Union Internationale des Sciences Biologiques

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WORKING GROUP "INTEGRATED PLANT PROTECTION IN ORCHARDS"
GROUPE DE TRAVAIL "LUTTE INTEGREE EN VERGERS"

WORKSHOP
GUIDELINES AND LABELS DEFINING INTEGRATED FRUIT PRODUCTION IN EUROPEAN COUNTRIES

LADENBURG, GERMANY
13 - 16 FEBRUARY 1990

EDITED BY E.DICKLER

IOBC / WPRS BULLETIN
BULLETIN OILB SROP

1990 / XIII / 8

International Union of Biological Sciences

INTERNATIONAL ORGANIZATION FOR BIOLOGICAL AND INTEGRATED CONTROL OF NOXIOUS ANIMALS AND PLANTS

WEST PALAEARCTIC REGIONAL SECTION

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Preface

The discussion concerning Integrated Fruit Production (IFP), the drawing up of guidelines for IFP and appropriate labelling is well under way in several European countries. This dramatic development was triggered off by an increasing awareness of environmental issues on the part of the consumer, together with the market's growing demand for foodstuffs which are produced using more ecologically 'safe' methods. This situation is to be highly valued, even if the danger of missuse and setbacks in commercial fruit production cannot be ruled out in the face of such a rapid development. Fortunately, many fruit-growers have proved to be extremely receptive to IFP-practices. Several production guidelines have already been established, whilst others are still in the drafting stage. Indeed certain products, which have been labelled as a result of these guidelines are already found in the market.

The IOBC/WPRS Working Group has viewed Integrated Plant Protection in Orchards as one of its main objectives as far back as the 1970s, and the first publication on this subject was released in 1977 by H. Steiner, (Bull. OILB/SROP No. 4). The time was not yet ripe however to implement IFP in commercial fruit production on a large scale.

In view of the European common market and the considerable divergence in the demands made within the individual countries, the IOBC/WPRS Working Group was requested to organize a workshop. The primary aim of this workshop was to discuss existing guidelines, as well as those in developmental stage and to establish minimum requirements for the label "IFP". Furthermore, the longterm objectives of this workshop were to harmonize these guidelines and to compile the minimum requirements for a "European guideline".

This bulletin only contains the papers which dealt directly with IFP-guidelines. More general presentations, for instance on the monitoring of pest organisms, have not been included.

E. Dickler
Convenor IOBC/WPRS Working Group
"Integrated Plant Protection in Orchards"
July 1990

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GUIDELINES AND LABEL FOR INTEGRATED FRUIT PRODUCTION IN EMILIA-ROMAGNA (ITALY)

C. MALAVOLTA, F. MAZZINI, C. ZAGHI and R. CANESTRALE Asessorato Agricoltura e Alimentazione, Regione Emilia-Romagna

Summary

The "Regional project for the diffusion of integrated pest management in orchards and vineyards" is a program of research, field experimentation and extension of integrated pest management techniques. It was launched in 1973 and, by 1989, involved approximately 12.800 hectares of fruit orchards (peach, apple, pear, plum, apricot and cherry) covering over 4000 farms. In 1990 the program will employ more than 200 technicians, occupied with experimentation and technical advising about integrated fruit production, with particular reference to integrated pest management and fertilization (as well as with all the other main agronomy techniques).

Scientific aid to the project is supplied by university institutes and regional bodies. The guidelines applied are the classic IPM techniques (based on economic threshold, selective and biological pesticides, natural biological control, forecasting models); concerning fertilization, a balanced program is applied, based on soil analysis in relation to fruit quality, pest management and environmental protection.

The application of integrated pest management has brought about a 25 - 30 % reduction in the quantities of pesticides used, the number of treatments and the costs. In order to promote commercially the production of farms involved, a quality trade-mark has been set up. In practice, this initiative consists of an agreement between producers' associations and the Regione Emilia-Romagna. This agreement makes possible the use of the regional label if the producers, or their organisations observe specific obligations, controls and sanctions. In 1988 and 1989, 4600 and 4800 (provisional data) tons of fruit have been marketed using the regional label with satisfactory results.

1. Introduction

The "Regional project for the diffusion of integrated pest management in orchards and vineyards" (Progetto regionale 1986-1990 per la diffusione delle metodologie di lotta integrata alle avversità dei fruttiferi e della vite) is a program of research, field experimentation and extension of integrated pest management (IPM) techniques. It was launched by Regione Emilia-Romagna (RER), in 1973, starting with a period of preliminary testing of sampling and monitoring methods, economic thresholds and chemical products. After this period, in 1980, a demonstration phase to put these methods into practice was begun. By 1989, approximately 12.800 hectares of fruit orchards (peach, apple, pear, plum, apricot and cherry) were involved, that is more or less 15 % of the

regional fruit production, as well as 4700 hectares of vineyards, covering over 4000 farms. Strawberry and other herbaceous (open field and protected) crops are also involved.
In 1990 the program will employ more than 200 technicians, occupied with experimentation and technical advising about integrated fruit production, with particular reference to integrated pest control and fertilization (as well as with all the other main agronomy techniques). These technicians are engaged, through partial contribution from RER, by producer's organizations, and by other public and private bodies. Among these technicians, 11 work as coordinators and are responsible for training activities of newly employed technicians and for drawing up weekly bulletins. These bulletins are recorded on telephone answering machines and published in the local newspaper, as well as, at an experimental level, by videotex. Scientific support is provided by university institutes and regional bodies. The representatives of these bodies are divided into specific working groups and sub-groups (which deal with the stages of the production cycle and/or the different crops).
The introduction of IPM techniques in fruit production has led to an average reduction of about 30 % in the number of treatments, quantities of pesticides used and pest control costs, compared with farms practicing traditional pest management. Furthermore, this initiative has had some influence on the type of protection methods recommended by other agricultural technicians in RER, thus contributing to more rational pest control strategies on a much larger scale than is directly affected by the project.
In order to further enlarge the application of integrated fruit production, a quality trade-mark has been set up to promote the produce of farms practicing integrated pest management. This initiative consists of an agreement between producers' associations and RER administration. This agreement makes possible the use of the regional label if the producers, or their organisations, apply official guidelines for integrated productions and observe specific obligations, controls and sanctions.

2. Guidelines for integrated fruit production

The guidelines applied to the control of the principal fruit orchard pests and diseases consist of a general frame of samplings and classic IPM decision-making system (based on economic thresholds, use of selective and biological pesticides, natural biological control and forecasting models).
The farms are required to be visited by the technician once a week or less frequently, according to their degree of autonomy.
Samplings are carried out weekly on shoots, leaves and fruit (100/ha plus 25 for each hectar after the first), which are randomly chosen on 20 plants/ha (plus 5 for each hectar after the first); sex traps (1 or more according to the size of the orchard and the species monitored), are also used. Sampling results are noted on appropriate forms and data from pilot orchards are also collected and processed by means of a computer network which is still in an

experimental stage.

The justification of treatments, by means of sampling for pests (application of economic threshold) or of favourable climatic conditions for maladies (when possible by means of forecasting models), is always required. Timing of treatments is also based on forecasting models when available.

Concerning pesticide choice, a list of advised active ingredients is given; it permits normally the optimal application of integrated control. In particular emergency conditions the use of partially selective active ingredients is also admitted due to technical and/or economical problems (1 and 2).

An example of a technical problem is the control of oriental fruit moth (*Grapholitha molesta*) and peach twig borer (*Anarsia lineatella*) on peach. In this case, the mating disruption technique has not been sufficiently tested in conditions of small surface orchards (the normal condition in RER). So it is still necessary to use active ingredients such as azinphos-methyl because phosalone, trichlorphon, diazinon or other biological or chemical insecticides are not always effective enough against these pests.

On apple orchards, because of costs, farmers sometimes prefer the application of azinphos-methyl for the control of *Cydia pomonella* (instead of the advised diflubenzuron) and of leafrollers (fenoxycarb or *Bacillus thuringiensis* are the advised products).

On the other hand, azinphos-methyl and other similar insecticides, probably because of frequency of use, don't demonstrate unselective effect of practical importance. Finally, on pears, fenoxycarb use isn't homologated yet, so frequently problems are solved by means of unselective active ingredients.

Further information about the techniques applied against principal and occasional pests and diseases are available in the manual "Lotta integrata in Emilia-Romagna" (IPM in Emilia-Romagna) (3 and 4).

Post-harvest treatments are admitted when physical methods are not sufficient.

Fertilization is also managed by the technicians. In this case, a standardized soil analysis is required each 4-5 years in order to apply a balanced program calculated according to technical guidelines, annually revised on the basis of the experimental results. This program relates soil content with fruit quality, pest management and environmental protection. Both organic and synthetic fertilizers are permitted.

Concerning the other agronomy techniques (i.e. irrigation, weed management, etc.), a list of rational practices is also advised.

The respect of these guidelines is verified by a commission of RER administration technicians and scientific supporters; controls are executed indirectly on forms and directly on field, randomly choosing technicians and farms checked.

During the next years it is possible that additional levels of application of integrated fruit production will be identified: the most advanced would permit the application of the newest

more advanced techniques independent of costs. If this is done, a specific commercial promotion would be very important in order to afford eventual major costs.

3. The rule for use of RER label

Until 1988 fruit producer's organisations and regional administration had agree upon a rule about commercial promotion of fruit production of farms involved in the IPM regional program.

This agreement makes possible the use of the regional label for the production respecting the guidelines above mentioned, if the following rules are observed:

- the lots of fruit destined for commercial promotion have to be identified with a code referring to forms during stockage and processing; a lot is the production coming from a single orchard or, in case of differences
in treatments applied, the production of one or more cultivars similarly treated;
- it is necessary to test for presence and level of residuals of active ingredients used during last 60 days before picking on apples and pears, and 45 days on stone fruits; at least 20 % of parcels have to be tested;
- commercial packages must be closed; label and written messages used have to be the official ones; the fruit store and packer need to be indicated.

RER administration and producer's administration have delegated to COVOER (a consortium for promotion of fruit and vegetables of RER) the respect of the rules above mentioned. This mixed public/private body operates by means of inspection and by testing pesticide residuals during stockage and commercialisation.

In the cases where this rule is not respected, RER administration applies sanctions based on the reduction of financial contribution and technical support to bodies involved in the regional project.

During 1988 and 1989, 4600 tons and 4800 tons (provisional data) of fruit have been marketed using the regional label with satisfactory and promising economic results.

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"ALMAVERDE": THE APO'S LABEL FOR INTEGRATED FRUIT PRODUCTION, IN THE THIRD YEAR OF PRESENCE ON ITALIAN MARKET.

Giulio BENVENUTI

Apo is an Association of Horticultural Growers compound by 6 Cooperatives with over 6.000 members, that trades 120.000 tons of various horticultural products. Its seat is in Cesena, a town located in Emilia Romagna (North-East Italy), between Bologna and Adriatic See, along Emilian Way.

In 1980, after 7 years of experiments guided from the University of Bologna (firstly in the Institute of Entomology), Emilia-Romagna Agriculture and Food Dept. started with a first project in order to carry out in a meaningful number of farms, Integrated Pest Management methods.

Following up the good results obtained and the set up of technical work and data harvest, was passed a five-year plan for the spreading of IPM methods in the District, that provided for a financing of specialized technicians care of horticultural cooperatives. Two years later, Italian Ministry of Agriculture draws its inspiration from this Plan drafting the "National Plan for Integrated Control".

Actually, in Emilia Romagna there are 137 technicans, 11 coordinative engineers, 13 experimenters.

Since 1980 A.P.O. participates in this project of Emilia-Romagna Dept., whose Representative is in this Workshop, with an increasing number of cultivations, specialized technicians and farms: actually, the controlled surface amounts to 987 ha., for 770 plots of land, in 353 farms, supervised by 15 technicians. For each plot is kept a Card with all the data required for the control, as well as the Project above mentioned orders: each technician attends for every year to an increasing number of farms, which are named, during the different stages, year after year, "New-introduction Farms", "Expert-collateral Farms" and "Expert-self-managing Farms".

These classes show the autonomy degree of the farm, therefore the frequency of the technical visits, with the aim to involve the growers up to the self-management in the basic data required for IPM. The technicians remain at these farms' disposal for every need.

We are also bringing forward a parallel program, growing strawberries with Biological Control: in 1989 we have produced 2.300 tons of these (from 547 plots).

From technical point of view, the general plan of IFP is represented by the guidelines of Emilia Romagna Agriculture Dept.: the kind of farm aid, the sampling form of plant parasites, and all the organization of the IPM. Nevertheless, for trading with label, we have set up a "Production-Rule" that provides for some important aspects:

- Every lot of traded fruit with IPM label is always analysed from our specialized Laboratory for the research of chemical residues (named GREENLAB). (See Table 1.).

- A careful selection of employable Chemicals, not only based on selectivity and toxycity, but also on residual properties, in order to obtain a range of chemicals as reduced and choice as possible (see Table 2.). The grower can use only the chemicals permitted by the Production Rule (see Table 3.).
- Obviously, to prefer, where possible, the employ of Biological Control (like *B. thuringiensis*, male disruption, Nematoda entomoparasites).
- The prohibition to employ chemical weed-killers.
- To keep manuring within fixed bounds, preferring organic matter, with exclusion of leaf-manuring.
- To keep controlled also the irrigation, by calculation of daily evapo-transpiration and supplying to the farms one pluviometer: a suitable Card says to the growers how to manage their irrigation system in the best way.
- The exclusion of consociated cultivations.
- To supply growers with selected (and suitable for Integrated Production) plants and cultivars; the rootstocks are produced by micropropagation, to guarantee the uniformity and health standard.
- The prohibition to employ acaricides.
- The prohibition of post-harvest treatment with chemicals. Every lot of fruit must be marked by the grower to be recognizable on delivery.

Every grower that doesn't respect our "Production-Rule", as well as every lot that, in the analysis response, has more than 50 % of the maximum residue permitted by Italian Law, is automatically excluded from trading with "ALMAVERDE" label.

Therefore, in practice, the aim is an Integrated Production with a final control by analysis that guarantee the consumer; An important aspect is the necessary continous technical improvement, in order to arrive at the no-chemical management of all the cultures as soon as possible and to go deep into the question of the quality parameters, as CEMAGREF in France started to do.

So, it's not possible to think that the actual situation can be enough. The complete integration of all the agronomical practices, the exclusion of chemicals and mineral manuring, the preservation of spontaneous vegetation, are part of this future purpose (habitat management).

Notwithstanding this, the level obtained, as warranty of quality and safety, is already good: above all the control of the production during every stage till the trading, is essential for a serious program that justifies the meaning of the label.

We started to trade the Integrated Fruit Production in 1986 with apples and in 1989 we have sold with our own IPM label (named "ALMAVERDE") 4.608 tons, among apples, pears, peaches, nectarines, apricots and plums (see Table 4.).

This kind of product is always principally traded by the Great Organized Distribution (supermarkets) into sealed (one by one) packaging.

During the evolution of "Almaverde" trading program, that involved a growing number of farms, and therefore an increasing marketable production with label, was necessary a police of marketing that, above all, informed correctly the consumers about the characteristics and the availability of this product.

Besides, we think it will be very important in the future that the IFP label management remain at the Production and won't end to the trading that never can guarantee all the steps of the control from the beginning: this is a basic aspect for a credible IFP program.

Table 1. Number of analysis made for "ALMAVERDE" label certification (1989)

CULTURE	N° OF LOTS ANALYSED
STRAWBERRY	373
PEACH and NECTARINES	477
APRICOT	58
PLUMS	15
APPLES	97
TOTAL	1020

Table 2. The selection of employable chemicals (1989).

CULTURE	N° OF SYNTHETIC CHEMICALS PERMITTED		
	BY ITALIAN LAW	BY IPM IN E.ROMAGNA	BY A.P.O. IN "ALMAVERDE"
STRAWBERRY (glasshouse)	58	3	no one
STRAWBERRY (open air)	58	8	2
PEACH and NECTARINES	93	31	10
APRICOT	62	30	4
PLUM	69	30	6
APPLE	111	30	11
PEAR	103	30	6

Table 3. Kind of chemicals permitted in "ALMAVERDE-Production Rule" during 1989, in the main cultures.

CULTURE	PARASITE	CHEMICALS PERMITTED
APPLE	Q. perniciosus	CALCIUM POLYSULFIDES
	D. plantaginea	OXYDEMETON METHYL
		VAMIDOTHION
	A. pomi	PIRIMICARB (not later of June)
	C. pomonella	DIFLUBENZURON
		AZINPHOS METHYL
	P. cerasana, A. podanus,	FENOXYCARB
	A. pulchellana	B. THURINGIENSIS
	L. scitella, Phyllonoricter spp.	DIFLUBENZURON
		FENOXYCARB
	V. inaequalis (only after	COPPER
	infectious rains up to June)	DODINE
		PENCONAZOL
		BITERTANOL
		FENARIMOL
		MANCOZEB
	P. leuchotricha	SULPHUR
	N. galligena	COPPER
PEACH	M. persicae,	ACEPHATE
AND	M. varians and	ETHIOFENCARB
NECTARINES	H. amygdali	PIRIMICARB
	T. meridionalis and T. major	ACEPHATE
	G. molesta and A. lineatella	AZINPHOS METHYL
		DIAZINON
		TRICHLORPHON
		male disruption
	P. pentagona	CALCIUM or BARIUM
		POLYSULFIDES
		FENOXYCARB (peach only)
		CHLORPIRIPHOS METHYL
	T. deformans & C. beyerinkii	ZIRAM
	S. pannosa	SULPHUR (peaches)
		PENCONAZOL (nectarines)

STRAWBERRY	M. euphorbiae and C. fragaefolii	CHRYSOPERLA CARNEA HEPTENOPHOS (*)
	T. urticae	Phytoseiulus perimilis
	Noctuidae	Bacillus thuringiensis (baits)
	Botrytis cynerea Oidium fragariae	VINCLOZOLIN(*) SULFHUR

(*) Permitted only in open air.

Table 4. Farms and surfaces guided by IPM and Biological Control in A.P.O. (1989)

CULTURE	FARMS	SURFACE (ha)
STRAWBERRY	547	111
PEACHES and NECTARINES	331	608
APRICOTS	92	52
PLUMS	47	25
PEAR	40	17
APPLES	148	123
VINE	112	162
TOTAL	1317	1099

EXPERIENCES WITH THE INTEGRATED FRUIT PRODUCTION IN SOUTH TYROL

H. Oberhofer, South Tyrolean Advisory Service for Fruit and Wine Growing, Lana

After having mentally prepared and practically trained our apple growers for years for an integrated plant protection, in 1988 our Advisory Service tried to put together "Guidelines for the integrated pip fruit production". During the winter of 1988/89 the working group for integrated fruit production, AGRIOS, was founded and the guidelines were introduced to the fruit growers.

About 1.000 growers with an orchard area of 1.800 ha and an apple production of 60.000 t joined the programme. During the production season 1989 officers of the Plant Protection Service supervised the participating exploitations. By random tests 300 orchards and their field books were checked.

10 % of the orchards were excluded from the programme by the control agents or by the growers themselves, because of a violation of the guidelines. About 55.000 t of apples finally had the right to be sold with the label "integrated production". At the beginning of the commercial season the interest for "integrated" apples was not very high. But during the last months both, the knowledge about and the demand for this production has been constantly growing on the market.

In 1990 we estimate about half of our annual apple production (300.000 t) will be produced according to the guidelines of our working group for integrated production.

THE IFP IN FRANCE: PRINCIPLE AND ACTIVITIES OF THE COVAPI

MANGUIN, J.P., Avignon

The French Committee for Integrated Fruit Production (IFP) has been created on january 16th 1979, from the recommendations of the I.O.B.C. through the International Committee for I.F.P.

At that time, only the G.A.L.T.I. was operating in Switzerland, that we met several times during the first four years, on the invitation of Mr. J. Thiault, ex-President of the International Committee of the I.F.P.

In the first years, the development of the COVAPI has met some difficulties because of few growers were concerned with I.F.P. Just some independant growers, involved with integrated fruit protection and good taste qualtity fruits, became members, followed the recommandations and commercialized with the COVAPI stamps.

Now, everyone, commonly, speaks of global quality. So, we are believing that more and more growers will make the necessary efforts to achieve the aim of:

Growing a fruit with a good taste quality and less residue level.

In other words: a fruit as natural as possible.

To be successful a grower has to take care of three balances.

- A balance of the orchard with the immediate environment, which means to create and protect some not-sprayed hedges nearby the orchard. Diversify the types of orchards and grow different kinds of floras to attract and maintain a maximum of various auxiliary faunas in the perimeter.
- A balance of the fruit tree, which means to stop the research of a highest productivity for a mean yield and growth with right orchard management.
- A balance of the fruit, which means to grow and raise a fruit for pleasure: well sun colored, well developed, well mature, tasty, and with a minimum of chemical residues.

So the grower has to be competent, well adviced and convinced.

To assist the grower, the COVAPI has a technical commission where work scientists, field advisors and growers.

Every year this commission:

- actualize the spray product list
- complete the taste quality rules
- study a group of reference orchards.

This group of reference orchards is followed through:

- a soil analysis (every 5 years, in general)
- a mineral leaf analysis every year
- a mineral fruit analysis every year
- 1 or 2 organoleptic fruit analysis every year

- An eventual fruit residue analysis
- An eventual storage control.

  All these informations are treated with an informatic programm to help the interpretation of each reference parcel
- To determine the evolutions on a period of time
- To calibrate the medium range of the mineral contents
- To find the specific features of each region
- And finally to aim for a constant progress in I.F.P.

For the promotion of the COVAPI fruit, the grower is the only one responsible with the consumer or the public service agents. As long as the COVAPI fruit is grown in accordance with the guideline, and the controls are suitable, the growers use posters, tracts, and stamps of the COVAPI and pay a redevance for them to the association.

Conclusion: Between a mostly chemical fruit growing production and a bio fruit production, the I.F.P. is the right response to the consumer, the ecologist, and the economist.

May these words be heard.

And this approach of fruit growing be developed.

PRACTICAL METHODS TO ESTIMATE TASTE QUALITY OF FRUITS

Francoise ALAVOINE-MORNAS, Michael CROCHON, Cemagref, Aix en Provence

Abstract

Practical methods to estimate taste quality of fruits have been defined by the CEMAGREF. These methods are based on the measurement of "sugars" level (estimated with refractometric index) which indicate how the fruit has developed on the plant, and acidity or firmness which are criteria of ripeness. Threshold of taste quality have been proposed and are now used by fruit growers, distributors, etc..., in order to estimate the level of quality and to improve the value of their products. The specifications of the organisations of I.P. have to take into account taste quality which is nowadays an element of the quality of a product (absence of bruise, taste quality, low level of residues or absence of residues, quality of service and informations, etc.).

1. Practical methods to estimate taste quality of fruits

1.1. Physiological basis of taste quality

The CEMAGREF (National Centre of Agriculture and Forestry and Water Management) of AIX EN PROVENCE has carried out studies in order to define simple methods usable to estimate taste quality of fruits. The methodology of those studies is to make physical and chemical analyses of samples of fruits, and to organize tastetests of the samples: the aim is to explain the results of the taste-tests with the measurements, in order to find analytical criteria of taste quality.

All the studies show that taste quality of fruits is in relation with the life of the fruit on the plant. A good-tasting fruit, is, first of all, a well-developed fruit: a fruit which has accumulated enough reserve elements during its development. The complementary condition for a high taste quality is the ripeness.

1.2. Methods of estimation of taste quality

The three main measurements are:

- "Sugars" content, which is the decisive element in the consumer's appreciation. In fact, we use the optic capacity of sugar juice to refract the light, and we measure the percentage of soluble solid content, often incorrectly labeled refractometric index.
- For the estimation of ripeness, two measurements are used: acidity (titratable acidity is measured by neutralization) and firmness (measured with a penetrometer).

The ratio between "sugars" content and acidity has a significant influence on taste. It can give an indication of ripeness but not necessarily of good quality.

1.3. Practical use of those methods

Thanks to these studies, the CEMAGREF has found objective criteria of taste quality for the main species cultivated in France. A study funded by the EEC and carried out in several countries of Europe in 1988 show that the main criteria of quality ("sugars" content) is available in all the countries.

Thresholds of taste quality have been defined: they refer to a minimum level of refractometric index and, in addition, to the acidity or firmness or the relationship between refractometric index and acidity.

These methods are now currently used by fruit growers, traders, distributors, etc., who want to know the taste quality of their fruits. Associated with commercial norms in specifications, the use of criteria of taste quality results in an improvement of the value of their products. A survey conducted in France in 1987 (including growers members of the COVAPI) shows that the fruit growers who know the taste quality of their fruit can sell them more easily, sometimes at a better price. In all the cases, knowing the level of quality of the products gives technical indications and the results can be put in relation with cultivation methods.

1.4. Conclusion

The word "quality" is often used in all domains of fruit production. The quality of a product, for the consumer, is what gives him satisfaction and makes him buy the product again. It involves:

- Quality of appearance (which makes the consumer buy the product the first time);
- Taste quality: fruits are very strongly linked with an idea of pleasure, sun, holidays, regeneration of vital forces, etc. A fruit which looks attractive but which has in fact a bad flavour or texture is very disappointing for the consumers and gives a very bad image of all the kinds of fruits.
- Guarantee about the level of residues: the consumers are now fully aware of the problems of the residues of pesticides in agricultural products and of the pollution of the environment. The organically grown products have now a very good image among the consumers, what improves the overall appreciation of the product. The fruits producted with integrated production methods can also give a safety to the consumers and get benefits from this positive effect on the appreciation of the consumers.
- Quality of information and service: the products need to be sold with a relevant information about the origin, methods of production, main characteristics of the product, use, etc., and the package needs to be adapted to the maintenance of the qualities of the product and to the requirements of the consumers.

Hence, taste quality is an element of the quality of fruits and needs to be taken into account in the specifications of the organizations which promote integrated fruit protection. In

addition, practising methods of integrated protection results in a better management of the orchard and a better knowledge of the fruits, which help to produce good-tasting fruit.

AN ECONOMIC POINT OF VIEW ON INTEGRATED PROTECTION

Claude FADY, Daniel MORIN, CEMAGREF, Aix en Provence

Abstract

A study carried out by the CEMAGREF about the economic benefits of integrated production shows that this type of practise has resulted in a dramatic saving of money thanks to a reduction of the number of applications and a decrease of the pesticides, especially of miticides.

1. An economic point of view about integrated fruit production

1.1. Description of the work

The CEMAGREF has carried out a survey in 1984 and 1985 among fruit growers (including members of the COVAPI).

The form involves three parts:

- The first part concerns general information about the farm, the pest management, the motivations of the grower, the level of value of the crop;
- the second part gives a description of each orchard taken into account for the study, with the cultivation technics and the characteristics of the crop;
- the third part records all the pesticide applications on the orchards previously described, and the pest or disease taken into consideration.

1.2. Results of the survey

a) Description of the sample. Motivations of the growers.

65 farms in 1983/1984 and 69 in 1984/1985 have been concerned in this survey. The number of orchards is 108, with in 1984, 54 % apples, 26 % pear and 19 % peaches, and in 1985 58 % apples, 20 % pears and 20 % peaches.

90 % of the growers of the sample apply integrated methods in 1984, and about 80 % in 1985.

The fruit growers who practise integrated protection are younger than the others. The surface of the orchards are the same in the two methods of cultivation.

The motivation of the growers who do not apply integrated protection methods is first of all the difficulty of the method, then the absence of technical help.

The growers who practise integrated production make it generally among a group (except in the region Alsace). The motivation is first of all the decrease of the costs of pesticides, then it is an ecologic motivation (to respect the balance of animal life and to have less residues on the fruits). In fact, the decrease of the number of applications of pesticides is in balance

with the high prices of specific pesticides used in integrated protection. But in this sample, there is in general only an idea of "integrated protection" and not still of "integrated production", except for the members of the COVAPI.

The integrated protection is made by means of

- specificial action pesticides;
- observation of the evolution of pests in the orchards;
- application during "critical periods".

The time spent by the farmer for the observations in the orchards is approximately 126 hours a year.

Less than 30 % of growers use integrated protection as a means of improving the value of their production. The majority of the growers think they have had no particular commercial advantage since they use integrated protection technics.

b) Technical results

The mean yields are generally the same. The main deseases concerned in 84 and 85 are two cryptogamic deseases. The criteria to decide the application of pesticides is at first the personal observations for the growers who practise integrated protection; for the others, it is just the phenological stage of the tree.

The pesticides which have a specific effect are used by the two types of growers; dangerous pesticides are still used by growers who apply integrated protection methods.

c) Economic results

For the species with pips, the mean cost of the pesticides is independant of the yield. However, for the peach tree, the higher the yield is, the more expensive the pesticides are. In fact, the cost per kilogram of fruit is appproximately the same for all the species because of the higher yield in 1984/85.

The cultivation of the apple tree needs the greatest amount of pesticides. The cost of pesticides per hectare is the highest for this species.

The mean cost of pesticides per kilogram of fruit in 1985 is higher for the fruit growers who did not practise integrated protection than for the others.

The cost of the pesticides is in close relationship with the number of applications. But in general, for apple and pear, the growers choose less expensive pesticides when they make a greater number of applications. For apple and pear, the number of applications is higher for the growers who do not practise I.P. than for those who practise it; it is almost the same in the two categories for peach.

In 1984, fruit growers who practise I.P. use more expensive pesticides as they apply the methods more completely. In 1985, they seem to make an effort for saving money on pesticide prices.

The breakdown of the total cost of pesticides is the following: 40 to 50 % for the fungicides (in the two methods), 25 to 35 % for the insecticides and 15 to 25 % for the miticides. The cost of miticides is 60 % higher for the growers who do not practise I.P.
People who do not practise I.P. spend in mean 29 % more than the others for pesticides, because of a higher number of applications of pesticides rather than more expensive pesticides.

1.3. Conclusion

This study carried out in 1984/85 show that integrated protection involves in fact various behaviours. But in general, there is a progressive evolution which leads to make this method more common.
The main results are a saving of money by means of a reduction of the number of applications of pesticides, and consequently a decrease of the cost of these applications, and a decrease of the cost of pesticides (about 30 % for all the pesticides and for all pests).

THE LABEL "FRUITNET": WHAT ARE THE AIMS AND GOALS?

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1. Introduction

After some years of trials on integrated pest management (IPM) the Research Station of Gorsem began in 1989 some extension work on IPM in cooperation with about 100 fruit growers, 30 of them being located in the french speaking part of Belgium. Thanks to the dynamism of one member of this group of 30 fruit growers, some money could be attracted from the regional authorities of the Walloon region, exactly from the Ministry of Agriculture and Environment. This money was put in a project entitled "Integrated and Computerised Fruit Production". The general aim of this project was:

- to produce fruit by technics exerting less pressure on the environment such as IPM and later on IFP (integrated fruit production);
- to use in this project the modern technics of computing and information processing in order to attain the first goal.

A general description of this project has been given elsewhere (Marcelle, 1989).

As this group of 30 fruit growers did not want to work on an individual basis but on a collective basis they took as an example one of these numerous groups applying IFP in Switzerland, the group "Cultival" working in the Valais. As in the swiss model, the walloon group put the accent on the fact that all the controls in the orchards should preferably be done in groups, with the hope of increasing the knowledge of each participant much more rapidly than by working individually.

2. How and why a group of fruit growers?

As in the swiss model "Cultival", the walloon group named "Fruitnet" is formed of sub-groups of 4-6 people accepting to work together in one direction, that of integrated fruit production. "Fruitnet" was founded some months after the beginning of the practical work in orchards, exactly on 1 October 1989. The aims of this structured association of fruit growers are:

- to promote and coordinate all cultural technics for attaining the optimal intrinsic quality of fruit;
- to participate in the promotion of the best integrated technics of fruit production compatible with "good" agronomy, health, ecology, economy and environment protection.

The biggest advantage of being an organised group of people working together is that there will be a kind of self control on the application of the future guidelines for IFP. This point will be of most importance when the label "Fruitnet" which until now is only a regional

label saying that people using this label are applying IFP, would become a commercial label of quality. A first control on the attribution of the label should be done by the producers themselves as each fruit grower will exactly know what happens in each orchard controlled by each sub-group. A "technical commission" provided for in the statutes of the association took as model what exists in the groups "Galti" or "Cultival" in Switzerland. This commission is composed of 6 members elected by the fruit-growers. If necessary help and advices could be asked to official research and extension services. After visiting the orchards this commission can decide if a batch of fruit picked in an orchard can receive the label or not, according to some criteria defined in the guidelines. Such internal controls of quality could be very important for the diffusion of integrated technics of fruit production but it is possible that they are not sufficient for the credibility of a commercial label implying an extra payment for fruit from IFP. This point will be discussed in the next chapter.

3. The problem of a commercial label in IFP

During years, in Switzerland, fruit growers putting fruits from IFP on the market did not receive more money for their production. They were happy to state (for instance in the case of fruits from the Galti) that their fruits were preferably chosen when offered at the same time than fruits coming from conventional orchards. So, in this time, the different labels existing on the swiss market for IFP fruits did not give any extra value to the fruits. It is of course tempting for the fruits growers producing fruits according to some special guidelines that their fruits could be recognized from the other ones and/or that some people cannot claim that they are also producing fruits in the same way if this is not true. On the other hand some consumers seem to be ready to pay some extra money for quality fruits produced by a more "ecological system", it means by a system exerting less pressure on the environment. Combining both wishes should result in the output of commercial labels certifying some quality of the fruits coming from IFP. By its decision to commercialize from 1990 fruits from IFP under a specific label the "Swiss Fruit Union" has probably given an impulse to the creation of different commercial labels in Europe for fruits produced by integrated technics. A first visible effect of this decision in Switzerland was the establishment of guidelines for IFP common to the whole country.

The creation of a commercial label is of course a problem depending on the fruit producers themselves and for some people, a problem having not relationship with research. It is true for many commercial labels but in the particular case of IFP, in my opinion, research has to help the different groups of fruit growers to build realistic guidelines for IFP and, if possible, to find good systems for warranting the labels.

Building realistic guidelines means that according to the regions and their specific problems, there could be different guidelines for applying "a good agricultural practice". It seems

impossible to me that for instance the guidelines of "Cultival" could be applied without any restriction by the group "Fruitnet". Some pests could be specific to one region and be ignored in the other one. Is it now possible to build a kind of minimum guidelines usable for instance in Europe, maybe that will be one of the results of this workshop?

Warranting and controlling the labels remain a difficult problem. The first system applied by different swiss and french groups is the kind of internal control carried on by the professional fruit growers working in groups and having enough power to exclude of the label every batch of fruits which did not answer to the good practice defined in the guidelines. In some countries such a system can maybe work without too much problem thanks to the "good mentality" of everybody, from the fruit grower until the end of the chain used for commercialization. In other countries some doubts are arising and people would prefer to have a more reliable system of control not depending on the profession. Finding such a type of control seems to me a difficult task for the following reasons:

- An analysis of pesticide residues is expensive and probably did not permit to separate fruits produced by integrated technics from fruits produced by more conventional methods respecting all the guidelines of pesticide use.
- The analysis of some specific pesticide normally forbidden in IFP did not necessary give very clear results. For instance the swiss guidelines of IFP prohibit the use of growth regulators except for thinning. We have seen that no residue of daminozide could be detected in pear when this chemical was used for growth regulation early in the season. In this case even an analysis cannot detect the false application of the guidelines. In such cases help and advices from the research can result in the building of more realistic guidelines but probably with important consequences and deviations from the mind of IFP (for instance everything which cannot be detected in the fruits could be used...). The principal aim of IFP was and must remain the production of quality fruit by softer technics exerting less pressure on the environment than the more conventional methods.

In the case of the label "Fruitnet", this problem of control is not yet solved. By working in small groups the fruit growers of "Fruitnet" will have the opportunity to control themselves and by the technical commission some kind of authority can warrant the attribution of the label. Until now nothing else could be expected in the two or three next years. But later on, in the frame of what is called "Quality of the walloon products" (that is a system approving and controlling the quality of a lot of food products by means of a net of laboratories) it could be imagined that the label "Fruitnet" could be recognized and received this kind of super-label of the walloon region but with the consequences that a permanent and official control should be done on the fruits. Until there research must help to find what are the best criteria which should be used for controlling the quality of fruits produced by IFP.

4. Against the idea of a label

Some people of the research are strongly against the idea to commercialize fruits from IFP under a special label for different reasons. In my opinion the three most serious reasons given for sustaining this opposition are:

- a label emphasizing the quality of fruits produced by integrated technics results in a kind of suspicion against the fruits produced by conventional methods;
- there is not enough fruit from IFP to answer to the need of the market during the whole season;
- finally of course the problem of the control of the real content of the label.

This last reason is the most serious one (see chapter 3) and until now only the trust in the integrity of the fruit growers applying IFP can give an answer more or less acceptable to this concern.

Answering to the first reason is easy. All surveys made in West Europe on the image of apple has very often led as first image "health and freshness" but as second image "residues of pesticide", even if this is surely not the reality. It was and it is still the task of the professional organizations of fruit growers to demonstrate that the whole fruit sector is much more sound than the impression get by the consumers.

To the second reason (the lack of fruits from IFP) the best answer I ever heard is the following: "It is very good so! Even if we can sell fruits from IFP only during one month, that will be as for the "Beaujolais Nouveau", people will appreciate and wait until the next year when we will come back with our special fruits".

But all these reasons are a battle of rear-guard because whatever our own wish could be commercial labels for IFP are there and in my opinion, it is one of our tasks to help and guide the producers going in this new direction.

5. Acknowledgements

Thanks are due to the I.W.O.N.L. for their financial support of the research on IPM. Mr. J. Denis, in the frame of the convention with the walloon region, has financially supported my attendance to this workshop.

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THE EVOLUTION OF INTEGRATED FRUIT PRODUCTION IN AUSTRIA

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The principles of Integrated Fruit Production (IFP) play an important role in Austrian fruit production since a long time. Especially the methods of Integrated Plant Protection (IPP) are observed by many growers. The scanning of the activity and the development stages of important animal pests (for example *Laspeyresia pomonella*) has a long tradition and enables specific spraying against these pests by warning messages. In the way of lectures, publications in journals and inspections the fruit growers had the opportunity to learn the methods of IFP and many of them reached a high level in it. Since some years the Federal Agency for Plant Protection publishes lists of side effects of pesticide active substances registered for fruits in Austria. The used scoring system of the IOBC for those effects is now well known by many fruit growers and they pay attention to that offered facts, when they choose their pesticides. There have been instructions in which the identification of beneficial and destructive insects has been trained. Scab computers are used by many fruit growers and more and more of them use pheromon traps for watching the local flight activity of codling moth and other pests.

This way it succeeded to bring many ideas of IFP to the fruit growers and a climbing percentage of them worked within the rules of IFP. But till now there was no organisation which published special guidelines for IFP and there was no seperate commercialisation of fruits from IFP too. Up to 1988 there were only little intentions to do this. But in this year some fruit producing areas in Europe, all in front South Tyrol went to public with the announcement of selling fruits, produced in accordance with special IFP guidelines. As reaction there was the cry for own IFP guidelines and a seperate commercialisation of fruits from IFP in Austria too.

Austria is a federation of 9 federal states, and every federal state has an own association of fruit growers. These associations build up the Austrian Fruit Growers Association. At first some of these local organisations began to work out own IFP guidelines and there was the danger that Austria gets up to 9 different IFP guidelines with own labels. But at the end common sense won the race and all members of the Austrian Fruit Growers Association agreed to make one IFP guidelines and one IFP label for whole Austria. The work on these guidelines went on in autumn 1989 and they will be finished just at the beginning of the 1990 season. The guidelines will include not only apple, all important pome and stone fruits will be covered. In later years perhaps even small fruits will be included.

This way 1990 will be the first year in Austria with an official production of fruits from IFP under the leadership of the Austrian Fruit Growers Association. The growers, who want to attend the programm have to announce themselves at the association and have to tell the area, which will be in the programm. They will have to follow the strict guidelines, fill out recordings on controls and sprayings and to admit checks of control commissions on their areas. This year will bring many experiences to all involved people, to the fruit growers, the advisers, the marketing associations and at last the sucess of the programm will depend on the reaction of the consumers.

GUIDELINES FOR INTEGRATED FRUIT PRODUCTION IN NORWAY

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In Norway we are now working on guidelines for an integrated fruit production (IP), which will be built up around the existing knowledge of the different fields of fruit growing, storage and marketing. A group of 12 participants representing the advisory service, research institutions, growers, storage and marketing organisations, are just nominated to prepare a proposal for such guidelines during this spring. Parallel with the work on the guidelines, we are also going to start special courses for growers with previously good experience in fruit growing who want to get an authorization in IP. These courses will last for about 50 hours. At the end there will be an examination. Those who pass the examination will get a diploma as a proof of minimum knowledge in IP.

Development of integrated pest management

Since early in the 1960s, strong research effort has been made on developing an integrated pest management system for different harmful insects and mites in fruit orchards. Better knowledge of the pest species and the beneficial insects and mites, have since 1965 resulted in a reduction of the pesticide use in our orchards by 70 percent. We have developed action thresholds for the most harmful phytophagous insects and mites. For one of our serious pests on apples, the apple fruit moth, *Argyresthia conjugella*, a prognose- and warning system has been developed, which have reduced the insecticide use against this species from 2 standard sprays a year to 1 spray each fourth year. Good results in using standard compounds of pesticides in very low concentrations have been obtained. These results are already taken into practical use by the fruit growers.

In the principal fruit growing areas, we have established warning systems for apple- and pear-scab, which have resulted in a strong reduction in the yearly number of fungicide applications. Depending on the apple variety, a protection program against scab, mildew and storage diseases amounts to a total of 2-8 applications a year.

The opinion of growers and consumers

It seems clear that the time now has come to go a step further, to expand from the IPM strategy to the knowledge of IP. Many farmers are interested in this development, based on horticultural knowledge and for environmental and economical reasons. They now also feel a tough competition with imported apples from USA and other fruit producing countries, after the GATT organisation ruled against our seasonal import restriction program in June 1989, under which we have been able to operate since 1934.

The consumers are highly aware of the "high quality" of the Norwegian fruit because of the low number of chemical applications in our orchards during the growing season compared to the number of applications necessary in many fruit producing areas in Europe and USA.

Preliminary guidelines for IP in Norway.

We define integrated fruit production as an orchard management based on ecological and other scientifically tested methods for an economic production of high quality fruit safeguarding nature and human health.

Minimum demands of IP of apples:

Education: The growers have to acquire knowledge about IP through special courses, professional meetings and private studies.

Plant material: In connection with new orchards priority must be given to varieties with a high degree of resistance against pests and diseases.

Plant system: Use single row systems with small trees which provide maximal utilization of the sunlight and minimal requirement of chemical spraying.

Chemical growth-regulators: Except for the two compounds, 1-naphthylacetic acid and ethephon, used around blossom time, it is forbidden to use any chemical compounds for growth-regulation and fruit-thinning.

Fertilization: As a basis for the fertilization planning, soil samples every 5th year are required or every 8th year if regular leaf chemical analysis are applied. Nitrogen can be used only in moderate amounts when leaf analysis or visual symptoms of leaves or fruits indicate that nitrogen application is necessary.

Leaf-feeding is allowed only if the trees show deficiency symptoms or after heavy stress situations as drought, high yields, etc.

Plant protection: Carry out regularly control functions of orchard pest species by use of standard methods as beating samples and visual control. If chemical treatment is necessary, use selective compounds or compounds in very low concentrations.

For scab control use the informations from the scab warning system.

Against diseases spray only by necessity. Use compounds without harmful effect on beneficials.

Herbicides can be used in new plantings and in the establishing phase of a new orchard. Later in the period of rotation only spot treatment of herbicide is allowed.

All chemical compounds with a harmful effect on pollinating insects can only be used at night time.

	Carry out regularly control of the spray equipment.
Harvesting:	Depends on fruit quality and consumption time. Cooperate with the advisory service and the storage company.
Fruit quality:	Only first class fruit can be sold with an IP label.
Storage:	Persue the guidelines for optimal storage practice. End the storage period when 3 percent weight loss of the apples is reached.
Trade:	IP fruit can only be sold in original packing. Food Control Authority have the responsibility for the quality control functions in the shops.
Notes:	Each IP grower is going to have a special note-book for plant protection management, fertilization, harvesting time and fruit production. By the yearly inspection the notebook will be controlled as a basis for a statement whether he follows the IP guidelines or not. The storage companies shall take notes about the storage conditions and grading results of the products from each grower.

Labelling:

We are discussing an appropriate labelling for the IP fruit. One proposal is to take our IP products to the market as "Norwegian Milieu Fruit", as suggested in the preliminary guidelines. Many people argue against this because the term "milieu" is too much used in other connections. Another proposal is to label it as "Norwegian Integrated Production", with the short term "NIP-fruit". But marketing people are very sceptical to the term "Integrated", because there are so many people who do not understand the meaning of the term. Lately we are discussing if it is possible to use the same label as we now are going to use for other "milieu" products, as non bleached paper products, etc. On such products there will be a label which shows a white swan on green bottom. Together with this label there will not be necessary to use the term "milieu".

Further strategy:

The members of our working group for IP will discuss these preliminary guidelines in detail. They also have to decide a labelling practise and to establish a control system for the production. Below there is a proposal for a control scheme, which can be used both of the grower and the controller.

We hope that the final guidelines and the first authorization courses in IP will be finished this year. The first integrated produced apples then probably can be taken to the market in 1991.

CONTROL SCHEME FOR INTEGRATED FRUIT PRODUCTION

Name: _____ Address: _____

Year: _____ Cultivar: _____ Location: _____

	POINTS -4	-2	0	+2	+4
Knowledge:					
Participated in courses,meetings,etc:	No			Some	All
Legal use of chemical growth reg.:			Yes		No
Fertilization according to plan:					
Nitrogen	Very bad	Bad		Good	Very good
Other fertilizers:	Very bad	Bad		Good	Very good
Plant protection:					
Spray program of fungicides:			Calendar	Warning + own opinion	
Spray program of insecticides:	Calendar			Warning + own control	
Pesticide spray in low cons.:	No				Yes
Spraying time for compounds harmful to honey-bees:	Warm day with sunshine		Daytime cloudy		Night
Use of herbicides:					
The ground under each row, %	100	75	50	25	0
Spot treatment:				Yes	Unsprayed
Mulching:			No		Yes
Bee-attracting weeds in the orchard:	Many		Some		Very few
Number of days from the application time limit to harvesting:					
Fungicides:			0	14	28
Insecticides:	0	14	28	42	Unsprayed
Control of harvesting time in relation to consumption time:	No			Partly	Yes
Filling in of notebook:	No		Partly	Good	Very well

Points: _____ Remarks: _____

Evaluation:

Conventional production: -42 - +20 points
Integrated production: +21 - +64 points

MINIMUM REQUIREMENTS FOR APPLE CULTIVARS USED IN INTEGRATED PRODUCTION

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Abstract

In integrated fruit production (IFP) the choice of cultivars, like other inputs or methods in the production system, must contribute to an economical production of high quality fruit which safeguards the environment and human health. An adjustment of the lists of recommended cultivars should probably take place. The list of recommended apple cultivars in Norway is presented as an example.

Introduction

Important properties of apple cultivars in integrated production (IP), are disease resistance, high fruit quality, good storage ability, annual and sufficient cropping, and good tree characteristics in general.

Apple cultivars which are highly susceptible to serious diseases like scab, *Venturia inaequalis*, and powdery mildew, *Podosphaera leucotricha*, are not suited for IP. In general, such cultivars should not be planted in IP plantations. A problem may occur, however, when well established cultivars which are popular among the consumers, must be characterized as highly susceptible.

In Denmark Hansen and Andersen (1985) in the year 1983 - with especially favourable conditions for scab infection - found that for example 'Summerred', 'McIntosh' and 'Cortland' were heavily damaged by scab. These cultivars, together with for example 'Lobo', are also in general characterized as susceptible to scab, and to some extent also to mildew. In Northwestern Washington State, USA, Norton (1981) after recording in the years 1972 - 1979, concluded that the following cultivars were highly susceptible to both scab and mildew: 'Burgundy', 'Idared', 'Jerseymac', 'Jonamac', 'Jonnee', 'Julyred', 'Melrose' and 'Magnolia Gold'. Also 'Vista Bella' was highly susceptible to scab but not to mildew.

The following question may be raised: Which cultivars can we allow in IP and which ones cannot be allowed?

Apple cultivars in commercial production in Norway

The apple cultivars in commercial fruit production in Norway, as listed by Kvale (1988), may be mentioned as an example (Table 1).

Of these cultivars, 'Summerred', 'Gravensteiner', 'Åkero', 'Lobo', 'Vista Bella' and 'Julyred' may be characterized as highly susceptable to scab, and to some extent to mildew. In future IP it is tempting to suggest that 'Summerred', 'Gravensteiner' and 'Åkero' may be allowed, because they are well established and very popular among the consumers.

Although being a profitable cultivar, 'Lobo' may be discharged because of its susceptibility to diseases combined with a rather poor fruit quality. Since 'Vista Bella' and 'Julyred' are not yet established, they should not be allowed in IP.

Recommended apple cultivars in a future IP in Norway

The list of recommended apple cultivars in a future IP in Norway may be very similar to the list of cultivars in commercial production today. It is natural to suggest that the old Danish cultivar 'Filippa', which has good resistance to scab and mildew and high fruit quality when well developed, should be tried in a modern high density planting system. This cultivar could be an alternative to 'Lobo'. Similarly, 'Geneva Early' may be tried as an alternative to 'Vista Bella' and 'Julyred'.

A principal question

It is a principal question whether one should allow the growers to plant all the cultivars they want to grow in IP, or if it is right to eliminate the most disease susceptible cultivars.

If it is really so that IP is thought to be an ideal combination of all production factors, so that the environment is taken care of and the products are safe for the consumers, it should be restrictions also in the choice of cultivars. IP must not only be a new designation of the conventional practice; it must be an important step towards a crop system which really safeguards the environment and the human health.

Table 1 List of recommended apple cultivars in commercial fruit production in Norway (From Kvåle, 1988)

Major cultivars	Special cultivars
Quinte	Red Torstein
Red Prins	Katja (=Katy)
Summerred	
Gravensteiner	Cultivars being evaluated
Red Gravensteiner	Vista Bella
Åkero	Julyred
Lobo	Carroll
Aroma	Discovery
Red Ingrid Marie	Tohoku 2

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DEVELOPMENT AND SCOPE OF GUIDELINES FOR INTEGRATED FRUIT PRODUCTION IN BADEN-WÜRTTEMBERG (FRG)

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The endeavours to establish guidelines for integrated production in order to enter the market with a commercial label, have become one of the most widely discussed topics among European fruit growers. Propositions to that effect were present in Baden-Württemberg already in the 1970ies, when Hans Steiner started to implement integrated principles in several apple orchards (1). Subsequently, a guideline was formulated corresponding with the suggestions by the IOBC-working group (2), but it remained draft for those ideas did not meet the necessary approval at that time. Thus, integrated control was practised by a smaller group of farmers, but without impact on the market worth mentioning.

From recommendations to binding rules

In the 1980s the integrated system could be established in commercial fruit growing of Baden-Württemberg on a larger scale. Within a new advising program, initiated by the Ministry of Agriculture, 4 additional advisers were engaged to promote the practical applying of integrated control and in 1985 a new guideline was presented by the regional plant protection service (3). Though this guideline served as a valuable instrument for the existing advisory bodies, it implied no obligation for the farmers but remained a recommendation only.

Increasing public demands on more ecological agriculture manifested e. g. in new legal regulations for plant protection (1986) brought about a change recently. As well as in several other European countries, in Germany more and more farmers accepted the integrated concept and the need to inform the consumer about the quality of their production. Thus, in 1989 the fruit growing region "Niederelbe" published guidelines with the aim of appropriate labelling (4). When other German regions were considering to label their apples as well, it was primarily the Bundesfachgruppe, head organization of all fruit growers in the FRG, that managed to coordinate the various activities on a national scale and to set up general outlines as a standard for all regional integrated guidelines (5).

In spite of this rapid advance, the Landesvereinigung Erwerbsobstbau (LVEO), regional union of fruit growers in Baden-Württemberg, for some time hesitated to support those conceptions. But when in spring 1989 a study group was founded at the Lake of Constance to draw up new guidelines and a similar work was started in the Rhine valley, the LVEO changed its attitude. At the end of last year this union decided to adopt the study group's concept of guidelines for the whole country and to take the leadership and initiative in the further development.

Eventually in Baden-Württemberg, the Ministry of Agriculture, the LVEO, marketing

organizations and the plant protection service agreed on a version of guidelines which was worked out at the end of 1989 and generally accepted in January 1990 (6). Setting up the requirements to issue a commercial label this guideline corresponds with the outlines edited by the Bundesfachgruppe. For the first time, there now exist binding rules in Baden-Württemberg for farmers who claim to practise integrated control.

Scope of the present guideline

As mentioned above, the present guideline adapting and completing the older one was worked out by a study group of scientists, advisers and producers. To point out the general aim of addressing the consumer, it was called "Guideline for integrated and controlled fruit production in Baden-Württemberg". Consisting of 3 parts, namely

- the guideline in the strict sense,
- some technical instructions,
- and a list of chemicals permitted (which is to be renewed every year),

the scope of objectives comprises all important fruit growing aspects. Particularly the following matters are treated in detail:

- planning and setting up the orchard (size, variety, planting system);
- regularly repeated cultural and plant protection measures, such as cultivation of soil, fertilization, thinning and pruning for better fruit quality, last not least control of noxious organisms with the help of natural enemies and selective chemicals;
- harvesting and storage procedures, including the demand of a repeated fruit picking;
- finally the fruit growers' qualification: The producers are obliged to improve their knowledge, to take part in training courses and advisory sessions, and to keep records about all interventions in his orchard.

As to the technical instructions these supplementary materials are meant to assist advisers as well as farmers and to provide detailed informations about special measures or methods e. g. the strategy against scab, the application technics or harvesting precepts.

Underlining the producers' responsible part, this guideline was edited neither by the plant protection service nor by anyother official institution, but by the LVEO. In 1990, this organization will take the licence for a label and for the first time will offer it to its members.

Requirements and control schemes

To obtain this label the producer is obliged to observe the conditions stated in the guideline. Among the various requirements the observance of the list of permitted fungicides, insecticides, herbicides etc. is most important. The selection of these chemicals was done with respect to their side effects on beneficials, particularly on predatory mites, and considering the specific need to avoid scab infections. Another main aspect is the protection

of the ground water. In detail the following basic requests were formulated:

1. No use of herbicides that may affect the ground water;
2. Not more than 4 spraying with dithiocarbamates, and at most two times in sequence;
3. At a maximum 1 spraying with benzimidazoles per season;
4. No use of pyrethroids;
5. No use of growth regulators except for the purpose of fruit thinning;
6. No post-harvest spray, or rather: no spray after commencement of harvesting a certain variety.

Much more difficult than any restriction in the use of chemicals is attaining an agreement on the procedure and extent of control and on the way to finance it. At present, it is envisaged to insist on 4 different controls:

1. Plausibility of the farmer's records;
2. Inspection of the farm and the orchard;
3. Examination of residues on leaves and fruits;
4. Check of the marketing channels.

To find out efficient methods of control and to estimate the arising costs, a one-year-study at the Landesanstalt für Pflanzenschutz was launched by the Ministry of Agriculture, that also bears the expense of controls done in 1990. This financial support will facilitate the start of this venture but there is no doubt that in the long run the project must be self-financing. Thus, every farmer who wishes to obtain the label certifying his apples as being produced according to integrated principles will presumably have to pay a certain fee to cover the basic costs.

The present development towards guidelines opens new prospects for the introduction of integrated control into commercial fruit growing in Europe. The increasing use of labels may probably improve the acceptance of ecologically favourable methods. As more and more farmers are joining, the experiences gained in Baden-Württemberg as well as in other countries will soon reveal the possibilities and limits of those concepts and certainly confirm the need of international standards as proposed by the IOBC.

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ADVISING IN FRUIT PRODUCTION VIA BTX IN RHEINLAND-PFALZ

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In 1985 the government of Rheinland-Pfalz started a teletext programme (Btx) to improve agricultural extension. The total programme consists of 2400 Btx-pages and is offered by "Agrarinformation Rheinland-Pfalz". It is financed by the Ministry of Agriculture, Viticulture and Forestry and the farmer's and vine grower's associations.

For the fruit growers 508 pages are offered. Most of the information deals with plant protection (approximately 320 pages). Of great importance are the market informations (70 pages). About 50 pages can be used for communication between the growers and the advisory service and between the offices and administrative departments. Extension offered by the cultivation advisory service comprises

- latest news: cultivation recommendations
- literature reviews
- experimental results
- market prices.

Extension offered by the plant protection advisory service comprises

- warning services for each of the growing regions
- informations on the plant protection products
- basic knowledge on the biology and epidemiology of pests and diseases
- pheromon trap-catches
- results from the numerous scab monitoring stations (infection periods)

Latest news, market prices, warning services and the results from the pheromon traps and scabmonitoring stations are actualized daily. The other informations are revised once a month or in weekly intervals.

Btx can be used either with special Btx sets (Multitel, Bitel etc.) or with special PC-software. By now 200 users (fruit-farmers) have joined the Btx-programme of Rheinland-Pfalz.

"INTEGRATED FRUIT PRODUCTION" IN THE NIEDERELBE-REGION (FRG)

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The guide-lines for integrated fruit production in the Niederelbe-region have been developed and published in 1989 in response to the changing conditions for fruit production in the German Federal Republic. Some of the driving aspects were the tightening up of the plant protection legislation, general rise of environmental-consciousness, reduced number of pesticides registered, increasing problems concerning pathogens' resistance to pesticides and the aggravated situation on the market. The guide-lines comprise special requirements regarding site suitability, planting material, soil management, tree training, aspects of fruit quality, plant protection, harvesting, storage and sorting. The concept of integrated fruit production, derived from an intense form of cultivation, aims at a comprehensive approach taking into account all factors affecting the apple tree.

Integrated plant protection occupies a central position in IFP. In the 1980s the development of qualifications for IFP was started in the Niederelbe-region by the Obstbauversuchsanstalt (OVA). In an area of 10 000 ha pome fruit 70 monitoring stations provide detailed information about scab infections. The periods of the flight activity of about 20 potential pests are determined at ten different locations by means of pheromone traps. All collected data are made available to the fruit growers by means of a digital telephone. During the vegetation period the information is actualized daily as necessary.

Continuation courses were carried out regularly to enable the fruit farmers to distinguish noxious and beneficial organisms and to deal with threshold levels.

The use of pesticides is limited to those which are not restricted for use in water protection areas and to agents that are relatively innocuous for beneficial organisms. Employment of growth regulators is not accepted.

The results of visual controls, dates of infection, threshold levels, actions carried out, etc. must be documented by the fruit grower who has to allow his records and pesticide stocks to be inspected by authorized representatives of a control organ.

Repeated checks carried out by advisers for plant protection and cultivation ensure the compliance with the guide-lines. The checks include visual controls during the vegetation period and sampling of at least one test fruit from each orchard of the farm which is analysed for pesticide residues by the LUFA (Hameln).

In spring 1989 the introduction of the IFP-concept into fruit grower's practice was realised for the first time. 170 fruit farmers, together cultivating a total area of about 1550 ha, were willing to produce pome fruits in accordance with the guide-lines. The readiness to take a risk in the intended reduction of chemical plant protection was especially found among young farmers. Constant motivation and care for the fruit growers were necessary to ensure the first year's success. Thus, a considerable process of rethinking was produced among all

the fruit farmers in the Niederelbe-region.
A trade-mark was granted to 149 of those 170 fruit farmers. Their production had been run according to the guide-lines, the other 21 had to be excluded.
It is expected that about 400 fruit growers will practise IFP in 1990. In the Niederelbe-region it is planned to win over all fruit farmers to implementing integrated fruit production.

INTEGRATED FRUIT PRODUCTION IN RHEINLAND-PFALZ

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Abstract

In Rheinland-Pfalz fruit production comprises an area of about 8.000 ha. On 4.500 ha apple is cultivated; on 3.200 ha stone fruit, mainly sour cherries and plums are grown. Cultivation of apple is expanding.

In 1989 approximately 10 % of the fruit production area were cultivated in Integrated Fruit Production systems and this form of production is rapidly expanding. The guideline for Integrated Fruit Production in Rheinland-Pfalz was established in 1988/89 by the cultivation and plant protection advisory services. It is identical with the guideline for the Federal Republic of Germany. Integrated fruit production systems are characterized by reduced N-fertilization, mechanical weed control, prohibition of the use of growth regulators (except for thinning), the use of pesticides which are not harmful to beneficial insects, reduced application rates of pesticides and biological control methods.

The label "Aroma Obst from Integrated Fruit Production" is conferred by the "Arbeitsgemeinschaft Integrierter Anbau Rheinland-Pfalz e.V." (a farmer's association under supervision of the governmental advisory services). The fruit growers have to document their fertilization and plant protection management in fieldbooklets. The orchards are supervised by control committees and soil-, fruit- or leaf-samples are taken at random and are analysed for pesticides residues and pesticides that are not allowed in Integrated Fruit Production. Violation of the guideline for Integrated Fruit Production may result in exclusion from the "Anbaugemeinschaft".

1. Fruit production in Rheinland-Pfalz

In Rheinland-Pfalz fruits are cultivated on approximately 8.000 ha. There are three main growing areas: Palatinate, Rheinhessen and Mittelrhein (from Koblenz to Bonn). Average temperature is 8.5 - 10.0 °C and average rainfall 500 - 800 mm per year. On ca. 60 % of the growing area apple is grown and on ca. 40 % stone fruits (mainly sour cherries and plums) are cultivated. Almost all of the fruit growers are owners of "mixed farms". Cultivation of apple is expanding whereas production of sour cherries is decreasing. Most of them grow vine plus fruits, a minor part of them field crops plus fruits.

2. Cultivation

The most common cultivars in apple production in Rheinland -Pfalz are Golden Delicious, Cox Orange, James Grieve, Idared, Elstar and Jonagold. In Integrated Fruit Production resistant or tolerant varies should be grown if possible. By now there is no cultivar available that combines disease resistance with a good fruit quality. But crossings of Elstar and Prima

in the Netherlands are very promising, and we hope to include disease resistance in integrated systems in about five to seven years. In the fruit growing regions of Rheinland-Pfalz we exclusively use one-row-systems because they are better suited for mechanical weed control and application of plant protection products. In new installated orchards 2.500 to 3.500 trees per ha should be cultivated. Some progressive growers are planting 5.000 to 6.000 trees/ha.

In Integrated Fruit Production the need for applying fertilizer, especially nitrate fertilizer has to be inquired by soil investigations. The "N_{min}-method" and some nitrate quick tests are in use. N-fertilizer application rates range from zero to forty kg per ha.

During the last years in pruning methods some good expriences were made with summer pruning. The growth of the trees can be reduced quite well, and there is no urgent need for growth regulators. The only exception where growth regulators are used in integrated systems is for thinning. Thinning by hand is too time consuming so that we cannot disperse with chemical thinning agents. Because problems with contamination of groundwater with mainly herbicides occurred we are looking for alternatives in weed control. Good results were obtained with different mechanical methods that work well in our regions with quite low rainfalls. Persistent soil herbicides are not allowed in Integrated Fruit Production.

3. Plant Protection

Main diseases in apple production are apple scab and apple powdery mildew. The most serious pests are codling moth (in the Palatinate and Mittelrhein), summer fruit tortrix moth, red spider mite, *Dysaphis* spp. and black water rat. Minor problems are created by leaf miners (*Stigmella malella*), wolly apple aphid, rust mites, green apple aphid and apple sawfly.

In stone fruit production Monilia and shot hole disease are most damaging and sometimes bark diseases (such as Valsa and Verticillium) and silver leaf disease of plums are found in the orchards. The most important pests are small winter moth, red spider mite, black cherry aphid, leaf-curling plum aphid (vector of Plum Pox Virus), plum fruit moth, plum rust mite and European brown scale.

Red spider mite and wolly apple aphid are becoming less important whereas black water rat, the rust mites and scales occur more frequently in the orchards.

In the Integrated Pest Management (IPM)-systems the use of insecticides, acaricides and fungicides being not harmful to beneficial organisms, the use of damage or action thresholds and forecasting models for pests and diseases and the use of biological control methods are the most important tools. Pesticides are only used if the abundance of the populations are above the action threshold. Fungicides against apple scab are applied after infection periods. In Rheinland-Pfalz almost 50 thermohygrographs and 15 monitoring stations are used to predict scab and partly apple powdery mildew. Pheromon traps for

codling moth, summer fruit tortrix moth and plum fruit moth and several other traps give us informations on the flight of the pest and allow optimal timing of pesticide application. Wherever possible pesticides and fungicides are applied with reduced application rates. In the last two years efforts were taken to introduce Typhlodromus pyri into the apple orchards for biological control of red spider mite and to a less extent of rust mites. Further biological control methods that will be included in IPM systems are CpGV and Trichogramma spp. Only plant protection products in accordance with the "National Guideline for Integrated Fruit Production" are allowed to be used in Integrated Fruit Production in Rheinland-Pfalz.

4. Guideline and label for Integrated Fruit Production in Rheinland-Pfalz

The guideline for IFP in Rheinland-Pfalz is identical to the National Guideline for Integrated Fruit Production. It provides the basis for IFP in our country. Detailed informations and instructions on IFP are given to the fruit grower by the "Anleitung für den Integrierten Obstanbau". This brochure (ca. 50 pages) contains IFP-systems for apple and stone-fruits. It was provided by the cultivation and plant protection advisory services in 1989 and will be actualized at least every two years. Fruit growers who want to start with IFP have to join one of the ten IPM working groups. If they are planning the installation of new orchards they have to consult the cultivation advisory service. The IPM-working groups meet 2 - 3 times a month from March to June and once a month from July to October. The training courses deal with branch-samples, beating-samples and visual controlling of orchards to decide if the pest populations are above the action thresholds. Further topics are the biology and the determination of beneficials, properties of plant protection products, thermohygrographs and weather stations, new plant protection methods and economics of IPM.

Trials carried out by the cultivation and the plant protection advisory service are visited and the results are discussed.

An important aspect in IFP is the commercialization of the products. There is a large backlog demand. Up to now traders and co-operatives have refused a seperate commercialization of fruits coming from IFP due to the fear of splitting the market. A lot of fruit growers especially self-commercializers - want to take advantage of IFP and include it in their advertising campaigns. In 1990 seperate commercialization of Integrated Fruit Products shall start in Rheinland-Pfalz. In March 1990 a label "Aroma Obst" from Integrated Fruit Production was created. It will be conferred by the "Arbeitsgemeinschaft Integrierter Obstanbau Rheinland-Pfalz e.V.", a registered fruit growers association under supervision of the governmental advisory services of the Ministry for Agriculture. Only members of the growers association can get the label for their products. The association is financed by the growers themselves and by a support from the government of Rheinland-Pfalz. The fruit growers can join IFP either with some orchards or with the whole farm. A

certain minimum size for orchards is recommended. After a time of at maximum five years the whole fruit production of the farm has to be IFP. The fruit grower has to give the permission to the control committee of the "Arbeitsgemeinschaft" to inspect his farm and the orchards.

The control committees check the fieldbooklets (in which the growers have to document their fertilization, cultivation and plant protection activities) if they are complete and plausible. The spraying machines and the depots of plant protection products are inspected. The orchards are supervised visually on pests and diseases, beneficials, weed control (mechanically and herbicide use), pruning, plant nutrition and fruit quality and expected yield. Samples (soil, parts of plants, fruits) are taken either at random or on the suspicion that production is not in accordance with the guidelines. They are analyzed for pesticide residues and pesticides that are not allowed in IFP.

If the guidelines for IFP are violated either the grower will be excluded from the "Arbeitsgemeinschaft" or the label will not be conferred to the harvest of certain orchards.

In 1989 130 fruit growers with approximately 800 ha, that is 10 % of the fruit growing area, had joined IFP. The interest of the farmers in IFP is enormous and the working groups expand in size and number. It is expected that in near future the major part of fruit produced in Rheinland-Pfalz will come from IFP.

FACTORS INFLUENCING THE DEVELOPMENT OF INTEGRATED FRUIT PRODUCTION IN THE UK

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Integrated Pest Management is at an early stage of development in UK fruit growing and Integrated Fruit Production even more so, so this assessment of the factors affecting its development is based on a subjective appraisal of the situation, rather than on wide experience of its operation in the field. My aim in this paper is to examine the factors acting on UK growers which might influence their decision to adopt integrated fruit production techniques. In this, a contrast is made between the relative significance of agronomic, economic and legislative pressures. Not all act in the same way and the danger that must be avoided is a piecemeal reduction in the crop protection armoury in response to short-term pressures, without the co-ordinated approach to a reduction in pesticide use which IPM provides.

Over the past 40 years or so, UK growers, and those advising them, have adopted a rational approach to crop protection. The approach has been rational in the sense that their action made good economic sense at the time, but there have often been adverse consequences due to inadequate knowledge at that time. It is not appropriate here to elaborate on the problems resulting from pesticides used in orchards but resistance by fruit tree red spider mite and scab fungi, the adverse side effects of widespread and intensive use of DDT, and the high acute risk to spray operators using earlier fungicides and insecticides are prime examples.

During those 40 years the UK apple acreage has fallen steadily from 55.000 hectares in 1947 to around 25.000 in 1988. UK production satisfied some 60 to 65 % of domestic demand during the early 1950s, but was down to 41 % in 1987. Average yields, in contrast, increased from 9.5 tonnes per hectare in the 1950s to around 13 to 14 tonnes per hectare during the 1980s. Although these changes were in part due to rationalisation and structural changes (e.g. average orchard size increased from 2.4 to over 25 hectares), a large part of the increase in yield has been attributed to the increase in pesticide use. During the 1960s the average number of sprays applied to orchards was approximately 18.5 per annum and this increased to a maximum of 23.6 sprays per annum in the 1980s. Since the early 1980s there has been an overall decline in pesticide use on fruit, which now averages 18 to 19 sprays per year and the desire to further reduce pesticide input is widespread.

The following sections summarise the major economic, agronomic and legislative factors which have recently affected the growers attitude to pesticide use in orchards.

a) Economic factors

i) The changing role of markets:

A key factor has been a rise in the importance of multiple retail outlets for fresh produce. The demand for high quality and continuity of supply has led to the increased use of pesticides in the field and an increased requirement for longer term storage, with consequent need for pesticides. In addition to the demands of retailers, must be added the strict requirements of the EC grading system plus competition from imports during the 1970s. This in turn led to high premiums for class I apples which were achieved by an increased spraying programme. Thus, for example, a Class I apple comands a price at least 1.5 times greater than a Class II and the gap between them is getting wider.

By the 1980s, supply to the supermarkets accounted for over 40 % of the English apple crop (the majority of that going to the five major multiple retailers). Supply to those retailers was concentrated via 18 major cooperatives which dealt with all aspects from grading to marketing. These co-operatives in turn marketed some 60 % of the national crop. In summary, there was a concentrating of activity among few co-operatives and still fewer retailers. The major retailers, therefore, play a significant role in determining the quality requirements and the means of achieving those requirements. Processors also have a significant effect, even though less than 5 % of production is marketed through them. At present the grower is faced with conflicting demands from retailers both for high quality and for the absence of contaminants such as pesticides. Moreover there is no sign yet that the British consumer is ready to accept lower quality produce; indeed hand-in-hand with increasing concern about pesticide residue, supermarkets report an increase in complaints about blemishes or remains of pests in produce.

The major retailers are also generally making more stringent requirements about pesticide residues in food. These frequently include:

- Grower warranties that maximum residue levels (MRL) are being met; where there is no UK MRL then very often the Codex MRL must be met. Since there is generally no label indication on the pesticide to give the grower advice as to how to comply with the Codex MRL, in effect the demand for compliance with this generally means that pesticide cannot be used without intensive monitoring of residue levels, if it can be used at all.
- Residue analyses have to be undertaken. These may often be carried out by the supplier and are expensive for him to perform.
- Specific requirements may be made of the grower not to use a particular pesticide where a health risk is perceived. In recent years concern over the use of the apple growth regulator Alar (daminozide) has led to a ban on its use by most of the major retailers. Frequently there is misunderstanding about the role of maximum residue levels, which have been used or interpreted as safety standards by some of the major retailers.

Whereas such specific requirements are usually demanded of suppliers of conventionally produced apples, a more general reduction in pesticide use has until recently been perceived as applying to "organically-grown" produce only. Until recently few if any UK retailers perceived any potential for reduced use (for example via integrated pest management) rather than virtual zero pesticide use as an alternative to conventional production. Cheapness and quality are the criteria sought by those customers who are not already seeking and paying a premium for the organic label.
At present then, benefits other than any premium or marketing advantage must be sought in adopting an integrated pest management approach in the UK.

ii) Relative costs of inputs and value of output
Commercial apple growing requires high capital investment and the years of establishing on orchard are not profit making. Growers are therefore under pressure to maximise profits as early as possible and maintain them at a high level. Crop value is now at around an average of £344 per ton. An average pesticide input of a ten day scab spray programme plus insecticides and herbicides, might be of the order of £250 per hectare, or roughly £25 per ton. Pesticides, even including the use of dips in storage (which might add another £10 to £30 per ton, including all storage costs) form a very small proportion of the gross revenue. The majority of costs arise in fixed costs and in marketing and there would appear to be little economic advantage to be made in adopting a less programmed approach. Indeed, one study showed that for a larger producer a shift in grade of less than 1.5 % would lose any saving to be made in reducing sprays by adopting a supervised regime. Clearly there is little immediate economic incentive to adopt IFP techniques. Indeed the verification steps required in operating an IPM system, complete with labelling to indicate the system of production, may actually add to the cost of production.

b) Agronomic factors
The agronomic factors affecting the adopting of IFP have already been dealt with at length by other papers in this volume. To summarise these briefly, insecticide resistance by fruit tree red spider mite and pear sucker, and fungicide resistance by scab and Gloeosprorium have had a major impact on the adoption of particular pest control programmes. The development of fungicide resistance has underlined the need to switch between different classes of fungicide and to avoid reliance on any one fungicide group. Insecticide and acaricide resistance has, together with the loss of alternative acaricides such Cyhexatin, led to the widespread adoption and use of organo-phospate resistant *Typhlodromus pyri*. However, the advent of acaricidal pyrethroids may reverse this trend if problems arise. There is a desperate need for predator-safe acaricides to integrate with fruit tree red spider-mite or rust-mite control if predator control should prove inadequate.

Resistant cultivars are available for rosy apple aphid, and high level of scab and mildew resistance have been bred into apple varieties. However, other factors have a major influence on cultivar selection, namely:

- retailer demand, in that new varieties must conform to specific retailer requirements;
- harvesting requirements, in that there is often a need for a prolonged harvest period due to the shortage of labour for harvesting operations;
- storage ability, with increasing pressure to reduce the use of post-harvest dips, resistance to post-harvest disease is likely to be of greater significance than scab or mildew resistance.

c) Legislative changes:

A number of changes in UK legislation which affect pesticide use, are substantially influencing the ability of the UK grower to adopt particular pesticide programmes. Under the control of Pesticides Regulations (1986), the review of pesticides on safety ground has led to the loss, for example, of Cyhexatin. This, as mentioned earlier, has been a major stimulus to the use of biological control in top fruit as well as soft fruit production and also potentially in hop production. Two other factors which are likely to have a major effect on pesticide use in fruit growing but whose impact has not yet been evaluated are the controls over minor uses of pesticides and over use of tank mixes. Changes in the ability of growers to use pesticides for minor crops, has led to a reduction in label recommendations for some top fruit and many soft fruit pesticides. In addition, restrictions on the use of tank mixes may reduce the flexibility of growers to use combinations of particular pesticides. Hence changes under the Control of Pesticide Regulations have in general put increasing pressure on pesticide users, not least in top fruit production.

Another major area of legislation has been that affecting operator safety. Under the Control of Substances Hazardous to Health Regulations (1988) the grower must base his decision of which pesticide to choose on the grounds of safety to the spray operator as well on agronomic suitability. These regulations might also ultimately affect the design of orchards to minimise risk of drift and to allow the still more widespread use of cab mounted tractors. The opportunities for spraying may be restricted due to requirements for spraying within certain wind speeds; such requirements are particularly stringent for ULV air-assisted spraying, as frequently carried out in orchards.

The net result of this legislation is to add to the costs of chemical control. The grower will have to demonstrate that controls over the risk of exposure have taken place, and the adoption of integrated pest management techniques may be proof of this, adding a further incentive to adopt such an approach.

Under the forthcoming Food Safety Bill, retailers will be expected to prove that they have taken steps to ensure that their suppliers are providing safe food and complying with certain

standards of food production, including standards of pesticide use. Here again, an opportunity may be perceived for the classification of producers using integrated fruit production techniques, as a means of identifying those suppliers who have a more reliable or responsible approach to pesticide use.

Finally there is the question of European Community Legislation and its impact on pesticide use. Under the forthcoming Maximum Residue Level Directive, Europeanwide MRLs will be set, these will be based principally on Codex MRLs but in some cases may be lower. It seems probable that UK growers may face some problems in complying with EC MRLs in their use of pesticides for post-harvest treatments. By their nature, post-harvest treatments frequently result in higher pesticide residue levels - this after all is their intended function - but these may not comply with EC MRLs which have been based on studies involving the use of such pesticides pre-harvest. The effect of this may be a reduction or loss of post-harvest uses. This may be a regrettable step for two reasons. First, applications of dips and drenches generally involve less risk of operator contamination since they are carried out under controlled conditions. Secondly, provided there is safe disposal of the waste pesticide, use of dips and drenches involves no risk to the environment. For example a pre-harvest treatment of Benomyl is likely to have an adverse effect on soil invertebrate populations, whereas use of the same fungicide for disease control post harvest will have no such adverse impact.

The net result of EC and UK legislative action to date may be to reduce the pesticide armoury, but this is more of a piecemeal removal of pesticides - similar to the bans on specific pesticide uses made by retailers in response to consumer concerns. Such an unco-ordinated approach to pesticide reduction is undesirable, since pesticide reduction as implemented in IPM schemes, must be structured and managed to safeguard crop protection in the long term.

Another danger of an unco-ordinated approach is that it may force the premature adoption of poorly tried pest management systems. This can result in early failures and loss of grower confidence before the system has had a chance to evolve into an effective one.

In conclusion, English growers are looking for a reduction in pesticide use by 50 % or more over the next few years, whilst still producing a high quality crop. IFP may, in due course, present a marketing opportunity of its own but the indications are that at present the UK consumer is not yet ready to positively discriminate for food produced under such techniques. The benefits to the grower must therefore lie in securing a reliable outlet, especially through the multiple retailers, and possibly also in ensuring compliance with UK pesticide regulations as well as overcoming the present problems of insecticide and fungicide resistance.

Above all, there is a need for both customers and regulators to realise the problems that a piecemeal dismantling of the pesticide armoury may bring. The proper approach is a planned IPM system. It is necessary, therefore, to emphasise the fundamental reasons behind the adoption of integrated fruit production, namely a reduction of potential environmental damage and the long term viability of pest and disease control strategies. Whilst there may also be an additional perceived benefit of reducing pesticide residue levels in food, this should not be taken as the primary aim of integrated fruit production. For this reason it is neither correct nor realistic that growers using integrated fruit production techniques should have their production systems verified by residues analysis of the finished product. Whilst it must be recognised that verification is a major problem if labelling for integrated fruit production is to be widely adopted, any emphasis on residues analysis will automatically lead to consumer concern over the safety of other, conventionally produced, produce. We should gauge the success of our IFP and IPM system by the environmental criteria we hope to achieve and by the stability we hope it should bring to pest and disease control strategies.

PROGRESS TOWARDS INTEGRATED ORCHARD PROTECTION IN THE UK AND PROSPECTS OF REDUCING ENVIRONMENTAL AND OPERATOR HAZARDS FROM ORCHARD SPRAYING

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Abstract

Eight aspects of Integrated Orchard Protection viz. natural enemies, cultural practises, pest and disease monitoring, pesticide scheduling, dose and volume rate management, harvest intervals (including pesticide residues), application methods and spraying hazards are discussed in relation to UK orchard fruit production. Progress to date with Integrated Protection and Produce Certification, grower attitudes, success and difficulties are covered. We are currently drawing up guidelines for Integrated Orchard Protection in the UK. We are proposing they include the following:

1. Avoidance of the use of pesticides toxic to key predators and parasites and presence of these natural enemies in orchards as proof of good practice.
2. Elimination of overwintering sources of disease inoculum and of rootstock sucker growths which are an important source of common green capsid (*Lygocoris pabulinus*) eggs.
3. Regular structured monitoring of pest and disease levels and orchard conditions, with orchard by orchard records of assessments.
4. Scheduling of treatment according to need, using the least hazardous selective pesticide appropriate. Records of applications should tie in with monitoring records.
5. A flexible approach to dose and volume rate, managing of rates according to the nature and intensity of the target pest or disease. Most growers should be able to reduce pesticide use by 25 - 50 % in this area.
6. Maximisation of harvest intervals with checks on pesticide residues.
7. Optimisation of application methods to get the maximum proportion of the dose applied on the target with minimum hazards to environment and operator. Transverse flow sprayers have an important role here.
8. A requirement to assess and minimise spray drift and operator hazards from orchard spraying. The mandatory use of tractor cabs and targeting of the direction and size of the spray aerosol to the tree are being considered.

The Government extension service for which we work (The Agricultural Development and Advisory Service (ADAS) in England and Wales) is now a commercial organisation. Once the guidelines have been formulated we intend to market an Integrated Orchard Protection Service, whereby growers enter into a scheme which certifies their fruit as being produced

according to the Integrated Orchard Protection Guidelines for a fee. We are proposing to issue labels to growers which meet the requirements of the guidelines.

Introduction

In the following paper eight essential elements of Integrated Orchard Protection are discussed in relation to the UK, covering progress to date, grower attitudes, success and difficulties and proposed future action.

There are approximately 23.000 ha of apples and 4.000 ha of pears grown, in southern England. Principal apple varieties are Cox (35 %) and Bramleys Seedling (35 %). Pear varieties are mainly Conference (76 %) and Doyenne du Comice (17 %) (MAFF, 1986). Orchards are mainly semi-intensive and in single rows, but recently more intensive multi-row orchards have been planted. Most orchards receive a blanket spray programme of 15 - 20 applications of 1 - 4 active ingredients per application each season. This approach has been very successful in terms of pest and disease control, but is expensive (circa £250-300 per ha per season) and is becoming less acceptable to consumers, spray operators and the environment. Integrated Orchard Protection offers prospects for solving some of these problems for the future.

1.Establishment of Vigorous Populations of Natural Enemies

As a minimum requirement growers must avoid using pesticides toxic to *Typhlodromus pyri* on apple, or to *Anthocoris sp* post-blossom on pears.

Not permitted on apple	Not permitted on pear
Synthetic pyrethroids	Synthetic pyrethroids
vamidothion, dimethoate,	Any OP or carbamate after petal fall
pirimiphos-methyl	
benomyl or carbendazim	
triforine	
dinocap, sulphur, dithiocarbamates	

Two problems remain. Firstly, there is a lack of firm validated information on the relative toxicity of remaining pesticides to these key natural enemies, particularly where multiple applications are made in the field. Some information is conflicting. Are chlorpyrifos, fenitrothion and carbaryl truely Typh-safe? Secondly, selective *T. pyri* - safe insecticides are more expensive than broad spectrum ones eg., chlorpyrifos = £25/ha/application, cypermethrin = £3/ha/application. There is still a body of growers who still use the cheapest pesticide. They will continue to be successful as long as new effective acaricides are developed.

2.Implementation of Cultural Practises to Minimize Pest and Disease Levels

Without doubt, pests and diseases, and hence the need for spraying, can be greatly reduced by removal of sources of infestation or infection. This task is labour intensive but can be made more financially viable when combined with other orchard operations, in particular pruning. Practices we are considering here are as follows:

1. Removal of rootstock sucker growths lest they harbour eggs of the common green capsid (*Lygocoris pabulinus*).
2. Removal of infections of canker (*Nectria galligena*) and wood scab (*Venturia inaequalis*) infections.
3. Removal of primary blossom and vegetative infections of apple powdery mildew (*Podosphaera leucotricha*) at blossom time.
4. Removal of cankers and wilted shoots caused by blossom wilt (*Sclerotinia laxa* f sp *mali*).

Growers should be required to implement these and any other appropriate cultural practices to meet the Integrated Protection Standard.

3. Monitoring of Pests and Disease Levels, Orchard Conditions and Meteorology

Monitoring is a pre-requisite of integrated protection because without it pesticides cannot be applied according to need. Assessment methods and treatment thresholds have been developed for the majority of orchard pests and diseases. In the late 1970's we intensively encouraged growers to adopt supervised control with some success (Carden, 1987). However, the assessment methods have proved far too labour intensive and costly for most growers. Few, if any, now strictly adhere to the prescribed methods though most make approximate visual assessments.

An integrated Orchard Protection Standard must require growers to make regular assessments of pest and disease levels and to keep records, as well as of orchard conditions. This requires very careful thought. Assessment methods for pests and diseases which are practical and effective for large fruit farms must be devised. Examining 50 trees per orchard on a 400 hectare fruit farm is not practical nor particularly informative. In our experience you get pages of zero's, when one page is enough.

4. Scheduling of Treatment According to Need, Using Selective Non-Hazardous Pesticides where Possible

It is likely that "blanket routine" spray applications will be needed for apple and pear scab control for the foreseeable future in the UK. When it rains for two weeks the 'kick back' action of current scab fungicides is too short. There is some scope for fungicide reductions post blossoms.

However, for other pests and diseases, growers must be required to spray only when

necessary to satisfy the Integrated Orchard Protection standard. Records of pesticide applications should tie in with pest and disease levels. British growers are now required by law to make a hazard assessment of the pesticides they use (Control of Substances Hazardous to Health, 1990). The least hazardous but effective pesticide choice should be made.

A major difficulty here is storage rots. In the UK, Conference pears and Cox apples are prone to *Botrytis*, *Phytophthora*, *Gloeosporium* and brown rot. With long term storage (beyond January) in some years considerable economic losses can occur. The simplest and least environmentally damaging method of control is the use of post-harvest dips or drenches with MBC or dicarboximide or metalaxyl fungicide. The alternative is preharvest orchard sprays with similar fruit pesticide residue problems but additional environmental and human harzards. It may be possible to substitute the post-harvest fungicides with biological control methods eg., antagonistic bacteria, but will these be any more acceptable? The best solution is new cultivars.

Most bramley apple fruits destined for long term storage (eg., till June) require treatment post-harvest with an anti-scald agent (eg., DPA). The problem can be overcome by use of low oxygen stores with ethylene scrubbers.

Post harvest dipping or drenching with fungicides could be permitted under the Integrated Fruit Protection standard providing that after storage, fruit is washed and polished during to remove most of the residue from the fruit surface. Perhaps fungicides which penetrate the fruit should not be used. In addition, environmentally safe ways of disposal of the fungicide solution must be specified. Alternatively, if fruit were pre-sized before storage there may be an opportunity for ULV electrostatic application of fungicides. Suitable technology has been developed for potato tubers used for seed. There is almost no waste with this technique.

5. Dose and Volume Rate Management

The debate about orchard spraying is presently intense in England. A large and growing proportion of orchards are sprayed using very low volume (circa 50 l/ha) and low volume (circa 100 l/ha) rates (Cross, 1989). Furthermore, large reductions in pesticide dose rates are made and over 100 growers are using one eight to one quarter of the dose rates recommended by manufactures, and many more are making modest reductions (Cross, 1989).

It is clear that dose rates recommended on pesticide labels are often designed to deal with high levels of pest or disease pressure in adverse conditions with poor application machinery. For example, efficacy data for approval of scab fungicides in mainland Britain is often obtained from orchards in Northern Ireland where scab is endemic and the rainfall much greater than in southern England.

Careful monitoring of pest and disease levels and climatic and crop growth conditions,

coupled with efficient spraying techniques, might enable substantial reductions in pesticide dose-rates to be made when conditions allow. However, the grower then loses the manufactures warrantly and guarantee of effectiveness.

Adjustment of dose-rate requires an understanding of the nature of the pest or disease target, in particular the concepts of reversibility and relative economic threshold levels. Some pests or diseases (eg., phytophagus mites, apple grass aphid (*Rhopalosiphum insertum*) or powdery mildew) can be tolerated at considerable levels before significant injury is caused.

Others (eg., Codling moth (*Cydia pomonella*), rosy apple aphid (*Dysaphis plantaginea*) or scab) cause economic damage even when present at quite small levels. Reversibility is the ease with which a pest or disease can be controlled once damaging levels have been recorded. Whilst powdery mildew is reversible because high levels can be readily be reduced by spraying, codling moth is irreversible because larvae inside the apple cannot be controlled.

The economic threshold and the reversibility of a pest or disease must be taken into account when reducing dose rates. In our experience dose-rates can be reduced by 25 - 50 % without significant difficulties arising in many orchards in southern England.

We recommend a flexible approach: dose and volume rates should be adjusted according to need. In the first 2 years growers should be required to make modest (25 %) dose rate reductions. Larger reductions (50 %) should be expected in subsequent years, provided records show that no problems are arising.

6. Maximising Harvest Intervals with Checks on Pesticide Residues

Although pesticide residues on apple fruits eaten by consumers are not detectable or very small in Britain (MAFF, 1985) (most of the problems are on imported fruit) they are a cause for concern to consumers. Public concerns, even though they are often illogical and without true foundation, must be addressed and countered. Consumers, must be re-assured that fruit is safe to eat. If pesticides are applied in accordance with Good Agricultural Practice residue levels should not exceed maximum permitted residue levels (MRL's).

Minimum harvest intervals and dose-rates ensure that residue levels do not exceed the maximum permitted level. However, an Integrated Orchard Protection Standard must encourage growers to maximise harvest intervals. In most seasons, spraying with pesticides during August and September can be entirely avoided in Britain. The main barrier to complete avoidance of pesticide use during this period (and after harvest) are the post harvest diseases. Integrated Orchard Protection should require a minimum harvest interval of six weeks.

Analysis for pesticide residue is expensive and hence cannot be done on all crops. Some large supermarkets are now requiring growers to have one or two spot checks done on

pesticide residues each season. The Integrated Orchard Protection Standard should formalise this requirement. Biochemical methods of checking the presence or absence of residue (eg., the Enzytech anticholinesterase system) should be investigated.

7. Optimisation of Application Methods

Axial fan sprayers are used almost exclusively for orchard spraying in Britain. This is because they are well suited to traditional orchards with large tall trees and with an over-hanging canopy for which they were originally designed. Although there are a number of different models they are all basically similar, projecting a full arc of air from a curved band-shaped orifice profiled to the periphery of the fan and spray tank. Up to 60 % of the spray is lost with this axial fan design which is poorly suited to modern intensive and semi-intensive orchards. The air output is excessive and poorly targeted. In the Netherlands, transverse flow, vertical boom sprayers have been conclusively shown to be superior in every way for modern orchards (Wiedenhoff, 1989).

An Integrated Orchard Protection standard must recognize the need for improving deposition efficiency from orchard sprayers. Discussion with growers should reveal a knowledge of these difficulties and a willingsness to rectify them. New machinery purchases should be made bearing in mind these factors. Transverse-flow types should be required in orchards with a row spacing less than 5.0 m when new machines are purchased.

8.Reducing spray drift and operator hazards from orchard spraying

Orchard spraying appears to be the most potentially hazardous form of ground crop spraying practised in Britain, spray drift and operator contamination levels being at least an order of magnitude greater than those from arable boom sprayers (Cross and Berrie, 1989). In unfavourable wind conditions with conventional medium volume (500 l/ha) spraying an operator not protected by a cab becomes soaked with spray solution in less than 1 ha of spraying.

This is an inherent fault in the design of axial fan orchard sprayers. They generate a massive forced aerosol of spray 5 or more metres in height which inevitably leads to large spray drift levels, even in quite light winds. Orchards are often sited adjacent to dwelling places and public rights of way, so orchard spraying can pose a significant potential hazard to the general public. New pesticide regulations in Britain place a mandatory requirement on all users of pesticides to take all reasonable precautions to protect the health and safety of humans and the environment. Contamination of bystanders or their property with large amounts of spray drift will surely be regarded as unreasonable.

A collaborative study between the Institute of Engineering Research, Silsoe, Bedfordshire, and the Agricultural Development and Advisory Service funded by the Ministry of Agriculture, Fisheries and Food was started in 1988 to measure and mathematically model

spray drift from orchard sprayers, and to seek ways of reducing and operator contamination without prejudice to efficacy. Good progress is being made, but it may be some time before the work is completed and we are able to publish our results.

A number of factors influencing spray drift and operator hazards are being investigated:

1. Spray quality and volume rate
2. Nozzle and boom positioning
3. Air velocity and volumetric flow
4. Anti-evaporants
5. Physical barriers

We are hoping to include some practical measures for reducing orchard spraying hazards in the Integrated Orchard Protection guidelines now being developed. The most important of these is likely to be a requirement for careful targeting of air and spray to the tree.

In the future it will be possible to spray orchards without significant losses. The spray aerosol can be enclosed in a canopy carried by the sprayer. Spray liquid not deposited on the tree can be collected and recycled. This was first done many years ago at Long Ashton Research Station. Such systems are now used on a commercial scale in viticulture. An air asissted canopy sprayer for orchards has been developed by the Dutch Institute for Mechanisation (IMAG) at Wageningen in the Netherlands. The main barrier to the use of canopy sprayers in orchards is variation in tree size and planting system. An Integrated Orchard Protection Standard should encourage growers to plant single row orchard with uniformly narrow row spacings (less than 4.0 m) and to maintain tree height at less than 2.0 m so that eventually canopy sprayers can be used to solve the spray drift problem.

Concluding Remarks

In England we believe that the above eight areas are each vitally important to Integrated Orchard Protection. Any standard or guidelines for certification of Fruit produced by Integrated Orchard Protection should have specific requirements in each of these areas. Adoption of Integrated Orchard Protection must bring real benefits in terms of reduced pesticide use and reduced environmental and operator contamination. However, the standard must be a practical one which a significant body of growers can adopt without too much difficulty, and must not lead to greatly increased costs or losses of fruit or other difficulties.

Recently we sounded out the manager of a large fruit marketing co-operative and several large independant fruit growers for their views on certification of Integrated Orchard Protection. Only general principles were discussed and no prices for servicing such a system were disclosed.

The response was negative from the marketing co-operative and some of the growers. Several difficulties were envisaged. Firstly, it was felt that product labels disrupt the market

place leading to reduced sales of the commodity in question because they bring issues into the consumers mind at the point of the buying decision. Reduced sales of apples in America following introduction of an 'Alar free' apple label was cited as an example. Secondly, the marketing co-operative manager wanted all, or nearly all, the several hundred growers in his co-operative to qualify for the standard if the system was to be adopted. Thirdly, this co-operative and another large one are sponsoring a code of Good Practice to counter media criticisms of current growing systems. A more favourable, though cautious, response was received from the other growers, and some are enthusiastic.

As scientists, we are able to draw up meaningful and useful guidelines for Integrated Orchard Protection. Our main difficulty will be persuading growers and marketing co-operatives to adopt them.

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GENERAL PROGRESS WITH INTEGRATED FRUIT PRODUCTION IN THE UK APPLE INDUSTRY

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Introduction

In our quest to improve fruit quality and fruit growing we must not forget the sovereignty of the consumer. British consumers enjoy eating apples. A recent survey shows that 71 % of the population eat fresh fruit regularly and apples are the most popular fruit accounting for 30 % of the total fruit marketed with citrus fruit second favourite at 24 %.

However, like consumers elsewhere in the world our consumers are becoming increasingly concerned about the use of pesticides in fruit production. In response to this and to maintain customer confidence the industry is already taking steps to reduce pesticides usage in orchards whilst maintaining fruit quality demanded by the markets and EEC Grading Standards.

1. Production Trends

The UK fruit industry is facing a challenging period brought about by economic and market forces and increasing competition in the market place from fruit from all over the world. The total value of UK fruit output is £ 227M, top fruit (apples, pears, plums and cherries) account for roughly 53 % of this output and 47 % comes from soft fruit crops (strawberries, raspberries, blackcurrants and other soft fruit). Apples are the most important fruit crop valued at £ 88M representing 36 % of the total UK fruit output.

Cox's Orange Pippin is the major dessert apple variety accounting for 63 % of the total area of dessert apples (14.350 hectares) and Bramley's Seedling represents 90 % of the total culinary apple production (8.870 hectares).

As in other north European fruit growing areas there has been a significant reduction in the area of apples grown in the UK over the past 20 years.

In dessert apples the area has gone down by 37 % and for culinary apples a reduction of 47% during this period. There is now about 23.000 hectares of apples grown in the UK.

Despite the substantial reduction in area UK fruit output of quality apples has not fallen to the same extent and has largely been maintained because of planting more young orchards, improved varieties/clones, growing systems and new technology.

2. Marketing and Consumer Trends

The volume of imports of apples into the UK has increased by roughly 45 % in the past 10 years and further competition is likely considering that apple production throughout the world is increasing in Chile, Turkey, China.

Our progressive growers have responded and adapted extremely well to this increased

competition and to the changing needs of the market especially in relation to fruit quality. There is, however, a significant shift from the need to improve fruit quality in terms of fruit size, colour and skin finish to improving fruit quality in terms of healthy and safety for the consumer, orchard operator and the environment.

The consumer's awareness about the use of pesticides/chemicals and associated residues and the health risk they perceive whether it is real or imagined represents a major issue that our fruit industry and others around the world have to face up to if consumer confidence is to be maintained in apples as a fruit as part of a healthy diet.

This interest and enthusiasm for "healthy eating" provides a tremendous opportunity for increasing consumption of apples and other fruit, a marketing opportunity which must not be missed.

There is however the underlying threat and danger of emotive, uninformed opinion and sensational media coverage on the use or mis-use of "chemicals" which causes immediate public concern and alarm - alarm which can eliminate consumer goodwill at a stroke.

To combat this demands the minimum use of pesticides in fruit production based on sound scientific evidence derived from research and development, evidence which can also be used in imaginative, public relations campaigns to give the consumer the assurance that they need. This approach would also help to defend the well being of the fruit industry.

3. Research and Development

There has been over the years considerable research and development directed at the effective use of pesticides and their application in orchards, post-harvest treatments and preparation of fruit for market. Yield and quality improvements have also brought economic benefits to the industry.

UK fruit growers have been quick to respond to these developments such as the use of healthy certified fruit trees (EMLA), supervised and Integrated Pest Management (IPM), as well as other techniques designed to reduce pesticide and chemical use in fruit growing. But we still have a long way to go.

Research and development is improving our understanding on how existing pesticides and new materials can effectively and legitimately be reduced whilst maintaining the critical balance between the minimum use of chemicals, the benefits of natural predators and the production of quality fruit.

Commercial practice is sprinkled with the products of research and development some more in harmony with the principles of Integrated Fruit Production (IFP) than others.

Over the years co-operation with the Industry has been instrumental in the successful introduction of new technology into commerce. This co-operation will certainly be put to the test in the wider adoption of IFP within the UK fruit industry.

4. Pesticide Usage Survey - APDC

Trends in fruit growing practice and reduction in use of pesticides in UK orchards are illustrated in the survey of apple and pear growers carried out by the Apple and Pear Development (APDC) in 1989.

The survey questionnaire sought to find out the techniques and practices that fruit growers were using in relation to reducing pesticides usage in apple and pear production. The encouraging response indicated the level of concern growers felt about this particular issue. Out of 1.017 growers occupying 20.160 hectares of orchards replies were received from 415 occupying 10.140 hectares. A selection of the main response are outlined below.

4.1 Survey Results

a) General Trends

(i) There has been a reduction in pesticides used in apple and pear production in the past 5 years (1983-88) on 68 % of UK orchard area (64 % of growers) notably in the use of insecticides and fungicides.

(ii) A further 36 % of growers affirmed their intention to reduce pesticides used in orchards by

* Reducing spray volume
* Orchard monitoring
* Use of vegetable oil in sprays

This general trend towards decreasing use of pesticides is also indicated by the adoption of a number of techniques used in orchards and after harvesting in preparation for storage or the market.

b) In Orchards

	Adoption	
	% Area	% Growers
* Pest and Disease Control		
Orchard Monitoring	92	97
Use of Pheromone Traps	75	66
Integrated Pest Management	73	62
Reduction of Spray volume	64	28
Use of Vegetable Oil in Spray	38	34

	Adoption	
	% Area	% Grower
* Other Practices		
Use of Mulches	66	33
Mechanical Weed Control	11	16
Use of Organic fertilizers by:		
i) Soil Application	17	21
ii) Foliar Application	38	40
Fruit Thinning - by hand	33	33

c) Pre and Post Harvest Treatments	Adoption	
	% Area	% Grower
Pre-harvesting Sprays for storage rots	36	38
Dipping and Drenching	81	68
Water Flotation	47	36
Washing and Brushing	57	49

In the past 5 years pesticide reduction reported in overall use of:

Insecticides	by 34 % of growers
Fungicides	by 27 % of growers
Growth Regulators	by 18 % of growers
Herbicides	by 11 % of growers
Dips and Drenches	7 % of growers

The data shows the extent of adoption of techniques where there was an opportunity to reduce pesticides.

There are others where there is limited opportunity to reduce usage because of lack of effective alternatives for example in post-harvest dipping and drenching.

4.2 Summary of Results

In general the results show there has been a reduction in pesticides used in apple and pear orchards in the UK in the past 5 years indicating growers concern and public feeling over the use of pesticides in fruit growing.

The survey results also show a need to:-

* Continue monitoring the industry's progress on this important issue
* Develop effective methods of spray application which are safe
* Develop alternatives to fruit dipping and drenching
* Improve public relations with consumers
* Establish better international collaboration towards "Integrated Fruit Production"

5. Conclusion

Production trends are inextricably linked to marketing trends directed at satisfying the needs of the consumer. Consumer awareness of pesticide use and the health risk they pose whether real or imagined will remain a major issue and priority which our fruit industries have to address if we are to retain "customer confidence" in apples as a healthy food - wherever the fruit comes from!

There is considerable marketing opportunity bearing in mind the enthusiasm for "healthy eating" - enthusiasm which would rapidly be destroyed by irresponsible use of pesticides or irresponsible or emotive media coverage on pesticide issues.

As in the past R & D must reinforce the whole approach to IFP aimed at the minimum use of pesticides including the use of plant breeding, genetic engineering, use of predators and other "natural practices" based on sensible and sound economics.

IFP must show real benefits to the consumer and fruit growers alike.

IFP therefore must be practical and robust in commercial practice.

The overall success of IFP will not depend on one factor but the interrelationship of many factors not least the commitment and enthusiasm to make it work.

This will demand even closer collaboration between all sectors of the industry both nationally and internationally to set guidelines which will provide the assurance of product reliability that the consumer is seeking.

HISTORY AND TECHNICAL EVOLUTION OF THE GALTI GROUP IN SWITZERLAND

O. Gonvers, arboriculturist, CH-1133 Lussy

History

Decade 1960 - 70. Launching of a rational anti-parasite campaign following the problem of harvest mites. The producers supply the pilot plots necessary for experimentation. Cooperation between scientists and producers.
This soon leads to the reviewing and experimental integration of other cultivation factors such as manure, pruning, protection of the soil, etc. Definition of tolerance limits and constant research on the best methods of cultivation.

1973. Recognition of the first group of producers participating in the campaign; tendency to progress from experimentation to actual practice throughout production within the group. Increasing importance of the role of the producer. The Lussy group has 5 members and 10 ha of land. As from this period the term "Integrated Techniques" is used.

1976. Beginning of courses for professional training in Integrated Techniques. These courses are open to fruit growers wishing to practise these methods. The courses last 3 years. Zone of influence: the Lake Geneva basin.

1977. Preparation of the statutes and constitution of the "GROUPEMENT des ARBORCULTEURS LEMANIQUES PRATIQUANT LES TECHNIQUES INTEGREES".

G A L T I
(Group of fruit growers of the Lake Geneva region practising Integrated Techniques)

The statutes are set out in the SROP 1977/4 Bulletin and have not been greatly modified since then.
In order to become a member it is necessary to:

- Provide evidence of professional training
- Respect the directives of GTPI (Working Group for Integrated Products)
- Be prepared to accept inspection of orchards.

The group provides:

- Follow-up courses
- Advisory service and technical assistance
- Economic valorisation.

Influence and structure

All the techniques which were used during the campaign have been combined to create INTEGRATED PRODUCTION. By reason of the professional structure of the Galti, the entire Swiss production has progressively benefited from this group's experience and directives (methodology). Of the 900 ha production zone under the Galti's influence, about 80 % have experienced posistive results. 400 ha are affiliated to the group: these are cultivated by about 80 producers who are members. The latter are divided into 9 local groups consisting of 4 to 15 members.

Experiments with labels and analyses

Right from the beginning, the Galti has tried to experiment with an indicative label. (See bulletin SROP/III/2.1980). This has not met with much success on the commercial level up till now. The relatively low tonnage and the experimental character have not sufficed to awake interest. On the other hand, the quality of the fruits produced by the Galti orchards is a positive sales factor. The Thiault index, which covers all the plots which have passed the official orchards quality control ("CQV") before harvesting, has made it possible to establish an important file of data/reference regarding CQV Standards and intrinsic quality. In our region, this work enables us to confirm that the application of Galti directives ensures the minimum qualtity required by the Thiault index. The latter tends to remain an experimental test or is used to settle disagreements relating to the attribution of the future national label.

For the rest, the fruit is controlled by the cantonal laboratories, by taking samples. Experience has shown that if the directives are followed the tolerance standards allowed by law are never achieved. We should also mention that the results achieved with traditional methods are only very rarely positive.

The progress made first of all by the Galti and subsequently by the whole of the Swiss production is an encouragement to us, inasmuch as a label is being created in accordance with national directives, under a common philosophy, which is indispensable for the success of such an enterprise.

CURRENT STATUS OF WORK ON THE INTRODUCTION OF A NATIONAL IP LABEL FOR FRUIT IN SWITZERLAND

B. PEZZATI, Dipl. Ing. ETH, Deputy director of the Schweiz. Obstverband

Development and promotion of IP in the Swiss fruit production sector

In the Swiss fruit production sector, IP is already fairly wide-spread. It goes back as far as the 1970's when Dr.h.c. Baggiolini was the first to introduce this environmentally-friendly method of cultivation in the Lake Geneva area. In close cooperation with the OILB, the Federal Institute for Fruit and Wine Production in Changins, which carried out important work on the fundamental principles of IP in conjunction with its fellow institute in Wädenswil, he - in company with several other go-ahead fruit producers - initiated the foundation of GALTI, the first Swiss IP organization for fruit producers in Switzerland, in 1977.

This was followed by the establishment of further cantonal IP fruit producer organizations in the cantons of Zürich, Valais, Aargau, Thurgau, Lucerne, Zug, Berne, St. Gallen, Solothurn and Graubünden, to some extent accompanied by cantonal IP brands. In order to coordinate IP efforts on an overall Swiss basis, the Swiss Working Group for Integrated Fruit Production was set up in 1978. The working group defined its most important task, the Swiss Guidelines for Integrated Fruit Production (= SAIO guidelines). These guidelines were acknowledged in 1988 by all regional and cantonal IP fruit producer organizations as the valid Swiss IP guidelines. These guidelines are revised on an annual basis and, if necessary, upgraded to meet the latest advances in scientific and practical applications.

It can be assumed that 40 - 50 % of the total Swiss dessert apple production is currently grown in accordance with IP principles. In the previous year, approximately a quarter, i. e. 10 - 15% of total production, was subjected to IP control. In the case of other types of fruit, particularly dessert pears, berries and drupes, IP efforts are already under way. However, less progress, over a smaller area, has been made than is the case with dessert apples.

Promotion of IP by public and private bodies

The promotion of IP in current fruit production can be attributed to the cooperation of various private and government institutions. The government agencies involved include the Federal Alcohol Administration as well as the Federal Research Institutes in Wädenswil and Changins.

The Federal Alcohol Administration promotes the increased application of IP with a subsidized advisory service for fruit producers. The Swiss Fruit Association (SOV), as the umbrella organization for the Swiss fruit industry, supports the use of IP, particularly with

contributions for the establishment and promotion of cantonal IP fruit producer organizations.
Together with regional IP efforts, this coordinated government and private promotion has - at least in an initial phase - met with indisputable success in the promotion of IP in practice.

IP label

Regional labels

It has not proved possible to implement individual, regional IP labels at marketing level, i. e. at the overall Swiss wholesale level, or, if so, only to a limited extent. Use of the labels has so far largely been limited to local markets and direct sales - except for the MIGROS brand. This is mainly due to the fact that the majority of wholesalers are not in favour of regional labels for reasons of cost and distribution. In addition, it is feared that regional labels might lead to confusion.

Company brands

Migros, a major distributor, was an early promoter of the widespread use of environmentally-friendly production. The main purpose behind its own MS production guidelines was the marketing of the company's own MS brand through its own sales channels. Other groups of companies are also attempting to gain a profile by introducing their own brand names.

National IP label

Since many IP producers did not see any economic benefits, a certain amount of stagnation in IP set in from the mid-1980's on. This changed with the project for a national IP label, which was launched in 1988 by the SOV's own special production group.
What is the purpose of this IP label? The aim of marking fruit in this way is to let consumers know that this fruit has been produced using controlled, environmentally-friendly methods, i. e. in line with SAIO guidelines. The marking of products produced using environmentally-friendly methods is of increasing importance for the Swiss market and the average consumer, who has a high degree of awareness where chemicals and environmental pollution are concerned. With the label and the indirect, economic inducement - it can be expected that IP fruit will be given priority by the trade in future - the further implementation of this method of cultivation is to be promoted in practice. The long-term goal is a changeover to IP throughout the whole field of fruit production. In addition, confidence in domestic (integrated) fruit cultivation is to be promoted.

Initially, the national IP label is to be used to complement existing IP labels and company-own IP brands. In the Swiss wholesale and retail trade, only the national IP label will be used at the start, partly in combination with established company-own brands. In general, it can be stated that the various IP efforts in Switzerland are largely coordinated, particularly in terms of cultivation guidelines and controls. The national IP label is to be introduced on to the market in autumn 1990, largely for dessert apples.

IP regulation

Preparations for the introduction of the IP label are currently in full swing at the SOV. An internal survey on an IP regulation was recently concluded. This regulates the goals, organization, conditions, finances and legal questions.

Producers and wholesale companies wishing to use the IP label must hand in a corresponding application and declaration of intent to the SOV's newly-formed special committee for the national IP label by 1st July, 1990. If they satisfy the minimum requirements stipulated, fruit producers will be issued with a certificate and wholesale companies will be given a permit to use the IP label.

Certificate and permit

Producers' certificate

The certificate shows the name of the IP producer and entitles him to mark fruit produced in line with SAIO guidelines with the IP label. He must confirm that he is a member of a regional or cantonal organization of fruit producers recognized by the special committee; he must adhere to the SAIO guidelines throughout his whole production of the type of fruit concerned; he must put an IP marking on the crop containers (i. e. each pallet of the crate) and permit controls to be carried out and samples taken on his premises.

Wholesalers permit

A wholesaler is granted a permit if he is a control establishment of the SOV, marks all IP items accepted and intended for sale; he must mark the sales packs, if they contain IP fruit and, if technically possible, apply the special IP quality labels from the SOV and other correspondingly marked and recognized sales labels, and allow controls to be carried out and samples taken. Prior to every campaign, the SOV intends to publish a list of IP producers and wholesalers who are entitled to use the label.

Control at production and wholesale levels

Production level

On behalf of the special committee, two controllers, in each case, from the relevant regional or cantonal IP fruit producer organization ensure that SAIO guidelines are observed by the fruit producers. Combined with the advisory service, this monitoring process is carried out at every producer at least once a year, but not earlier than 5 weeks prior to harvesting.

Wholesale level

Careful controls at wholesaler level must be carried out by the controllers of the SOV advisory and control service, in combination with the actual quality control process. Checks are made to ensure that the fruit concerned, which is marked with the IP label, really is from IP producers and traders (i. e. bought in). Irregularities in the use of the IP label are reported by the controllers to the special committee, which will decide whether any sanctions are to be imposed. Practical controls at production level were first implemented throughout Switzerland by the various regional and cantonal IP fruit production organizations in 1989. The control concept proved to be sound. IP controls at wholesaler level are scheduled to start in autumn 1990 with the introduction of the national IP label.

Support by SOV

Within the framework of these IP efforts, the umbrella organization of the Swiss fruit industry largely handles the task of coordination. In addition, the SOV cooperates actively in the drafting of fundamental principles. Particular emphasis is placed on information. The following activities are also scheduled:

- Targeted press releases
- Informative articles in the household magazine "Oepfelposcht", which is published at regular intervals.
- Information for the general public in the form of a brochure.

In 1990, approximately 20 - 25 % of Swiss dessert apple production is expected to be marketed under the national IP label.

INTEGRATED FRUIT PRODUCTION IN SWITZERLAND: GUIDELINES AND MINIMAL REQUIREMENTS

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The present status of Integrated Fruit Production (IFP) in Switzerland has been reviewed by Pezzatti 1990, Meli & Schumacher 1990, Wildbolz & Spring 1990. In this contribution I shall concentrate on guidelines and on means to ensure their observance.

Guidelines for IFP have been published by the Swiss Working Party on IFP (SAIO) in 1982, and have since been revised in minor points. The guidelines cover all relevant aspects of an optimized fruit production and have become the basis of instruction of growers. Recently interest in a national IFP label has been growing. The claim of a label is the observance of the guidelines: Inspection and guarantees become therefore necessary.

Self commitment to guidelines is the base of the system. Every grower subcribes to follow the rules.

Regional IFP groups organize the instruction courses and the inspection of the orchards.

Minimal requirements name the points which can and will be judged during the inspection of the orchard which takes place in autumn a few weeks before harvest:

orchard books:	They include basic data of the orchard, regular soil analysis, fertilization plan, list of fertilizers applied, pest monitoring justifying insecticide and acaricide applications, list of pesticides and herbicides applied.
planting system:	mainly 1-row planting.
soil management:	tree band: a narrow herbicide band or alternative like bark mulches.
condition of the tree:	fruit load, shoot growth, leave/fruit relationship.
condition of the fruit:	size, development, exposure to sunlight, external quality.

Based on these data the inspectors propose to award or not to award the label. The formal decision on the label is made by a special commission.

The system will become functional in 1990. Rules may have to be adapted according to future experiences.

The IFP label makes high claims for the quality of the fruit and of the production process. The value of the label will depend on the confidence of the consumers. This confidence can only be won and maintained by serious commitment of all parties concerned.

MELI T., SCHUMACHER R. 1990. Integrierte Obstproduktion - Stand 1990. Schweiz. Z. Obst- Weinb. 126: 67-74.

PEZZATTI B. 1990. Present state of the implementation of a label for Swiss fruit from integrated production. Bull. WPRS (in press).

WILDBOLZ TH., SPRING J.-L. 1990. Present status of integrated fruit production in Switzerland. Acta Hort. (in press).

INTEGRATED PRODUCTION (IP) WITHIN A COMMERCIAL SYSTEM (MIGROS-SANO)

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1. Introduction

About 20 years ago, one MIGROS Cooperative decided to set up an IP-Programme. Few years later, this programme was taken over by all 12 cooperatives and was called MIGROS-SANO-Programme. Through this programme MIGROS as a consumer cooperative, is taking its part of the responsability in the production of goods, which are commercialised by MIGROS.

In the early eighties, private and official organizations started to accept the M-SANO-Programme. M-SANO is today one of the recognized IP-systemes in Switzerland concerning fruits, vegetables and potatoes production.

Due to the high priority given to environmental problems by the cooperative members of MIGROS and the high concern of the Swiss population in general, in that matter, MIGROS-SANO could advance in a positive ambiance.

Today, MIGROS-SANO is looking out for a better collaboration with other IP-Programmes and organizations in order to increase the impact of a production respecting the environment in Switzerland.

2. Characteristics of MIGROS

Cooperative with 1,4 Mio members

Sales of 11,8 Billion Sfrs. (1988)

- Investments 643 Mio.
- Cash flow 635 Mio.
- Net profit 182 Mio.

Social commitments

- No sale of alcoholic products and tobacco
- 1/2 - 1 % of turn-over for cultural and social purposes (1988. 84 Mio. Sfrs.)

Number of cooperatives: 12
plus the "Federation of Migros Cooperatives" as central roof organization

Number of employees: 64'000

Retail sales 10,180 Billion Sfrs.

- Food 66 %
- Non food 30 %
- Restaurants 4 %

Market shares

- Fresh vegetables 49 %
- Apples 41 %
- Food in total 22 %

MIGROS-share in gross total income of Swiss agriculture = 24,3% (1988).

The figures are shown to understand on one hand the importance of MIGROS on the Swiss market and the possible impact of the MIGROS-SANO-Programme within the commercial giant, the production and the consumer on the other hand.

3. The MIGROS-SANO-Programme

3.1. Goals of MIGROS-SANO

3.1.1 Increase of the soil fertility

- adequat fertilization (norm)
- recycling of organic matter
- soft production methods (natural)
- minimal use of pesticides

3.1.2. Increase average quality of fruits and vegetables

- Development of own standards (norms) for plant juice composition
- Minimal and directed use of pesticides and fertilizers
- Control at the production level

As an overall goal: "Production respecting the environment"

3.2. Strategy of MIGROS-SANO

Fertile soils < – > Healthy plants

---- **M-SANO** regional technical development, research support

I |
N | · Soil fertility and plant quality standards
F | · Integrated pestcontrol
O | · Production planning
R | · Salespriority
M | · Supervision / control
A |
T |-- **GROWER** · Production with lower risks of chemical residues
I | · Production with a general better internal quality
O | · Environmental respecting production
N |

---- **CONSUMER**

3.3. Adviser service

The permanent contact to the producer is considered as very important. The producer receives assistance in the planning (annual planning for vegetable production) as well as during the implementation. Since the adviser has his office (in most cases) within the marketing services for fruits and vegetables, the production planning or the marketing interventions (e.g. when overproduction) are easy and in most cases very efficient. M-S-products do have a marketing priority, an other important fact in an IP-programme and a good argument for the advisory service.

M-Sano has permanent contact with the official extension services. In certain cases lists for phytosanitary IP-products, training of producers etc. are made in commune.

M-Sano is as well in the position to pay for damages or losses in the production, if tests of new technics, varieties etc. are not successful.

3.4. MIGROS-SANO in figures (1989)

• Headquarters Lausanne	3 persons
• Regional technical advisers (Agronomists)	8 for vegetables
	4 for fruits
	1 for potatoes
• Quality standards for vegetables and fruits (norms)	22
• Sort fertility standards (norms)	16
• Number of producers	ca. 1600
• Total surfaces	ca. 4500 ha
• Budget per year	3 Mio. Sfrs.

4. Marketing

4.1. Label "MIGROS-S-PRODUCTION"

The Migros-SANO-Label stays for the production system. That means: fruits and vegetables with M-SANO-Label are goods out of the production, respecting the guid-lines and norms of the M-SANO-Programme. The label is only in use if the production or the quality of the product shows significant differences to the traditional production/product and if these differences can be controlled.

The label is recognized by all Migros Cooperatives and the Migros Federation. The labelling is made as usual on the packing lines by the dealers, the companies or by the Migros own packing units. The M-SANO-Label is used for Swiss products with an exception for two italian products from a M-S-controlled producer.

4.2. Marketing priority

Products out of the M-SANO-Programme have priority in the marketing. A maximum of 70

- 75 % of the Migros needs of a given product should be M-S-Production (average year) to prevent overproduction of M-SANO-labeled products during exceptional years. This stage has been reached by the vegetable production during certain periods of the year. 50 - 60 % of the apples and about 10 % of the potatoes are from M-S-Production.

The marketing priority is certainly more important during very productive years with general overproduction.

Apart from the M-S-potatoes no difference in prices is made between traditional and M-S-Production. In the potatoe production the producer is compensated by Migros with 300 Sfrs/ha for higher production costs. These costs are included in the salesprice with 2 cts more per kg M-S-potatoes.

5. Control

5.1. Control in the production

Since the permanent contact between the producer and the adviser exists, control is quiet easy.

Certain adviser instruments are at the same time useful for control, e. g. soil/fruit/residue-analyses anual plan for fertilizing and plant protection etc.. Each producer has to keep records about all the interventions in his orchard.

5.2. Control in the marketing channels

Only few fruit producers are selling their products directly to Migros. Most of the production goes through the usual marketing channels, e. g. producer via cooperative to Migros or producer to cooperative via dealer (1/2/3) to Migros etc. To prevent the mix up of M-S with other products, the dealer has to join a certificate M-Sano with name of previous dealer/cooperative and the indication for the producer (Name, No.). It is therefore possible to follow the products back to the producer.

All these controls are made by the M-SANO-advisers, who know the producers, the cooperatives and the dealer. We are conscient about the problems, which accure through the fact, that our advisers are at the same time controllers.

6. Perspectives

IP has become a general approach in agriculture. Since about 12 years, M-SANO is assisting as well other organizations in agriculture for specific research.

During the next few years, M-SANO will try to collaborate as good as possible with other organizations. Thousands of data for soils, products, composts etc. are available and certainly useful for everybody.

General Conclusions and Recommendations of the Workshop on Guidelines and Labels defining "Integrated Fruit Production" in European Countries, Ladenburg, Germany (FR), 13-16 February 1990

1. It was agreed that Dr. E. Dickler would urgently request the establishment of an IOBC "Study Group" for Integrated Fruit Production (IFP) Guidelines.
2. It was agreed this "Study Group" be comprised of one nominated and invited representative from each European country.
3. It was agreed that Dr. E. Dickler would be chairman of the "Study Group" for one year, subsequent chairmen being elected.
4. It was agreed that the function of the "Study Group" is to formulate International IFP Guidelines.
5. The role of the IOBC "Study Group" was defined as follows:
   - To provide an international forum for scientists, advisers and growers in consultation with associated trade and other bodies
   - to establish and coordinate International Guidelines to direct National and Regional Standards for IFP.

   Important activities will include:
   1. Coordination of information and activities.
   2. International scientific endorsement and supervision of standards.
   3. Promotion and future development.
6. Broad aspects of IFP to be included in the International Guidelines were agreed as follows:
   1. Education of the grower in the principles and practise of IFP.
   2. Site suitability, variety and healthy planting material.
   3. Planting systems consistent with IFP.
   4. Soil management consistent with IFP.
   5. Tree training and crop regulation consistent with IFP.
   6. Integrated Plant Protection according to accepted IOBC definition.
   7. High standards of all aspects of fruit quality.
   8. Harvesting and storage.
   9. Supervision of procedurers.
   10. Labelling and certification of produce but with final responsibility to the grower. Consumer promotion and information/education about IFP.