

## **‘Nabotjek om implementering af IPM (Integreret plantebeskyttelse)’ (Neighbour check on the implementation of IPM (Integrated Pest Management))**

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### **Preface**

‘Nabotjek om implementering af IPM’ is a collection and presentation of information about IPM efforts and measures in our neighbouring countries. This knowledge was used as the basis for discussions of and inspiration for the IPM task force which – chaired by the Danish Environmental Protection Agency – submitted proposals for a future IPM effort as part of the Pesticide Action Plan 2017-2021.

The framework directive on the sustainable use of pesticides (Directive 2009/128/EC or SUD) prescribes that member states must implement the eight IPM principles. How the individual countries have carried out the implementation varies as do the measures that have been applied. The objective of this project has been to describe how the IPM principles are implemented in a number of neighbouring countries in which cultivation conditions are comparable with Danish conditions. No systematic collection of knowledge and information about implementation of IPM in our neighbouring countries has previously been made. Through participation in EU projects Aarhus University (AU) and SEGES know of many activities and involved stakeholders and used these contacts for our collection of information. We would like to express our thanks to all contacts in our neighbouring countries, who went to a lot of trouble to collect information and contributed to the study by filling in the questionnaire. All respondents are known to the authors.

The designing of the questionnaire and the collection of contact information were based on grouping the respondents into three groups: 1) people from authorities involved in legislation and initiatives for implementing IPM, 2) people involved in IPM research and 3) people involved in extension and communication. Subsequent to sending the questionnaire via SurveyXact to 57 contacts, it quickly became clear that many respondents closed the questionnaire after having answered a few questions. We therefore changed our strategy to actively approaching key persons in the countries from which we had no answers. For each country information on the affiliation of the respondents is included.

The report was compiled by SEGES and Aarhus University with Poul Henning Petersen, SEGES, and Per Kudsk, AU, as project managers. Lise Nistrup Jørgensen, AU, Jens Erik Jensen, SEGES, and Ghita C. Nielsen, SEGES, also contributed to the report. Our contact at the Danish Environmental Protection Agency was Anita Fjelsted, Section on Pesticides & Biocides.

## Summary

All our neighbouring countries work in different ways with efforts aimed at making agriculture less dependent on pesticides. Table 1 summarises these efforts. It is our impression that the activities were very much chosen considering the organisation of advisory service and research activities in the individual countries, i.e. the IPM efforts in many cases built on activities and competences that were already supported and aiming at developing novel crop protection methods.

Table 1. Survey of IPM implementation in 7 neighbouring countries.

Measure	Sweden	Germany	UK	Ireland	Netherlands	France	Poland	Denmark
Crop specific guidelines	+	+	-	+	+	+	+	+
Websites	+	+	(-)	+	-	+	+	+
IPM demo farms	(+)	+	(+)	+	-	+	+	+
Consultancy to farmers on IPM	+	+	-	-	(+)	+	+	+
Experience exchange groups	-	-	-	-	-	+		(+)
Training/In-service training	+	+	+	+	+	+	+	+
Authorisation of advisors	+	-	+	+	-	+	-	-
Specific focus on IPM research	+	+	+	+	+	+	+	+
Inspection of IPM implementation at farm level	+	-	-	+	(+)	+	+	-

+ Implemented measures that are a direct result of an effort to implement IPM.

(+) Effort that concerns aspects of IPM but not included in a programme for IPM implementation.

- No initiatives listed for the focus area in question.

Crop specific guidelines are mentioned in the SUD as a tool to be made available to the producers. All countries except the UK answered that in connection with their IPM efforts they prepared guidelines focusing on IPM methods. As is the case in Denmark, most countries prepared relatively brief guidelines addressing advisors and producers directly. Germany

gathered all relevant stakeholders for each crop and prepared an extensive report per crop; these were subsequently evaluated by scientists. In all countries the guidelines are available on websites dedicated to IPM or they are included on web pages dealing with crop protection.

IPM demo farms were part of the IPM activities in most countries but were organised very differently. Germany had 66 demo farms, at which an intensive monitoring of pest was carried out and a large amount of data was collected, however, it has proved difficult to use these data in a long-term perspective. One of the challenges was to find a sufficient number of experienced specialists and advisors. With funds from a pesticide tax, France has established 2,000 demo farms (DEPHY network) to which an advisor has been attached on the condition that the collected data were made available. There has been a great interest and it is the objective to increase the number of farms to 3,000. Fact and information sheets were prepared in connection with this project. In Ireland 3 demo farms were established at which a number of trial and research activities were carried out. Sweden did not set up new demo farms specifically for IPM but similar activities have been going on for many years under the programme 'Odling i Balans'.

Authorisation of advisors is in place in several countries but it is our impression that it is primarily the private and/or state advisory services that, through recruitment, ensure that the advisors have adequate qualifications as regards crop protection. The UK and Ireland have established a system in which the authorised advisors continuously must gather points/credits by participating in supplementary education activities in order to maintain their authorisation.

All countries have research activities aimed at developing IPM tools and methods. Several countries, e.g. France and Ireland, have allocated research activities at the IPM demonstration farms.

As regards the question of inspection of the implementation of IPM at farm level, the answers can be interpreted as none of the countries involved in this study performs any inspection. The concept of IPM build upon a complex relationship between crop, pests and cultivation and the concept of IPM is difficult to boil down to a simple recipe. We, therefore, tried to throw light upon the degree of IPM implementation at farm level by collecting knowledge from demo farms or by using checklists that inspectors/advisors have used together with the farmer.

Whenever possible, links were included to websites and documents that can provide information of the activities in individual counties.

In summary, we conclude that neighbouring countries have adopted different approaches to implement IPM but also that many initiatives are the same in the countries. Most countries state that IPM is widely implemented, but there is no specific documentation on the extent of IPM implementation at farm level. Generally, it is emphasised that tools supporting a more extensive use of the IPM principles are lacking.

## IPM activities and implementation in seven countries

### Sweden

#### Crop specific guidelines

'Jordbruksverket' (the Swedish Board of Agriculture) has prepared crop specific IPM guidelines for eight agricultural crops, onions and strawberry. The guides are available on the webpage of 'Jordbruksverket': [Odlingsvägledning för integrerat växtskydd](#) and are also disseminated through leaflets/fact sheets. The target group consists of producers, advisors and inspectors. Among other things, they are used at in-service training courses for sprayer operators. It has not been registered to which extent the guidelines were visited at the website or to which extent the guidelines were used by the different target groups. The crop specific guidelines are 3-4 A4 pages per crop and can be ordered through a [web shop](#).

#### Websites

The website '[Integrerat växtskydd – IPM](#)' ('Integrated crop protection – IPM') contains a description of IPM and provide access to the crop specific guidelines. There are links to a leaflet on IPM and legislative subjects and links to other webpages on IPM. The website states that the last update of many of the pages was in 2017. The homepage 'Integrerat växtskydd – IPM' is not updated very often but the underlying pages containing information from monitoring activities and other information on current crop protection issues are updated continuously. During the growing season 'Växtskyddscentralerne' publish [weekly reports](#) about pest development in agricultural crops as well as crop specific newsletters.

Producers and advisors are the primary target groups but the web site is also used by students, decision makers and others, who seek information and knowledge about IPM. Among the respondents, there was no knowledge of the number of visits to the IPM webpage. Several respondents estimate that the IPM page presumably does not have many visitors, whereas pages containing monitoring/warning and newsletters on crop protection are visited frequently

#### IPM demonstration farms

No special IPM demo farms were established but farms included in 'Odling i balans' programme have for many years had focus on promoting sustainable agricultural production. An IPM point system was developed and tested at the 'Odling i balans' demo farms. A report of this activity can be found on the web page [Integrerat växtskydd](#).

#### Consultancy to farmers on IPM

Farmers are offered individual consultancy through a project led by 'Greppa näringen', which is a collaboration between 'Jordbruksverket', 'Landbrukernes Riksförbund' and 'länsstyrelserne' (the county administration boards). The IPM guidance module ([IPM-rådgivningsmodul](#)) is one of many guidance modules the farmer can choose. The IPM module contains approximately 4 hours of individual guidance. The 'Greppa Näringen' web page contains a thorough description of the type of guidance provided ([beskrivelse af rådgivningstilbuddet](#)) and a number of annexes such as check lists and PowerPoint presentation on IPM. A 'consultancy package' begins with an initial

visit and is followed up by normally another two visits to the farm per year. The initiative could be multiannual. The counties are responsible for developing the 'consultancy package'.

In the years 2013-17, the number of participating farms was 6, 96, 148, 89 and 87, respectively (a total of 426). The advisors come from various organisations, e.g. 'Greppa Näringen', the local 'Hushållningssällskaperne' and other private organisations. The county administration boards ('Länsstyrelserne') administer the agreements with the advisors and also carry out some consultancy themselves. The scheme is fully financed by the competent authority ('Jordbruksverket').

### **Training/In-service training**

We interpreted the answers from the Swedish IPM stakeholders in this way: There is no formalised IPM content in the training, but IPM is included on equal terms with other relevant subjects.

### **Authorisation of advisors**

Advisors who are employed by 'Jordbruksverket' and those involved in the project led by 'Greppa Näringen' are required to participate in a 4-day course at which one day is devoted to IPM. The same course is offered to the producers. In addition, the advisors participate in conferences and meetings and they are continuously updated through their contact with 'Jordbruksverket'.

### **Specific focus on IPM research**

From 2009 to 2014 approximately SEK 100m was spent on 110 projects. A [synthesis report](#) was prepared that evaluates the research carried out and its implementation. The future research needs were also examined.

The results of research and trials were communicated at regional crop protection conferences and expositions/field days. Guidelines were also produced, and the results have been implemented in the consultancy provided by the regional advisory centres. Some of the results were made public through [Sverigeförsöken](#) (the Swedish trials).

### **Inspection of IPM implementation at farm level**

Inspection was carried out at 791 farms, where the implementation of IPM was evaluated by going through a questionnaire. The evaluation showed that 86% of the arable farms and 92% of the horticultural farms cultivated their crops according to IPM principles. The inspector is the one who evaluates whether the producer complies with IPM. 'Jordbruksverket' and 'KEMI' have published a report on the outcome of the inspections: [Bekämpningsmedel i jordbruket 2015. Tillsynsprojekt om integrerat växtskydd, sprutjournaler och preparat.](#)

The Swedish local authorities are the inspection authority. So far, no enforcement measures have been introduced specifically concerning IPM.

### **Other measures**

No financial incentives have been introduced to promote the implementation of IPM.

### **Other remarks from the respondents**

- The producers are sympathetic towards IPM but more knowledge is needed. They do not wish more rules.
- It was indicated that the advisors lack information on alternative control methods that have been studied in trials, including information on the costs of the methods. Research and development are needed. Therefore the advisors may feel uncertain regarding IPM strategies but they are positive towards promoting implementation of IPM.
- One respondent replied that the farmer should be motivated to adopt IPM through economic initiatives. Unfortunately, too few IPM measures are economic profitable, at least in the short term. Financial support to farmers adopting IPM measures could be another way of promoting IPM. This could be given as support for investment in machinery, etc. (inter-row cultivators, equipment for precision agriculture, decision support, etc.).
- Another respondent thinks that it will be necessary to create a demand among consumers.

### **Respondents**

This description is based on answers from 7 respondents representing 'Jordbruksverket' (4), research (2) and private advisory companies (1).

## **Germany**

### **Crop specific guidelines**

Producer associations and other relevant organisations are responsible for preparing crop specific guidelines. A group of scientific experts performs quality assurance of the guides, which are then annexed to the German pesticide action plan. The [specific guideline for sugar beets](#) is in the process of being annexed and guidelines for other crops are being prepared. A survey of specific guidelines under preparation can be found [here](#). The specific guidelines are primarily focused on cultivation conditions important to IPM and the target groups are farmers and advisors.

### **Websites**

The [IPM theme page](#) of the Federal Ministry of Food and Agriculture contains information about the implementation of IPM in Germany and IPM guidelines for the fruit and vegetables, golf courses, home and garden, nursery and sugar beet. The target group is end users, advisors as well as other stakeholders. A total of 1200 monthly hits has been recorded.

### **IPM demonstration farms**

A major project involving demonstration farms was initiated in 2011 with 27 farms with wine, fruit or arable crops. The next phase began in 2014 including more farms and more crops, for example vegetables and hops. During the period from 2011 to 2018, there were 66 demo farms in total: 27 arable farms, 12 vineyards, 13 orchards, 9 field vegetable crops and 5 hop producers. The farms were chosen to be typical representatives of the different productions. Participation in the demonstration farm project was limited to 5 years during which a large amount of data was collected on the implementation of IPM with a view to progress and identifying research needs. The current demonstration farm project will be finished in 2018.

A project group in the Federal Ministry of Food and Agriculture in Bonn was in charge of the project, and guidelines for IPM at the demo holdings were prepared by the Julius Kühn Institute (JKI), Institute for Strategies and Technology Assessment, which is also in charge of project coordination, data processing and analyses as well as dissemination of knowledge.

One advisor was employed full-time per 5 demo farms. Each demo farm received a financial support of EUR 8,000 for taking part and was also given consultancy free of charge. All participants in the project assembled for meetings.

The Central Institute for Decision Support Systems in Crop Protection (ZEPP) is in charge of guidance and monitoring and modelling of decision support tools. These tools are used by experts and advisors from the advisory services in the federal states, which are responsible for the intensive guidance at the demo holdings and for collecting monitoring data and for reporting to the JKI.

#### ACTIVITIES AT THE DEMONSTRATION FARMS

Advisors and experts from the regional advisory services provided IPM guidance and collected data in a collaboration with the farm managers. The consumption of plant protection products was calculated as a treatment frequency index (corresponding to the Danish treatment frequency index BI), and the pesticide load was calculated using the SYNOPSIS-GIS model. The time consumption for monitoring in the crops was recorded, and the farmers assessed the feasibility of monitoring in practice. Finally, the effect of both the chemical and the non-chemical control effort was assessed.

JKI processed data and published annual reports and is planning to publish an overall report at the end of the project. At an IPM workshop held to mark the end of the Danish IPM advisory project 2010-2015, one of the JKI scientists concluded that relatively small changes had taken place at the demo holdings, considering pesticide use and choice of cultivation methods. A very large amount of data was collected and at an EU workshop on IPM in Bonn it was concluded that, in general, there is a lack of alternative methods, for instance biological and mechanical, that provide a satisfactory and effective pest control.

In the project it has proved problematic to provide stability concerning the advisors linked to the demonstration farms, sufficient financing, and there have been challenges concerning the validity of data and results.

The realisation of the IPM principles at the individual farms depends on various circumstances specific to the farm. Monitoring and independent consultancy are important for the implementation of IPM. The project showed that monitoring is a very time-consuming task and that it is necessary to develop systems that can aid the farmers doing monitoring in a more effective way, for instance expert systems, monitoring with the aid of drones, crop sensors, etc. The use of non-chemical control methods are weather dependent, and the use depended on the agronomic conditions and technical possibilities at the individual farm. Development of IPM requires close collaboration between farmers, advisors and scientists. Results and knowledge about IPM were disseminated at field days and 'open farm' events as well as through conferences, publications, web pages, leaflets and booklets.



### **Consultancy to farmers on IPM**

Consultancy and information about IPM were organised by the responsible authorities of each of the federal states and was therefore varying. The farmers got information about IPM through the official advisory service (decision support systems incl.), articles in trade journals and private advisory firms.

Sources within the advisory service stated that 90% of the producers to some extent have received guidance/information about IPM. The demo farms played a pivotal role in the IPM implementation and these farms served as a role model how to implement IPM. Advisors employed by the federal states, private advisors as well as company advisors from the agrochemical industry have provided information on and disseminated IPM via regional information meetings. For example, in Schleswig-Holstein the effort was concentrated on three IPM demo farms.

It is concluded that the producers generally are of the opinion that they grow their crops according to IPM principles, for example by growing resistant varieties and using decision support systems such as damage thresholds, warning systems and forecasting. But some farmers consider IPM far too demanding and complex in terms of knowledge. There is a gap between the holistic scientific views on IPM, particularly when scientists think in cropping systems, and of what is doable at farm level (lack of time and profitability, but also knowledge and attention). The barriers are:

- availability of and familiarity with decision support systems
- a decreasing number of plant protection products which makes it more difficult to implement strategies that counteract development of resistance
- lack of biological control methods
- market conditions limiting the possibilities of a more diverse choice of crops.

The producers' approach to IPM also depends on personal preferences (risk tolerance, flexibility) and possibilities (farm structure, sales potential, access to guidance, knowledge about non-chemical methods, technical know-how and mechanisation of the holding).

The effect of consultancy about IPM among the producers in general was not measured.

### **Training/In-service training**

Good farming practice and IPM form part of the curriculum of agricultural education programmes and in addition there is a range of crop specific supplementary training courses.

### **Authorisation of advisors**

There are no specific requirements that advisors should be educated or authorised to give specific advice on IPM, but they must possess a spray certificate ([Pflanzenschutz-Sachkundenachweis](#)) to be allowed to advise on crop protection. The advisors, generally, have higher education qualifications such as a Bachelor's degree or higher.



### **Specific focus on IPM research**

In Germany there are no specific research programmes on IPM, but research into IPM forms part of the broader '[Innovation Programme](#)' and the programme "[Improving the conditions for organic agriculture and food industry and other forms of sustainable land management](#)" (BÖLN), which also comprises projects about IPM and research into pest control strategies. Examples of this are:

- The long-term study IPS (JKI)
- Possibilities of using crop resistance/- tolerance towards pests and developing strategies to exploit resistance/tolerance in the growing of agricultural crops
- IPM demonstration holdings ([DIPS](#))
- Online databases of decision support models for more than 40 pests are collected jointly for the federal states in [ZEPP](#), including for example a German version of the Danish decision support system Crop Protection Online ([Planteværn Online](#)).

[Current projects](#) can be found in the project database PLANT 2030.

### **Inspection of IPM implementation at farm level**

There is no inspection of the implementation of IPM at holding level apart from the activities at the demonstration farms.

### **Other remarks from the respondents**

One respondent notes that increased implementation requires custom-made guidance of the individual producer and better understanding of the long-term effect of different management strategies.

### **Respondents**

Silke Dachbrodt-Saaydeh from the JKI collected information from scientists. The Federal Ministry of Food and Agriculture and a consultant in Schleswig-Holstein also contributed. This was supplemented by material collected during an EU workshop on IPM in Bonn in 2016.

## **The UK**

The UK seeks to promote IPM through a number of voluntary initiatives.

- The NFU (National Farmers Union) encourages all farmers to draw up a farm specific IPM Plan. The NFU has established a website at which the farmers, by going through 30 questions grouped into 7 themes, can make their own IPM Plan. The questions are very similar to those in the Danish IPM Point System.
- The Voluntary Initiative (VI) is an industry initiative, which is meant to promote responsible use of pesticides. VI recommends that all producers revise their IPM Plan every year.
- Linking Environment and Farming (LEAF) describing IPM is published as a leaflet.
- Private initiatives, for example [Real IPM UK](#), which is a company established by farmers trying to increase the availability of biological products on the UK market.

### **Crop specific guidelines**

No crop specific guidelines have been prepared specifically referring to the SUD.

### **Websites**

Dissemination about IPM in connection with VI and other initiatives take place for example via websites.

[The Voluntary Initiative](#) is the home page for VI with a range of articles on IPM, protection of drinking water, nature conservation, etc.

[Pest Management Plan](#) (IPMP) has a link to a web page where the producers can fill in and store their IPM plans.

LEAF has a [description of IPM](#).

### **IPM demonstration farms**

The UK has not established any IPM demonstration farms but did, among other things, conduct a number of demonstrations on handling herbicide resistant black-grass.

### **Consultancy to farmers on IPM**

There is no active effort towards the individual producer as regards the implementation of IPM. No national agencies offer consultancy on IPM.

### **Training/In-service training**

No information.

### **Authorisation of advisors**

BASIS is the term of a scheme that requires advisors to be qualified. All advisors need to have their qualifications recognised. Advisors must be registered in the [BASIS Professional Register](#), which requires the following qualifications from its members:

1. The advisors must be in possession of a recognised qualification/education
2. Declare themselves in agreement with the Code of Professional Ethics
3. Commit themselves to the supplementary education scheme Continuing Professional Development (CPD), so that they can stay up-to-date with the most recent knowledge.

In order for an advisor to maintain the right to be in the register, the advisor has to accrue a number of so-called CPD points every year. The CPD is a structured supplementary education in crop protection, fertilisation, management of public areas, etc. The supplementary education programme also includes personal development. The advisors on the register are issued with an identity card confirming their qualifications and that these are up-to-date. The requirements for qualifications can be found on the web page [BASIS](#). Supplementary education is offered through BASIS and is divided into levels. Organisations such as NIAB also offer supplementary education that is approved by BASIS.

### **Specific focus on IPM research**

No special IPM research programme has been established, but for example projects and handling of resistant populations of black-grass have integrated cultivation methods as a research subject.

### **Inspection of IPM implementation at farm level**

The UK has not established an inspection scheme on IPM implementation. The authorities carry out a general inspection through the [Rural Payments Agency](#). The inspectors of responsible agency carry out visits to the selected holdings and check that the producers live up to legislation through inspection of spray records, spray certificate, etc.

### **Respondents**

NIAB assisted in completion of the questionnaire.

## **Ireland**

### **Crop specific guidelines**

Certain crop specific cultivation guides are accessible. Examples of guides can be seen by following the links for [winter wheat](#) and [spring barley](#). These guides are well developed and provide extensive background information on cultivation practises but they do also contain specific cultivation instructions. The specific guidelines are published by Teagasc, a semi-official authority, providing among other things research and guidance to the agricultural sector.

### **Websites**

Teagasc has developed a 'Platform for Integrated Pest Management in Irish Crops' (EPIC). The platform is meant to promote implementation of IPM at farm level. Work is being done on adapting forecasting tools and decision support systems on specific pests developed in other European countries to Irish climatic conditions.

Selected links to pages on IPM:

- [Teagasc's presentation of IPM](#)
- The Department of Agriculture, Food and the Marine's Pesticide Registration and Controls Divisions have prepared presentations on [IPM principles](#) and [Guidance notes on IPM for use on Irish farms](#).

### **IPM demonstration farms**

Three specific IPM demonstration farms have been established. Teagasc has been responsible for carrying out demonstration projects at the farms. Eleven research projects have been carried out at the three demonstration farms aiming at integrating research and practice.

The hosts have been very positive partners in the projects and farmers have been very satisfied with their participation in events at the demo farms. There have been more than 2,000 visitors. The advisors have not used the demonstration farms very much.

### **Consultancy to farmers on IPM**

Requirements for cultivation according to the IPM principles are implemented in the national legislation. The farmers are offered an IPM checklist in which they can tick off the IPM principles they live up to. Whether the producer will use the IPM checklist or his/her own registration tool is voluntary. The inspection visits show that most farmers use the IPM checklist. Please see the checklist below, which addresses the eight IPM principles.

### **Training/In-service training**

IPM is part of the curriculum of agricultural education programmes. No specific supplementary training on IPM for farmers has been established. An education for spray operators was established and since 26 November, 2015 only those registered as a professional user are permitted to spray. Distributors also go through supplementary education/training because all distributors had to be “appropriately trained” and registered by the Department of Agriculture, Food and the Marine. As of that date, a trained and registered distributor must be present at all sales outlets to ensure that the customers are given sufficient information about pesticide use and safety issues concerning health and environment. There are 4 suppliers of courses for distributors.

### **Authorisation of advisors**

All who wish to be registered as an advisor on pesticide use must possess a '[Professional Diploma](#)' in IPM and sustainable use of pesticides. The Department of Agriculture, Food and the Marine (DAFM) may decide through a “case by case” assessment whether any alternative qualifications can be accepted instead of the diploma programme. To achieve a DAFM registration, the advisor must update his/her training, continuously update it constantly and attend “Continuous Professional Education” (CPE). Similarly, Irish distributors must update their training and document this through a [credit system](#).

### **Specific focus on IPM research**

Ireland has had a number of research projects focusing on better exploitation of variety resistance. Crops are severely affected by disease attacks as a result of the humid climate. This results in relatively intensive spraying and severe problems with fungicide resistance. Fungicide resistance is thus an important research area.

### **Inspection of IPM implementation at farm level**

The IPM checklist or the farmers own notes about IPM are checked at the inspection visits.

## **Application of Integrated Pest Management (IPM) at user level.**

Herd Number: \_\_\_\_\_ Year: \_\_\_\_\_

**Tick only the appropriate options currently practiced on your farm.**

<b>1. The prevention and/or suppression of harmful organisms</b>			
Crop rotation	<input type="checkbox"/>	Sterile seedbed technique	<input type="checkbox"/>
Clean machinery and equipment	<input type="checkbox"/>	Clean potato boxes/growing trays etc..	<input type="checkbox"/>
Nutrient management programme	<input type="checkbox"/>	Irrigation (applied to schedule)	<input type="checkbox"/>
Soil testing (pH, nutrients, OM)	<input type="checkbox"/>	Protect beneficial organisms	<input type="checkbox"/>
Certified seed	<input type="checkbox"/>	Full inversion tillage (plough)	<input type="checkbox"/>
Choose disease resistant varieties	<input type="checkbox"/>	Minimum cultivation	<input type="checkbox"/>
Management of crop residues	<input type="checkbox"/>	Soil structure & compaction	<input type="checkbox"/>
Use of optimal sowing date	<input type="checkbox"/>	Clean crop storage areas	<input type="checkbox"/>
Other (please specify)			
<b>2. Monitoring of harmful organisms</b>			
Use early warning/forecasting systems	<input type="checkbox"/>	Monitor crops for pests/diseases	<input type="checkbox"/>
Use weather forecast to aid decisions	<input type="checkbox"/>	Advisor monitors crops	<input type="checkbox"/>
Can identify main pests	<input type="checkbox"/>	Use traps/sticky pads/lures	<input type="checkbox"/>
Other (please specify)			
<b>3. Application of plant protection measures</b>			
Some crops treated preventatively	<input type="checkbox"/>	Advisor makes decision	<input type="checkbox"/>
Decisions jointly made with advisor	<input type="checkbox"/>	Some decisions based on pest thresholds	<input type="checkbox"/>
Other (please specify)			
<b>4. Sustainable biological, physical or other non-chemical methods</b>			
Use natural enemies	<input type="checkbox"/>	Use crop fleeces	<input type="checkbox"/>
Use micro-organism plant protection products	<input type="checkbox"/>	Use crop netting	<input type="checkbox"/>
Use propane burners for weed control	<input type="checkbox"/>	Use mechanical weeder (e.g., steerage hoe)	<input type="checkbox"/>
Use manual methods	<input type="checkbox"/>	Use deterrents (bangers, kites etc..)	<input type="checkbox"/>
Use of topper/mower for weed control	<input type="checkbox"/>		<input type="checkbox"/>
Other (please specify)			

<b>5. The pesticides applied shall be as specific as possible for the target pest.</b>			
Applications usually for multiple pests	<input type="checkbox"/>	Resistance development is considered	<input type="checkbox"/>
Different modes of action considered	<input type="checkbox"/>	Broad spectrum products avoided	<input type="checkbox"/>
Different products considered	<input type="checkbox"/>	Familiar with different product labels	<input type="checkbox"/>
Economics are considered	<input type="checkbox"/>	Use advisor to help decide on product(s)	<input type="checkbox"/>
Consider following crops	<input type="checkbox"/>	Buffer zones are considered	<input type="checkbox"/>
Use weed licker for weed control	<input type="checkbox"/>	Use of seed dressings	<input type="checkbox"/>
Avoid insecticide use where bees are foraging	<input type="checkbox"/>	Use drift 75% reducing nozzles	<input type="checkbox"/>
Use air assisted sprayer	<input type="checkbox"/>	Use drift 90% reducing nozzles	<input type="checkbox"/>
Other (please specify)			
<b>6. Use of pesticides at necessary levels</b>			
Use reduced rates of application	<input type="checkbox"/>	Use adjuvants to reduce PPP use	<input type="checkbox"/>
Partially treat / spot spray fields	<input type="checkbox"/>	Applications timed to minimise use	<input type="checkbox"/>
Reduce frequency of application	<input type="checkbox"/>		<input type="checkbox"/>
Other (please specify)			
<b>7. Anti-resistance strategies applied to maintain the effectiveness of the products</b>			
Use products with multiple modes of action	<input type="checkbox"/>	Use robust rates of PPPs	<input type="checkbox"/>
Use tank mixes with multiple modes of action	<input type="checkbox"/>	Keep abreast of resistance development	<input type="checkbox"/>
Familiar with different product labels	<input type="checkbox"/>		<input type="checkbox"/>
Other (please specify)			
<b>8. Success of the applied crop protection measure</b>			
Success or failure of intervention is measured	<input type="checkbox"/>	Member of discussion group	<input type="checkbox"/>
Success or failure of intervention is recorded	<input type="checkbox"/>	Results discussed with advisor	<input type="checkbox"/>
Crop yields are recorded	<input type="checkbox"/>		<input type="checkbox"/>
Other (please specify)			

### **Other measures**

Ireland also has a document giving recommendation for public areas and private gardens. The [document](#) contains 10 steps towards more responsible use of pesticides on these areas.

### **Respondents**

The description is compiled based on information from the Department of Agriculture, Food and the Marine and a presentation by Michael Gaffney at the IPM workshop in Bonn.

## **The Netherlands**

### **Crop specific guidelines**

Crop specific guidelines have been prepared for a large number crops; these are collected in the publication [Best Practices Gewasbescherming Akkerbouw en vollegrondsgroenten](#). They are especially focused on crop protection and they contain guidelines for both agriculture and horticultural crops. The Dutch government commissioned this task to Wageningen University and Delphy as part of the project 'Telen met toekomst'. Delphy, a private advisory and development firm, prepared guidelines/instructions/flyers, etc. concerning IPM. Dissemination was through websites, leaflets, field events and was aimed at farmers, advisors and private firms.

### **Websites**

No specific websites have been set up as part of the implementation of IPM.

### **IPM demonstration farms**

No IPM demo holdings have been established.

### **Consultancy to farmers on IPM**

IPM is integrated into the general agricultural advisory system, which primarily is run by private advisors. There were several projects, supported by the Government, which had different target groups among the farmers. All advisors provide, to some extent, guidance on IPM but the independent advisors probably do this to a greater extent than the advisors employed at cooperatives or distributors. Public funds were made available for IPM activities aiming at the various target groups with several hundred participants but there were no grants for private consultancy.

The farmers are generally positive towards IPM. But they often feel that extra work and increased risk are not appreciated by the market. There is a wish for better monitoring in order to monitor their crops more closely. However, the extent to which the producers have adopted IPM in their practice differs greatly. The producers are relatively dependent on consultancy and the advisors are held responsible for the result. The advisors often make money from the sale of pesticides so there is a risk that their devotion to IPM is half-hearted.

### **Training/In-service training**

IPM forms part of both the curriculum of agricultural education programmes and in-service training of farmers.



### **Authorisation of advisors**

There is no authorisation of advisors.

### **Specific focus on IPM research**

IPM is in focus in the research programmes. 'Farming with future 2002-2012' was an effort aiming at implementing available knowledge and reducing pesticide use within a decade. There were study groups, regional working groups and demonstration farms, and late in the process there was specific consultancy aimed at farmers and advisors. Knowledge was disseminated through leaflets, booklets, etc. There were also 'Open days', meetings and supplementary courses. In terms of research, a major effort was done in relation to identifying possible alternatives to chemical control, such as mechanical methods but there was also a major focus on biological and alternative chemical products.

The scientists generally have a positive attitude to IPM but perhaps the effort has been insufficient as regards the implementation of the initiatives at farm level. The dissimilarity of the farms makes it challenging to put research outputs into practice.

### **Inspection of IPM implementation at farm level**

Referring to '[Milieukeur](#)', which is a certification scheme, it is stated that inspections are made of IPM at holding level. This scheme includes a module that deals with loss of pesticides to the surroundings. It is assessed that the number of producers with a certificate will increase from a few hundred to considerably more as a few retail chains now demand that the farmers have this certificate.

### **Other measures**

The respondent points out that the strongest incentive to implement IPM is the demand from the buyers.

### **Other remarks from respondents**

One need to make sure that the end users are involved as much as possible and be aware that their reservations about IPM, whether real or not, are important or relevant to them. Any reservations about IPM must be clarified – for example remarks that "my farm is different" in order to clarify whether these are real challenges or a lack of willingness to change. IPM measures are only effective if they are put into practice and barriers are broken down.

### **Respondents**

The summary is based on information from Wageningen University.

## **France**

### **Crop specific guidelines**

Crop specific guidelines have been prepared and are available on the IPM website [EcoPhytoPIC](#) (please see below). The crop specific guidelines have primarily been prepared by the research institutions and are used by farmers, advisors and private firms.

### **Websites**

Relevant information about IPM can be found on the website [EcoPhytoPIC](#), which was created in 2012 and forms a part of the EcoPhyto project targeting specifically IPM. The responsibility for the website rests with ACTA, an umbrella organisation for a number of research institutions, each being responsible for research and development within specific crops and contributing information to the website for these crops. EcoPhytoPIC is a very comprehensive portal covering many themes within all types of crops, including tropical crops. Research results are presented, articles on IPM are uploaded, interviews published, meetings and events announced just as there are various quizzes where anyone can test their knowledge on IPM. The target group is wide and comprises farmers, advisors and teachers at agricultural colleges. It is estimated that primary producers represent 15 per cent of the traffic on this page.

### **IPM demonstration farms**

In France the so-called [DEPHY](#) Network was set up. It now comprises 2,000 farms, which in whole or in part, are part of the network. DEPHY is funded via a pesticide tax and is administered by l'AFB (Agence Française pour la Biodiversité), which is part of the Ministry of the Environment. The Ministry of Agriculture manages partly the financial management. The DEPHY network forms part of the Ecophyto II plan, which succeeded the EcoPhyto plan.

An advisor is attached to the farms in the DEPHY network and the farmers must make all data relating to their farming practices available to the network. These data are collected by the appointed advisor and are used to calculate pesticide use/risk indicators but the data also provide input for nationwide analyses. A number of research projects have been carried out aiming at studying how cultivation systems with a considerably lower input of pesticides can be implemented. One of the outputs from DEPHY is a number of inspiration sheets describing what various farmers have done to implement IPM and reduce their use/dependence on pesticides. A total of 195 trial sites were set up as a sub-activity in DEPHY. In 2016, it was decided to consolidate and extend the network to 3,000 farms in order to address the interest from the participating farms and, at the same time, invite new farms to participate in the network.

### **Consultancy to farmers on IPM**

Guidance for the producers is developed by various organisations. The public advisory service is performed by the local 'Chambre d'agriculture', but the pesticide retailers and the agrochemical companies also have their own advisors. There are also private firms offering IPM guidance.

### **Training/In-service training**

IPM is included in the curriculum of programmes for education of young farmers and in the courses required to obtain a [spray certificate](#).

### **Authorisation of advisors**

There is a certification scheme for both advisors and pesticide retailers.

### **Specific focus on IPM research**

Research into IPM began in 2008-2009, and so far about 250 projects have been financed via the EcoPhyto plan. On the website EcophytoPIC all the projects have been listed and shortly described. In addition to EcoPhytoPIC, the research results are also disseminated via national or

regional seminars, videos and articles. The advisors in the local "Chambre d'Agriculture" are also communicators of the research results.

### **Inspection of IPM implementation at farm level**

Certificats d'Economie de Produits Phytopharmaceutiques ([CEPP](#)) ("pesticide savings certificates" in English) is a new concept in France. It is a system where pesticide retailers are required to promote IPM initiatives, which e.g. could be the use of biopesticides rather than conventional pesticides. The retailers earn a certain number of certificate units each time they sell for example biopesticides. For the major agricultural crops there are 19 IPM initiatives that can give certificates. For each of the approved IPM initiatives a brief description is available on how the certificate units are calculated. For example, on the French market there are three products containing the active substance pelargonic acid, which is considered to be an alternative to glyphosate for certain uses. The retailers earn 0.065 certificate units for every litre of product they sell. The target for all IPM initiatives is 17.65m certificate units in 2021, equivalent of about 20 % of the current sale of pesticides. The period until 2021 is a phase-in period, but subsequently a tax of EUR 5 will be imposed on the retailers for each lacking certificate unit; however with a maximum tax of EUR 5m per company. The certificates are tradable, meaning that the retailers who have earned more than they need may sell to those who have not met this requirement. The advisors are not affected by this scheme yet, but they may choose to participate and may then sell the certificate units they earn. The scheme is very similar to the scheme known from the carbon credit system. Following recommendations from specialists and evaluation by independent experts the Ministry of Agriculture defines which initiatives can be included in the CEPP.

### **Other measures**

"Chambre d'agriculture" organises field walks/farm visits. The plan is to increase the activity by more field walks, seminar, demonstrations, etc. Sprayer operators are required to complete an education (CertiPhyto).

### **Other remarks from respondents**

According to the respondents more resources are needed for IPM research. Another comment is that one of the major challenges regarding implementation of IPM is the strong specialisation exemplified by the maize cultivation in Southern France and winter wheat cultivation in Northern France, respectively.

### **Respondents**

This description is based on information from ACTA. In addition, information mentioned in ENDURE and presented at an IPM workshop in Berlin was used.

## **Poland**

Implementation of IPM is an important element in the national pesticide action plan. The requirements in the SUD are implemented in the legislation.

### **Crop specific guidelines**

Referring to the Ministry of Agriculture and Rural Development, the research institutions have prepared crop specific guidelines, which are communicated via web pages, leaflets, the advisory

service and printed cultivation guides. The guides are aimed at producers, advisors and private companies.

### **Websites**

The IPM website was developed by the Institute of Plant Protection, the Institute of Agricultural Science and Plant Cultivation and the Institute of Horticulture provide information to farmers and advisors about pests, control methods, IPM tools, decision support systems and plant protection at crop level. [Agrifagi](#) contains considerable amounts of information and the results of monitoring activities. The web page has about 15,000 visits every month.

### **IPM demonstration farms**

IPM demonstration farms have been established but no detailed information could be obtained.

### **Consultancy to farmers on IPM**

Experiences of IMP implementation were described at the [ENDURE conference](#) in 2015. In a contribution from Dąbrowski & Garnis, a survey of farmer's needs and research priorities was mentioned. The farmers expressed a need for establishing easier access to specialised guidance on IPM. Private consultancy firms focusing on 'Global G.A.P.' and integrated crop production have been established.

### **Training/In-service training**

IPM is included in the curriculum of agricultural education programmes and supplementary training is offered to producers.

### **Authorisation of advisors**

Poland does not have an authorisation scheme for advisors.

### **Specific focus on IPM research**

A research programme [LONG-TERM PROGRAMME OF IPP – NRI](#) focusing specifically on IPM was carried out in the period 2011-2015 to meet the requirement of the SUD. The results are disseminated through supplementary training courses, publications and seminars.

### **Inspection of IPM implementation at farm level**

IPM forms part of the inspection programme of the [national inspection authority](#), which is done by means of a checklist and interviews. In the reply, we received, it is stated that the degree of IPM implementation at farm level was good, as a large number of holdings live up to IPM. It is also stated that the farmers have a critical attitude towards some of the IPM principles.

### **Other measures**

No remarks.

### **Respondents**

The description is based on information from the Ministry of Agriculture and Rural Development.

## Denmark

A framework for cultivation according to the guidelines of IPM was created in the period 2010-2016, first as part of 'Grøn Vækst' ('Green Growth') and then as part of 'Pesticide Strategy 2013-15'.

### Crop specific guidelines

For 15 of the major agricultural crops, so-called IPM toolboxes were prepared, in which the IPM principles for each crop was transformed into a cultivation guide under Danish conditions. The IPM toolboxes are available on the IPM web page [www.dansk-ipm.dk](http://www.dansk-ipm.dk). SEGES and 'Gartneri-rådgivningen' (now 'HortiAdvice') also implemented IPM in the general management guidelines for all major agricultural and horticultural crops. The target group for the IPM toolboxes are farmers, advisors, teachers and students at agricultural colleges.

### Websites

Dissemination and information about IPM are gathered on the web page [www.dansk-ipm.dk](http://www.dansk-ipm.dk). From 2010 to 2015, the page was divided into two parts with a page about IPM methods and initiatives and a page with activities at the IPM demonstration farms. The page was updated in 2016, making the material produced about IPM more searchable and organised more systematically. The web page is primarily used by advisors and teachers. In particular, 45 IPM inspiration sheets with concrete descriptions of IPM initiatives are much used by advisors. In the period 2010-15 about 250 articles were produced which have had 80,000 hits.

### IPM demonstration farms

In 2010 5 demonstration farms were established for agricultural crops and 2 for horticultural crops. The farmers were given guidance about the general IPM principles, which subsequently were implemented at the individual demonstration holdings to the extent they were relevant. In addition, work was done on special focus areas/themes at the individual demonstration farms as agreed with the owner/manager. During the project period 175 events were held with about 10,000 participants. Fifty videos were produced about the demonstration farms and technical issues. The demonstration project was finalised with a leaflet about IPM: [IPM rimer på godt landmandskab](#) ('IPM rhymes with good agricultural practice').

### Consultancy to farmers on IPM

During 'Grøn Vækst' and then the Pesticide Strategy 2013-15 guidance on IPM was offered to agricultural and horticultural farmers. SEGES was the project owner and coordinated the national effort, including guidance through the local agricultural centres and private crop consultants. Each year from 2010 to 2013, DKK 3.7m was reserved for this effort and later around DKK 2m for agricultural crops. There were two consultancy models: consultancy targeted at individual farms or experience exchange groups. The individual consultancy programme ran over two years with 3 consultations per year. The effort increased with the size of the holding. In the project period 2010-2015, 1,135 holdings received consultancy on IPM and these farms represented about 254,000 ha.

The effect of the consultancy efforts was measured though an [IPM credit system](#) and an [interview survey](#).

### **Training/In-service training**

IPM forms part of the agricultural education programme and is part of the curriculum of the mandatory one-day update course that spray operators must complete every four years. In the period 2010-2016, an IPM course targeting advisors was organised each year. IPM was also a theme of many contributions at seminars for advisors and at the annual Crop Production Congress. In addition, a special effort was directed towards the agricultural contractors.

### **Authorisation of advisors**

There is no authorisation scheme for advisors in Denmark. Advisors employed by the agricultural associations and private practice advisors generally have higher education qualifications or are trained as agricultural technologists.

### **Specific focus on IPM research**

No funds have been allocated for an IPM research programme in Denmark, but IPM has been a focus area in connection with the distribution of funds from for example the Danish Environmental Protection Agency's Pesticide Research Programme, the 'GUDP' ('Green Development and Demonstration Programme') and the various levy funds through which a number of IPM projects were financed. In addition, there has been focus on IPM within the framework programme of research and innovations of the EU, which was also exploited by Danish research institutions. The projects cover a broad spectrum of subjects with a short-term time frame such as development of integrated strategies, use of alternative products/methods and pesticide resistance but also long-term efforts focusing on the technology of the future in the form of drones, sensors and robots.

### **Inspection of IPM implementation at farm level**

No inspection scheme has been set up.

### **Other measures**

The pesticide tax is a measure that is used with the objective of reducing the pesticide load. The effect of the pesticide tax was recently evaluated. The challenge will therefore be to keep the IPM effort in focus in the next few years if new objectives are to be achieved.

## **Perspectives**

The neighbour check showed that Denmark has undertaken a number of initiatives that can strengthen the implementation of IPM. It was made possible not least by a joining forces in the advisory service and by a close collaboration with research institutions. Many of the answers from our neighbouring countries confirm the experiences from the IPM projects in Denmark that implementation of IPM, which in itself is dynamic, requires continuous guidance and supportive research activities, which can make new methods and techniques available. The challenge will be to keep focus on IPM in the next few years if new objectives are to be achieved.

## **Annex 1. Questionnaire sent out via SurveyXact**

The questionnaire was prepared and sent out via SurveyXact..

### **Introduction**

On behalf of the Danish EPA we are conducting this survey on the implementation of IPM in our neighbouring countries – Sweden, Germany, Poland, Holland, France, UK and Ireland. From each country, we are asking:

1. Person(s) covering legal aspects and initiatives of IPM implementation from a governmental perspective,
2. Person(s) who are involved in IPM research
3. Person(s) involved in advising or communication of IPM to the farmers.

The questionnaire will take 20-30 minutes to answer.

### **Questions**

What role did you play in connection with the implementation of IPM?

Any remarks regarding your role in connection with the implementation of IPM

### **Were any crop or sector specific guidelines for integrated pest management published in your country?**

Who was responsible for drawing up guidelines for integrated pest management?

In what form are they communicated, for instance through websites, leaflets, advisory service, direct mail to farmers?

Do the guidelines only deal with integrated pest management or are the guidelines instructions on all aspects of crop protection / crop production?

Others, please specify

Who uses crop or sector specific guidelines for integrated pest management?

Others, please specify

### **Were one or more websites with specific information on IPM established?**



Who was responsible for developing and maintaining the website(s)?

Please describe briefly the content on the website. Please feel free to add links to the website(s)

Is (are) the website(s) updated regularly?

Please note any supplementary remarks

Who is the target group (several answers possible)? Please state several answers if a website has several target groups or if several websites have one or more target groups)

Others, please specify

To what extent was and is the website used? State for instance the number of monthly visits to the website

**Have any IPM demo farms been established in your country?**

How many IPM demo farms have been established? Please describe whether IPM demo farms were an activity which is finished now or whether they are an ongoing activity.

How are they organised?

Who are responsible for running the demo farms?

Who gives advice and makes reports?

What have you learned?

How is knowledge and experience distributed to the users?

Is the effect of IPM implementation on the demo farms measured e.g. in terms of total pesticide use and/or economic performance? Please insert links if results have been published.

**Are farmers offered consultancy on IPM ?**

If yes, how is this organised?

Who do the consultancy?

Is the scheme wholly or partly financed by the national authority?

How many farmers have participated in the scheme?

Have any experience exchange groups on IPM been established for farmers?

What is/was the extent of consultancy (modules, number of hours, etc.)?

**Is IPM a part of education of young farmers?**

**Are farmers offered training courses on IPM?**

Has the effect of the advisory effort been measured?

What has been achieved? Please insert links if results were published.

**Is authorisation of consultants compulsory?**

How does this scheme work?

What professional requirements must the consultants fulfill?

Is there any form of inspection by the authorities?

How do consultants get supplementary training?

**Is there a special national focus on IPM research?**

Which projects have been initiated, and what was the outcome? Please list most important projects and provide links to publications.

How are the research results on IPM communicated to consultants and farmers?

**Does implementation of IPM form part of the inspection on individual farms?**

**How is the inspection carried out, for instance through check lists?**

Which authority performs the inspection?

Which sanctions have been introduced (fines, reprimands, etc.)?

**Have any subsidy schemes, pesticide taxes or other economic incentives been introduced to support the implementation of IPM?**

Are there any other incentives for implementation of IPM that have not been mentioned?

Please describe what other incentives have been introduced

We should like to hear if you - based on your experience - have any suggestions for how implementation of IPM could be promoted.

Has a survey been made among farmers about their adoption of IPM?

What was the outcome of the survey?

**In your opinion, how is IPM received by farmers (barriers, opinions, etc.)?**

In your opinion, how is IPM received by advisers (barriers, opinions, etc.)?