official risk phrases of the EU (and other countries).*

** *Plant protection measures violating this criterion can be used in the green list only if their use is highly desirable, a strict resistance-management scheme has been defined and their eco-toxicological profile does not show other negative aspects.*

4. Establishing yellow lists

A complementary "yellow list" contains a critically selected group of plant protection products that do not qualify for the "green list" but should be available to the grower despite certain negative aspects. Reasons to consider the use of such products can be aspects of resistance management or earmarked use for precisely defined, exceptionally difficult cases.

The group of products listed in yellow lists can violate only the criteria of "selectivity" or "toxicity to key natural enemies" or "toxicity to other natural organisms" or "their potential to develop resistance in target". This group of products must be kept very small. Products are permitted only for precisely identified indications with clearly defined restrictions. Their use in advanced IP programs must be minimal, strictly regulated and monitored in the "Radar".

5. Providing product information to the farmer

Green lists with commercial products can list permitted pesticides with their commercial name and active ingredient. Yellow lists, however, must provide important product information in adequate form. Ecotoxicological data especially must be complete and facilitate the choice of the adequate product by the farmer. Models of possible pesticide tables are given in the IOBC Tool Box.

GLOSSARY (Explanation of technical terms)

Antagonist	Any living organism that acts as a suppressing factor of pest (arthropod, pathogen or weed) populations. Specific antagonists, but not the only ones, are > *Predators*, > *Parasitoids*, > *Entomopathogens* and antagonistic micro-organisms.
Arthropods	Group of invertebrate animals that includes, among others, the insects and the spiders (mites).
Beneficial organism	Any living organism that is beneficial to agriculture. It can be an > *Antagonist* or provide other useful services e.g. pollination (honey bee), soil formation (earth worms), epiphytic fungus.
Conservation biological control	Pest control through the active enhancement of > key antagonist action by > *Habitat management* and by maintaining important > *Ecological infrastructures*. It is a service provided by > *Functional Biodiversity*.
Ecological compensation area	Often used term for > *Ecological infrastructure* but with more restricted meaning.
Ecological infrastructure	Term preferred by IOBC. Any infrastructure that has an ecological value to the farm, such as hedge, grassland, meadows, wildflower strips, ruderal areas, conservation headland, stone heaps etc. that are at the farm or within a radius of about 150 m. Its judicious use increases the > *Functional Biodiversity* of the farm. Often called > *Ecological Compensation Area* with slightly different and more restricted meaning. See IOBC Tool-Box (www.iobc.ch).
Entomopathogen	A pathogen of insects, such as viruses, bacteria, fungi and nematodes.
Functional Biodiversity	Part of biodiversity that is of immediate use for the farmer (e.g. in > *Conservation Biological Control*.).
Habitat	Where animals live, overwinter, reproduce etc. Habitat management means to install, expand, maintain or manipulate important habitats inside or in vicinity of crops to attract and increase > *Antagonists*.
Inspection	Carried out by an outside neutral and certified inspection body (service). Either working on a contract basis or imposed by authority.
Key	Key (pests, antagonists): They are the most important ones.
Parasitoid	A species whose adults are free-living individuals and whose immature stages develop on or inside a single individual of their host that almost always is killed. Only some insects, mainly hymenoptera and diptera, are parasitoids.
Predator	A species whose adults and/or immature stages eat more than one other animal (prey) during their lifespan. Examples are hoverflies, ladybeetles and lacewings eating aphids.
"Radar"	Monitoring tool. Graphical display of the achievements made by individual members and by the entire IP organisation. See IOBC Tool-Box.
Tool-Box	The IOBC Tool-Box is a service available on internet (www.iobc.ch) to provide practical information, models and technical assistance in developing, improving and implementing Integrated Production.
Transgression	Mistake made that violates a rule of certain importance. Severe and intentional transgressions are frauds or other criminal acts.