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Summary

Expert sub-contracted to SZIE prepared a Desk Study on training programmes (occupational and tertiary level ones) on IPM in European Research Area. Information for the study were received from the followings:

- an internet search,
- analysis of selected course materials,
- a literature review of selected international experiences,
- a short questionnaire survey sent to selected respondents.

The Study concludes (among others) that:

- crop protection knowledge infrastructure is not sufficiently well organised to support wider adoption of IPM;
- information infrastructure, access of stakeholders to IPM education and training opportunities is diverse
- IPM is a standard best practice for certain crops, economic incentives are inadequate, hence demand for IPM training remains below the potential;
- Policy, regulatory and consumers pressures are propelling farmers and advisers to develop improved competence for IPM (minimised pesticide use, multifunctional agriculture);
- Considerable scope exists for European stakeholders to learn from international experience concerning
 - i. how to place crop protection science in society in a cost-effective way;
 - ii. how to reach thousands of small farmers (particularly in southern, eastern and central Europe), and
 - iii. how to complement participatory, learner-centred experiential training and education with actions that augment and scale up the impacts. The roles of farmers themselves are of particular interest under these heads.

This Desk Study will be shared with ENDURE Partners. Experts in SA1 Activity Group (training and education) will discuss and explore the lessons learned from this study.

INVENTORY AND REVIEW OF OCCUPATIONAL AND TERTIARY LEVEL TRAINING ON INTEGRATED PEST MANAGEMENT IN THE EUROPEAN RESEARCH AREA

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In fulfilment of a sub-contract to ENDURE – European Network for the DURable Exploitation
of crop protection strategies

i. Aims and scope

This report seeks to inform the work of ENDURE – European Network for the Durable Exploitation of crop protection strategies - using discussion at the inaugural workshop (21-23 February, 2007 at Sophia-Antipolis, organised by INRA TRANSFERT).

It was decided the report should include both occupational and tertiary level training and education and take an inclusive approach to what falls under the heading of integrated pest management (IPM). It should focus on experiences in the European research area, with selective reference to key experiences elsewhere, and highlight those that have taken a participatory, experiential learning approach. While the time allocated to the study would not allow a comprehensive listing of all such experiences care should be taken to cover the range and, where the information allowed, to review strengths, weaknesses, opportunities and threats to current provisions. The conclusion should provide guidance to researchers, educators and policy makers regarding positive experiences that could be further developed or applied, as well as identifying gaps and further work to be done.

This report thus has been composed of information from the following:

- i. an internet search
- ii. analysis of selected course materials
- iii. a literature review of selected international experiences
- iv. a short questionnaire survey sent to selected respondents
- v. key word search: *Journal of Agricultural Education and Extension*

ii. Main findings from the internet search

The first 500 entries (30pp) of over 1million posted on Google were accessed (May-June 2007) as well as selected entries listed in specialised internet search engines. The most fruitful key word entries were: **IPM courses; IPM courses Europe**.

2. 1 General findings

The internet search made clear that the way in which crop protection training and education are organised, the labels under which this information appears, and the specific provisions made for IPM training and education are **highly diverse**:

- between countries,
- between farming systems,
- between levels and
- in the balance of public and private provision.

The range stretches from contexts where provisions are largely delivered or contracted by **farmers' own organisations (Denmark)**, to countries in which **public providers still play a large role (France)** and those which have opened up to a very large degree to **private providers (England)**. No useful summary can be made of this diversity beyond noting it makes it very hard to develop a coherent and comprehensive overview of the situation.

The main general findings are:

- Courses run by American universities dominate the IPM web pages. Some of these support IPM education and training in the European research area (ERA); for instance IPM in high value crops in Albania, Ukraine and Moldova, under the USAID-funded IPM CRSP coordinated by Virginia Tech (<http://www.ento.vt.edu/ento>);

- IPM courses include non-credit as well as accredited on-line home study courses, thus reaching out potentially to a very wide audience;
- Refresher courses for occupational users of pest control chemicals are also prevalent; these include regularly updated information on techniques, equipment, regulations and product information as well as best practice IPM tips. Crop protection companies are actively involved in organising, delivering or participating in such courses;
- There are many on-line, short duration and specialist IPM courses for schools (including materials for use in school curricula but also for IPM and safe use of pest management chemicals in a school environment), golf course managers, hospitals, museums and libraries, managers of the urban environment, and for the use of IPM and, if needed, synthetic pest management chemicals in the home garden. These are offered by a range of commercial, non-government and public institutions, with both free and fee-paying options;
- The IPM methods and techniques included under any of the above are highly diverse, ranging from fully organic to classic biocontrol in orchards and closed environments and conventional industrial best practices in broad acre cropping, as well as options typically associated with genetically modified crops (principally *Bt* crops although these are not licensed for widespread field use in most of Europe at present);
- The role of the farmer as an informed decision maker does not emerge very clearly in the sites accessed. Information on on-line and other IPM-related decision support systems (DSS) requires a focussed search. Information on specific participatory, field-based, experiential learning approaches also would seem to require some prior familiarity with the relevant literature or with the work of organisations that have been promoting such approaches (e.g. PAN-UK; PAN-Germany; FAO);
- Many of the sites covering farmer participatory approaches relate to international development assistance programmes (e.g. DFID's crop protection programme on integrated vegetable production; <http://www.new-agri.co.uk/03-3/focuson/focuson6.html>).
- A number of sites specifically deal with how producers and agro-enterprises in developing countries can meet European MRLs (maximum residue levels) in fresh produce grown for export. Company-supplied information and training materials appear to be especially well developed under this head. See for instance Crop Life International's 'AgLearn' site (<http://www.aglearn.net>). This site also provides easily accessible links to the relevant global, European and national policy and regulatory frameworks.
- Other course information and materials are provided in relation to pest-specific or crop-specific sites, such as the European Whitefly Studies Network's site (<http://www.whitefly.org>) maintained by the John Innes Centre, Norwich, UK.

2.2. Analysis of selected European IPM courses

It was not considered useful in the time available to attempt to make an in-depth analysis of course materials. A selection thus was made to highlight four 'typical' kinds of provision: a university-based course for professionals (Netherlands); a university-based Masters level course (Germany); the extensive training support still provided by public agencies in France; and an extension-led approach (Portugal)

University-based provision: Netherlands and Germany.

The Plant Pathology Internet Guidebook (www.pk.uni-bonn.de/ppigb/ppigb.htm) compiled by T. Kraska, Institute for Plant Diseases at the University of Bonn, provides information for 19 European countries (including Russia) (table 1). It does not provide a fully comprehensive listing of provisions related to IPM education and training/research offered through universities/research institutes but it remains probably the best single source available at present. The information for courses on plant disease management is more complete than for integrated pest management. None the less it captures well the dominance - in terms of the number and diversity of centres - of Germany and the UK in provision of scientific university courses on topics that underpin IPM practice as well as signalling that it is possible to find at least one professionally or academically accredited course relevant to IPM at one or more university in most European countries. A main finding is that university courses that are specifically directed to or labelled as **IPM courses are relatively few**: the emphasis is on the underlying science rather than on putting the science to work in farmers' practice.

Table 1: Number of universities and research centres carrying out work relevant to crop protection and IPM training and education, based on PPIGB data

Country	No. universities and research centres
Austria	2
Belgium	5
Czech Republic	2
Denmark	4
Finland	3
France	1
Hungary	1
Ireland	1
Italy	6
Germany	35
The Netherlands	5
Norway	1
Portugal	1
Russia	1
Spain	2
Sweden	4
Switzerland	2
Turkey	2
United Kingdom	16
Total	94

Source: Plant Pathology Internet Guidebook (last updated 08.06 2007)

Course programmes and materials from two university centres were further analysed as providing contrasts between an orientation to professionals and to academic students (table 2).

Wageningen International (Netherlands) is one of the few professionally oriented courses based in and drawing on university capacity. The Institute of Plant Disease and Plant Protection, University of Hanover (Germany) offers one of the few Masters level courses in Europe that specifically includes an IPM-related specialisation. It is noteworthy that both seek to attract international students and both programmes are concerned with export-oriented cropping - and hence with IPMs a means of meeting consumer expectations and regulatory requirements.

Table 2: Illustrative course information, 2006-2007: Netherlands and Germany

Course	Organisation	Key words: content	Teaching methodology	Course design/target participants
IPM and Food Safety	Wageningen International, Netherlands training.wi@wur.nl	Solving problems in IPM related to sustainable agriculture and food safety: <ul style="list-style-type: none"> • GAP implementation • Policies & institutional innovations • Participation & multi-stakeholder processes • Food chains, food safety • Pesticides, food safety, environmental protection • Public & private grading & certification 	Interactive lectures; discussion; group work; case studies; presentations; field visits; action planning related to students' own situation	4 weeks, annually Comprising 2 courses (IPM Policies and institutional innovations; Pesticides and food safety in IPM). Fee: Euro 1850 per course Requirements: 3 years' professional experience; BSc/MSc; competence in English For managers, policy makers, specialists, senior technical staff, extension/advisory professionals
Biological Plant Protection	Institute of Plant Diseases and Plant Protection, University of Hanover, Germany www.ipp.uni-hannover.de	Biological Plant Protection: <ul style="list-style-type: none"> • Theory • Approaches & methods (including bio-technologies) within IPM framework • Applications & cases 	Lectures, papers, student-managed learning, excursions	Core module for a thematic specialisation, in context of MSc - International Horticulture 4 hours/week x 1 semester 6 ECTs Requirements: BSc; competence in English For those seeking academic qualifications in horticulture

Institute-based provision: France

France's rich experience is analysed here because though unique in its scale and extent it provides insight also into what may be missing in current European coverage as well as into the institutional capacity that could be exploited to help fill the gaps. Technical training in agriculture is offered as short courses (programmed and on-demand) through France's national public network of ten technical institutes and centres for agriculture (ICTA), supported by a professional association (ACTA) responsible for coordinating the training contributions of these centres and institutes.

The main findings are:

- courses are modularised, mostly short duration (typically, 1-2 days) and certified.
- programmed courses typically offer either '**knowledge about**' or '**how to**' skills training and are largely directed to professional advisers, local decision-makers, trainers and development workers.
- the cost of a 2-day on-demand ICTA course typically ranges between Euro 600-800; these are largely directed to farmers and technicians and their advisers.
- the programmed courses related to crop protection cover a wide and diverse set of topics, specified for field crops, fruits, vegetables and glasshouse/polytunnel production, including: use of specific chemical treatments per crop or farming system, setting up a crop protection field trial, interpreting trial results, the management of soil organisms, quality management for export crops, phytosanitary measures, prevention and management of health and environmental risks when using chemical controls, application of HACCP protocols, conservation of pollinators, EuroGAP implementation and production of biological (i.e. organic) vegetables.

It is noteworthy that there are no programmed courses in the Plant Institute's 2006-2007 calendar that are labelled 'IPM' as such. Three out of 92 offerings deal with

- (i) crop protection methods that minimise the use of synthetic chemicals (January 2007),
- (ii) precision agriculture (February 2007),
- (iii) integrated agriculture (March 2007).

The focus in the first two is on the reduction and safe use of chemicals; the integrated agriculture course also deals with a limited number of other management options (such as cultural techniques). However, the focus of ITA courses relevant to the aims of this report in general appears to be on (largely chemical-based) crop protection rather than pest management; the management of in-field insect dynamics or agro-ecology do not appear as explicit entry points. The pedagogical approach is based on lectures, group discussion, sharing of experience and field study, supported by information material (written and visual).

The Technical Institute for Biological Agriculture (ITAB, based in Rennes www.itab.asso.fr) is the principal centre responsible for organic farming; integrated crop protection here receives greater attention but again IPM does not appear to be an entry point as such. ITAB coordinates:

- long term training, in the context of the FORMAMBIO network that supports initial and continuing professional training in organic agriculture as well as the training of trainers. It is noteworthy that a participatory action research methodology here complements more formal learning exercises (www.cfppalerheu.educagri.fr);
- short term training for technicians and development agents;

- one day training sessions at ITAB's regional centres, principally for farmers in the course of conversion to organic agriculture, and their advisors and technicians;
- on-demand training.

Extension-led farmer training: Portugal

Finally, analysis was made of Portugal's development of IPM training courses in the context of contract extension, drawing on a paper by Cristóvão, Alves and Koehnen (2002)¹. IPM programmes have been growing rapidly in Portugal since the 1994 EU CAP reforms: between 1994-1996 91 courses were offered, attended by 383 technical staff and 1462 farmers; by 1999 over 8500 farmers had taken IPM training and demand remains strong from farmers' associations throughout the country. Training is provided through an IPM 'contract' focussing on the provision of technical services. It is arranged among three organisational partners: a farmer with a minimum of 2 acres; a farmers' association; and a Regional Agricultural Service. The farmer contracts to adopt and follow IPM practices for at least 5 years, receiving in return a per acre subsidy partly funded by the EU. He or she has to attend an initial 35 hour training course, with the option of following continuing IPM education courses; has to be a member of a certified IPM association (which takes 25% of the subsidy received by the farmer in return for providing training and extension support); and to follow national and EU crop protection rules and regulations. The Regional Services (organised under the Ministry of Agriculture, Rural Development and Fisheries) supervise the programme and check practices in actual use. If the recommended practices are not followed both the local association and individual farmer are penalised (for instance, the association may lose its status as a certified IPM service provider and hence significant income).

The paper assesses the impacts in the wine-growing area of the Duoro river valley where there are large numbers of small producers (in 2002, 80,000 acres, 38,000 producers). A small number of medium and large farms none the less have most power and influence because of their roles in the wine industry and marketing. An Association for Viticultural Development in the Duoro Valley (ADVID) was established in 1982 by a small number of owners of large wine estates with the aim of promoting technical innovations that would improve grape and wine quality in the industry. 'Clear cut results in terms of farmers' practices, health risks and limiting environmental damage' have been measured. Less satisfactory aspects were found to be the still low environmental awareness of participating farmers (because the economic incentives are the driver), incomplete mastery by farmers of methods to evaluate the risks of pests and diseases at farm level; and the time taken to develop grape and wine products with IPM certification. From ADVID's perspective the benefits are: producers and extension workers have gained greater and better knowledge of IPM principles and techniques; more knowledge of the choice of pesticides and other chemicals and related application techniques; better organization of vineyard operations with positive impacts on farm management and production costs; improved product quality with potentially positive impacts on sales (through consumer recognition of the health benefits).

The training approach involves 'classic' transfer of a standard set of rigorously defined IPM techniques by means of classroom training, field demonstrations and individual and group advisory sessions at farm level, supported by a range of written and visual materials.

¹ Cristóvão, A., Alves, F. and Koehnen, T. (2002) Contracting for IPM Extension: The Case of the Association for Viticultural Development in the Duoro Valley, Northern Portugal; available (June, 2007) at: http://home.utad.pt/~des/acervo_des/2002criartfporcon52.doc

Policy concerns include the sustainability and replicability of the programme because of its reliance on subsidies; the need to link field level training with much stronger education provisions at higher education levels and for supportive legislation and regulatory frameworks. None the less, the development within the EU of agri-environmental programmes has encouraged the adoption of similar types of programmes in an increasing number of countries, as in Germany, Switzerland, Spain, Italy and more recently also Hungary, and for a widening range of crops.

iii. Three examples of participatory IPM education taken from international experience

Three examples of interactive IPM education programmes for farmers, extension technicians and advisers that have been brought into practice in developing countries are presented briefly here as offering insights that may be useful in the European context as the EU IPM Thematic Strategy is implemented. To a varying degree they take a farmer-centred, experiential learning approach that is based in adult education (rather than technology transfer) principles. The aim is to develop broad-based understanding rather than simply to introduce substitute technologies or practices or less toxic crop protection chemicals.

3.1. Mobile Plant Clinics, Nicaragua

The concept of mobile plant clinics was developed by CABI and Rothamstead Research in the U.K. and the Central Science Laboratory in Nicaragua. The central aim is to reach areas and farmers who otherwise would not have much contact with professional services by means of mobile clinics, travelling to fixed sites on a regular schedule. The idea drew heavily on the positive experience of health outreach programmes, with high expectation that such an approach would prove cost-effective and reach target clients who otherwise are hard to reach; monitoring and evaluation studies confirm this expectation. There are three noteworthy features. (a) The clinics are staffed by IPM-trained technicians; he or she provides diagnostic assistance direct to farmers who bring examples of their disease- or pest-affected plants and insects for identification. The clinic is well-stocked with written and visual materials that can help the farmers gathering around to discuss and make their own diagnosis and to learn more about their problems. (b) Once a diagnosis has been made, the technician makes suggestions about the management options the farmers could try and gives advice on how they can set up and manage an experimental trial of the options in their own fields. The technician encourages the clients to return to report on the results. (c) When a diagnosis cannot be made on the spot the technician takes the farmer's sample and sends it on to one of the laboratories cooperating in the programme. The labs guarantee to provide a confirmed diagnosis for reporting back to the concerned farmers in time for the next clinic. Nine labs and three of the largest small producers' cooperatives so far (2006) are participating in the programme. (Further information: www.globalplantclinic.org; www.funica.org.ni; www.inta.gob.ni)

3.2. Push-pull strategies, Kenya

The strategy is a behavioural manipulation method that uses repellent and deterrent stimuli (push) and attractive and stimulant stimuli (pull) to direct the movement of pests and/or beneficial insects². The term push-pull was first used in Australia. The stimuli include visual

² This section is based on Cook, S.M., Khan, Z.R., and J.A. Pickett. 2007. The Use of Push-Pull Strategies in Integrated Pest Management. *Annu. Rev. Entomol.* 2007, 52: 375-400, and information from the Farmer Field

and semiochemical cues or signals that work by means of nontoxic mechanisms that can be combined with other non-toxic pest population-reducing methods. Push-pull strategies are under development in all major areas of pest management. Their use is currently underexploited; the reasons include the research effort needed to understand the behavioural and chemical ecology of host-pest interactions and the effort farmers need to make to monitor their crop and take informed decisions. Effectiveness in practice may be limited by incomplete knowledge of the biological functioning of the whole farm system. The inadequate arrangements within Europe for registering semiochemicals also so far has restrained the development of the semiochemical market and considerably hindered uptake of the strategy within the EU. Hence the following example is taken from Kenya, where one of the few commercially successful applications has been demonstrated.

A push-pull strategy for control of maize stem borer was developed for small scale farmers in Kenya by researchers from the International Centre of Insect Physiology and Ecology (Nairobi), supported by researchers at Rothamstead Research, UK, who had extensive field experience in working with small farmers in East Africa. The strategy was implemented with the support of public extension specialists and IPM facilitators (extension workers and farmers) trained under the Farmer Field Schools (FFSs) programme (see further below). They worked with FFS graduates and other farmer groups (many of them for women, who often manage their own maize plots) to establish on-farm experimental fields which could serve as ‘learning plots’ in the context of real-time management decision-making, as well as serving as a means to explore and measure the effectiveness of actions taken in tandem.

Farmer-to-farmer extension is spreading the strategy widely. However, the continuing cheap cost and ready availability of synthetic chemicals, strongly promoted by commercial sales agents, are significant hindering factors. The evidence of build-up of insect resistance to the most widely used chemicals simply encourages farmers who can afford them to use more. It is recognised that these perverse incentives require regulatory attention if the strategy is to become standard practice in Kenya; the strong export orientation of agriculture and consumer pressures may in the end push regulators further in this direction.

3.3. IPM Farmer Field Schools

Farmer Field Schools (FFSs) as a means for bringing IPM into practice among the millions of the world’s small producers were developed initially in Indonesia for controlling pesticide-induced outbreaks of the Brown Plant Hopper in irrigated rice. They have now spread to all parts of the world³, including Europe (see also section IV). Both the curricula and design have been adapted to suit different contexts and purposes beyond IPM but they all share the following characteristics: farmer-centred, experiential learning in groups, based on adult education principles; the field as the classroom and the site for measurement, observation, evaluation and interpretation of experiments throughout the growing season, peer analysis and review of results within the learning group, facilitation of the learning process and capacity-development within the group. Development of the organisational and leadership capacities of the members is important for sustaining IPM practice and discovery learning once the school has completed and for helping to build strong farmers’ organisations and networks. The training of the facilitators also typically takes place by the trainees undergoing a field school designed to meet their needs and running pilot FFSs under the supervision of more experienced facilitators. Over time, **networks or professional associations of facilitators**, who typically may be farmers or extension workers or NGO field staff, also

School programmes in Kenya. Further information from: sam.cook@bbsrc.ac.uk; john.pickett@bbsrc.ac.uk ; zkhan@icipe.org

³ Braun, A., Jiggins, J., Röling, N., van den Berg, H., and P. Snijders. 2006. *A Global Survey and Review of Farmer Field School Experiences*. A report prepared for the International Livestock Institute, Nairobi. June.

begin to emerge. The FFSs thus can be seen to share some characteristics with long-established practices such as American 4H Clubs or Dutch study groups. A recent meta review⁴ of IPM FFS provides robust evidence of their performance.

The FFS concept was introduced into Europe, with FAO support, to help farmers in central and eastern European countries develop capacity (Fig.1) to understand and apply IPM options for dealing with an invasive species, the Western Corn Rootworm, that spread rapidly through the maize-growing areas in the 1990s⁵.

Where both the institutional conditions and the necessary scientific support have been assembled effectively the WCR FFSs have taken off, evidenced by farmers as well as public extension facilitators running FFSs, established networks of public and private sector facilitators, FFS curricula for other crops and pests and an expanding range of IPM options tested in farmers' own contexts. The FFS concept also has been successfully introduced into technical college curricula, for instance in Hungary and Bosnia-Herzegovina. The maps created by FFS members for plotting WCR incidence and farmers' management responses (Fig..2) are contributing to landscape scale estimation and management of risk.



Fig.1: Members of an IPM-FFSs for the WCR, Hungary
Photocredit: P. Roggero

⁴ Van den Berg, H. and J. Jiggins.2007. Investing in Farmers-The Impacts of Farmer Field Schools in Relation to Integrated Pest Management. 2007.World Development, 35:4, April.663-686

⁵ Jiggins, J., Governatori, G., Roggero, P. 2005. Mid term Review, Regional Programme “Integrated Pest Management for WCR in Central and Eastern Europe”, FAO, Rome. Further information from the programme coordinator: Jozsef.Kiss@mkk.szie.hu



Figure 2: Risk estimation map prepared by members of an IPM-FFS for WCR, Bosnia-Herzegovina 2004

Photo credit: P. Roggero

IV. Results of a Stakeholder Enquiry

It was considered important that the information analysed so far be complemented by feedback from stakeholders in crop protection training and education. A short questionnaire was e-mailed to the participants in the Education and Training workshop at the ENDURE inaugural meeting (15), in addition to ten others known by the author of this report to be engaged in IPM training or education in Europe in the public and private sectors. Seven⁶ completed forms were returned (2: Italy; 2: UK; 2: Hungary –1; Regional – 1 (for a programme implemented in Hungary, Croatia, Bosnia & Herzegovina, Serbia & Montenegro, Romania, Slovakia, Bulgaria). The questionnaire (annex 1) invited respondents to complete a SWOT analysis (strengths, weaknesses, opportunities, threats) of a course known personally to them.

4.1. Main findings

The responses are given in full in annex 2. The main findings are:

- Refresher courses are needed at all levels for updating information on the latest findings from research as well as new products and equipment, strategies, regulations and policies; university-based refresher courses may find it hard to keep up with the pace of change.
- Participants in class room based crop protection and IPM training and education benefit from exposure to experimental fields and farm realities
- Participatory training and education provides robust evidence of multiple benefits but is hard to sustain in the absence of an appropriate organisational host and sufficient numbers of trained facilitators
- Participatory training and education reaches relatively few; effort is needed to augment its impact through complementary actions

⁶ No doubt the timing of the mailing during the European summer holiday months contributed to the low response rate.

- Training and education designed to develop farmers' ecological understanding as the basis of informed IPM decisions is effective but requires more effort on the part of both trainers/educators and farmers.

V. Key word search: *Journal of Agricultural Education and Extension (JAEE)*

The JAEE is Europe's leading journal for extension professionals, agricultural educators and decision makers. While it carries some articles on international experience its main focus is on the European experience. A key word search of the contents of all issues 1994-2006 revealed only 8 entries for IPM: 3 referred to articles reporting international experiences; 4 were citations in editorials or book reviews; 1 dealt with responses in agricultural education to changes in crop protection policy in the Netherlands. A renewed search was then made of the titles of the articles listed, for all issues 1994-2006, for 7 themes considered likely to relate to transitions toward more widespread adoption of IPM (Table 2)

Table 3: Key word search: JAEE 1994-2006

Vol/year	Greening agric landscapes	Agri-food Chains	Re-organ-isation of formal training & educ. provision	Training & educ. methods & curriculum devt	Sustai-nable agric.	Trainers' & educators' roles & identities	Compete nces required & attain-ments
1 94-95	2	1			1*		
2 95-96	2	2	7		1		
3 96-97	2		1		1		
4 97-98	1			1		1	
5 98-99	1			1	1*		
6 99-2000	2 + 1*		3		1		
8+ 02-03	2	1 + 1*					
9 03-04		2		1	1	1	
10 04-05			1	1			2
11 05-06			1		18		
12 06		2	1				3
Totals	13	8	14	4	24	2	5

Notes: * strong crop protection focus; + vol 7 not published

Hard copies of these articles then were retrieved from the editorial archive held at Wageningen University and read for thematic analysis.

The results are as follows:

- The three main drivers of change in agricultural education and training appear to be (a) developments in agri-food chains; (b) regulatory and policy developments

stimulating the ‘greening’ of Europe’s agricultural space and the adoption of sustainable (multifunctional) agricultures; (c) the increasing privatisation and commercialisation of former public extension and advisory services and expansion in the number of private sector (fee-based) technical training and education providers;

- The expectations placed on publicly-funded education and training have shifted from a mainly technical focus to facilitation of multi-stakeholder processes, study clubs and formation of networks and linkages in support of territorial projects that go beyond farmers and farming⁷. This is creating an ‘identity crisis’ especially among public sector providers;
- Providers feel themselves to be under pressure⁸, in the Dutch case anticipating a future in which they *evaporate* (vanish), *dissolve* (merge) or *crystallise* (seek regional or supra-regional cooperation).

iv. Conclusions

The admittedly brief study reported in this paper supports the following tentative conclusions:

- i. the knowledge infrastructure to support crop protection education and training appears to be well organised at the scientific level (though no doubt further synergies at national and European levels could be gained)
- ii. the crop protection knowledge infrastructure in general does not appear to be sufficiently well organised to support:
 - a. wider adoption of IPM practices or
 - b. to foster broad-based ecologically informed understanding of the options or
 - c. to support informed decision-making particularly among small producers who are farming mainly to meet their own needs or selling into local markets.
- iii. information infrastructures are not well organised to support the access of diverse stakeholders to IPM education and training opportunity;
- iv. cost considerations may become an increasing barrier for smaller or less profitable producers if the trend toward private suppliers continues.
- v. although IPM has become standard best practice for certain crops (e.g. Dutch glasshouse crops), farm systems (e.g. Mediterranean olive growing, in some countries; organic apple orchards) or for problem pests where resistance to synthetic chemicals has become problematic, economic incentives (that would make IPM pay at the farm gate) are inadequate; hence demand for such training and education remains below the potential
- vi. regulatory and policy pressures as well as changes in consumer expectations (reflected in supplier contracts to food processors and retailers) none the less are propelling farmers, extension and advisers to develop greater competence in crop protection approaches that minimise the use of synthetic chemicals and support evolution toward more sustainable, multifunctional agricultures.

⁷ Albaladejo, C., Couix, N. and L. Barthe. Learning in Agriculture: Rural development agents in France caught between a Job identity and a Professional identity. JAEE 13:2, 95-106

⁸ Mulder, M., Kupper, H. The Future of Agricultural Education: the case of the Netherlands. JAEE 12:2, 127-139

- vii. The technical components of such competencies increasingly are supplied by private providers (even if paid indirectly through public subsidy).
- viii. Considerable scope exists for European stakeholders to learn from international experience concerning:
 - a. how to place crop protection science in society in a cost-effective way;
 - b. how to reach thousands of small farmers (particularly in southern, eastern and central Europe), and
 - c. how to complement participatory, learner-centred experiential training and education with actions that augment and scale up the impacts. The roles of farmers themselves are of particular interest under these heads.

Annex 1: E-mail SWOT Survey

ENDURE: diversifying crop protection
European Network for the Durable Exploitation of Crop Protection Strategies
Survey of the Strengths, Weaknesses, Opportunities and Threats related to Crop Protection
Training and Education in the European Research Area including a special focus on
participatory approaches
June 22- 30 2007

Overall aims of the study: This e-mail survey is part of a study conducted on contract to ENDURE. The overall aims of the study are to develop baseline information on formal and non-formal crop protection training and education for farmers and advisers in the ERA; and insight into the strengths, weaknesses, opportunities, and threats (SWOT) to existing provisions.

Objectives of the survey: to carry out a SWOT survey from stakeholders’ perspectives of the current provisions for crop protection training and education

Scope of the survey: this survey has been sent to members of ENDURE, the crop protection industry, university course leaders, farmers’ organisations, supermarkets, crop protection specialists, agricultural training institutes and farmer training colleges; and NGOs.

The survey: Please use the enclosed form for analysing ONE crop protection training or education course known to you. Completed forms should be returned by June 30th by email to: janice.jiggins@inter.nl.net

(Dr Janice Jiggins, Communication and Innovation Studies, Wageningen University, The Netherlands)

Please fill in the following identification details:

1. Title of the training/education activity:.....

.....

2. Responsible organisation:.....

.....

3. Basic features:

Formal | Non-formal | Training | Education |

Focus: IPM | Safe use of synthetic chemicals | Sustainable cropping |

Other | Mainly for farmers | Mainly for advisers |

4. In your estimation, to what degree is the training or education designed to be

interactive with participants’ own observations in the field, experiences and practices?

Highly participatory | Partially | Not at all |

What are the strengths of the training/education provided?

What are the weaknesses of the provisions?

What opportunities do they offer for reducing pesticide usage?

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

Thank for taking time to fill in this form. Please return by June 30th to <janice.jiggins@inter.nl.net>

Annex 2: Survey responses

Response no. 1

Please fill in the following identification details:

1. Title of the training/education activity: Integrated Pest Management for Western Corn Rootworm (WCR) in Central and Eastern Europe

2. Responsible organisation: Food and Agricultural Organization of the United Nations (Regional coordinator: Dr. József Kiss, Szent István University, Institute of Plant Protection)

3. Basic features:

Formal Non-formal Training Education

Focus: IPM Safe use of synthetic chemicals Sustainable cropping

Other WCR, Community, Rural development

Mainly for farmers Mainly for advisers

4. In your estimation, to what degree is the training or education designed to be interactive with participants' own observations in the field, experiences and practices?

Highly participatory Partially Not at all

What are the strengths of the training/education provided?

characteristics (participatory-, system approach; discovery based; field based observation; non-formal education) are the most important strengths of the training stakeholders are jointly involved in the training (farmers, advisors, university people, students and teachers from secondary agricultural schools, etc.) possibility to share ideas, knowledge, experiences deals with real problem of the farmers (in this case: WCR) from observing one element of the maize ecosystem (WCR) leads to agro ecosystem analyses, towards IPM/IF which results in community development knowledge and change of farmers approach towards maize as an ecosystem is measurable possibilities for in-country regional and regional activities, trainings, and discussions possibilities for participatory research activities (research based on farmers needs, together with stakeholders) farmers are able to gain such personal experience, which they cannot get in the frames of an institutional education farmers learn from each other in a more relaxed way knowledge that is based on personal experiences is deeper farmers are motivated to find answers for more complex questions training focuses on different issues linked with agriculture, rural development, thus farmers knowledge will become many sided training has social benefits as well (community approach, community development), most of the farmers consider this achievement the most important; some farmers/facilitators feel that this is the greatest effect, result of the training after the trainings, even without organized meetings, farmers spend more time with agro-ecosystem analyses (experience) and they spend more time to share ideas with each other

What are the weaknesses of the provisions?

participatory, non formal education is new to farmers and facilitators as well, thus adaptation needs more time
during summertime (since participatory) farmers have lot of duty and in some cases training is at the end of priority list
since participatory approach has not got tradition in Central and Eastern European region, without projects and/or organization the farmers groups will not work further more as actively as before (see last point of strengths as well...)
theoretical background knowledge of farmers is not equal, in some cases basic knowledge is missing
it is difficult to find a good facilitator, who is capable of moderating the group activity in a way that avoids driving it towards a too much theoretical direction, and capable of giving immediate answers for farmers' upcoming questions
such experience based education has not social acceptance yet
farmers see no immediate daily profit from such activity, what they require in many cases

What opportunities do they offer for reducing pesticide usage?

In general:

wide spectrum of knowledge supports sustainable farming systems
farmers gain a better understanding about the role of natural enemies, beneficial organisms and the importance of monitoring based decision making through collecting and evaluating farmers' experiences within the group activity, and with the yearly publication of these records, it is possible to spread such an approach, where chemical control is not the first priority option in protecting yields
through the continuous existence of such an educational program, it would be possible to train farmers how to evaluate market information; thus, it is an option to support farmers in innovative decision makings replacing „routine” spraying decisions
in case of a future acceptance of this programme within EU and linking a trademark to this activity that certifies integrated farming, more farmers could join the programme; this would result in the existence of a network similar to the network and certification system of ecological farmers
community based approach can be the basis for that farmers would choose integrated farming rather than industrial cropping systems
the spread of integrated farming approach is possible with the promulgation of EU cross compliance and the acceptance of farmers' field training

Training was focusing on the development of IPM for WCR. When WCR, or rather the serious larval damages have appeared in a region, farmers have reacted thoughtless in general.

Farmers used pesticides against WCR adults in a field without any background information about the maize ecosystem and about the maize phenology. They did not know how and when WCR adults could cause damages. IT WAS EVEN IN THE CASE WHEN FORMAL TRAINING HAS BEEN GIVEN TO THEM ABOUT THE LIFE CYCLE, DAMAGE AND MANAGEMENT OF WCR. After the training when they discovered the life cycle, damages of the pest, and when they have opportunity to see what will be the result of adult feeding in different maize phenology stages, foliar insecticide application have been **decreased** in the region (no hard data). However, if based on the risk estimation risk management is needed foliar insecticide application is done.

Larvae of WCR could successfully develop only on maize root system. WCR follows its basic biology in Europe, thus females lay eggs in the soil of maize fields. Crop rotation

resistant variant, which lay eggs in other crop stands as well, is not present in Europe up to now. In the regions with high WCR adult population in one year, in subsequent year farmers used soil insecticide application regardless of maize production year (first year or continuous maize production). After the training farmers follow the **risk management approach**, thus they use seed treatment or soil insecticide application against WCR larvae based on the results of risk estimation from previous year. If based on the **action threshold level** there is no need for it, farmers do not apply soil insecticides even in continuous maize fields.

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

Advisory system still not functions in a way as farmers expect in Hungary. Farmers require much more participatory discussion and training. Continuous negotiations have been contacted with responsible persons from Department of Plant and Soil protection and Agri-environmental affairs (Ministry of Agriculture and Rural Development) and Central-Hungarian Regional Advisory Centre. However, there is no unambiguous sign that the program will be continued on National level. Because of this unsure situation facilitators have decided to establish a so called Facilitators Network, to continue this activity.

Threats are the following:

no governmental unambiguous acceptance regarding the methods, results of the project without legal base there is less (no) possibility for project/found application without continuous project/activity coordination, facilitators may lost their interest in the project

the educational method itself as well as the certification of the participation is not recognized yet

the training method is not accredited (which is not easy at all, since each farmer field school activity has a different scenario)

facilitators may loss their motivation if the facilitators training was not enough deep/if they have weak practical, technical background/if they feel that the payment is not in balance with their efforts/etc.

the training method is not accredited (which is not easy at all, since each farmer field school activity has a different scenario).

Since the training is participatory adaptation works well. Nevertheless, if the contact among farmers and facilitator will be not so strong, adaptation of newly attained techniques, skills may decrease. On the other hand adaptation very much depends of farmers. From this viewpoint threats are the following:

farmers' interest lean rather towards more simply, ready-to-use, immediate solutions farmers can easily give up such an activity in case if they cannot get their problems fully solved and/or they are not capable of gaining active knowledge due to the lack of background knowledge

market sector operates with more intensive motivations (promotions, simply advice).

those factors which are prioritized within such a training method (beneficial organisms, more effective soil activity etc.) are slowly influencing the population of pests, it is not so scenic

other forms of education can be more attractive (consultation with external experts, fast indoor courses, etc.) since provides immediate solutions

Response no. 2

Please fill in the following identification details:

1. Title of the training/education activity:

Project 'Farming with Future': Implementation of sustainable agriculture through the network of stakeholders

2. Responsible organisation:

WUR- PPO and DLV-Plant

3. Basic features:

Formal | Non-formal Training | Education |

Focus: IPM | Safe use of synthetic chemicals | Sustainable cropping ;

Other | Mainly for farmers Mainly for advisers |

4. In your estimation, to what degree is the training or education designed to be

interactive with participants' own observations in the field, experiences and

practices?

Highly participatory Partially | Not at all |

What are the strengths of the training/education provided?

All stakeholders signed an agreement in 2004, called the Covenant on Crop Protection. This agreement aims at reducing the environmental risks, caused by pesticides, with 95% in the year 2010 compared to 1998. Part of the agreement is the dissemination and implementation of knowledge on integrated pest management. Within the framework of this agreement all stakeholders took responsibility to contribute. The project Farming with Future tries to facilitate this process, in cooperation with and with respect for the core business of stakeholders.

The project is active in the most important production areas: in arable farming, flower bulbs, tree nursery, fruits, vegetables, mushrooms and glass house crops.

Farmers link their practical expertise with the results of agricultural research: in close cooperation of farmers, research and advisory services using all the experience of the different groups involved testing in practice innovations from farmers and the youngest knowledge and results of agricultural research

Farmers, agricultural organizations, advisory services and agri-business disseminate the tested knowledge.

What are the weaknesses of the provisions?

Rapid implementation of integrated pest management will only be successful if supported by all (influential) stakeholders.

In the project a dialogue is started with many stakeholders in order to build up a relation and to start up activities that match the special responsibility of the stakeholder within the Covenant. Hereby a "best match" is made between stakeholders and best practices, based on the interest and core business of the stakeholder.

The successful collaboration with stakeholders in the network depends on the willingness of these stakeholders. This willingness can be partly covered by common interests between the stakeholders and the project. Besides this, the Covenant on Crop protection should

contribute to the sense of ownership by the different stakeholders in reaching the Covenant's goals.

The new approach of dissemination and implementation of innovations has asks for a need of new skills for project workers. These social skills should include the ability to cooperate, build a network and facilitate the process and are a key enabler in the process.

What opportunities do they offer for reducing pesticide usage?

A broad implementation of integrated pest management and an active support of all stakeholders that signed the Covenant.

Farmers: Community-accepted way of production.

Stakeholders: better image, that provides an advantage towards competitors.

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

At the end of the project stakeholders should take over the implementation/stimulation of integrated pest management methods.

Higher prices of new, preferable pesticides in combination with low productprices.

International competition: short time versus long time goals.

Less interest of society for integrated pest control / production methods.

Response no. 3

Please fill in the following identification details:

Title of the training/education activity: visit to field/plot trials on crop protection at Papiano research station (June each year)

2. Responsible organisation: University of Perugia

3. Basic features:

Formal | Non-formal X Training | Education |

Focus: IPM | Safe use of synthetic chemicals X; Sustainable cropping X;

Other X Mainly for farmers | Mainly for advisers X

4. In your estimation, to what degree is the training or education designed to be interactive with participants' own observations in the field, experiences and practices?

Highly participatory | Partially X Not at all |

What are the strengths of the training/education provided?

Possibility to observe plots with own eyes

Possibility to interact with people running the trials

What are the weaknesses of the provisions?

Too many trials to be seen in just one morning

What opportunities do they offer for reducing pesticide usage?

Not many

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

(a) basic funding from the University

(b) in the material distributed during the field day, it would be good to have also results and not just description of the trials

Response no. 4

Please fill in the following identification details:

1. Title of the training/education activity:

BBRO BASIS sugar beet discussion groups

2. Responsible organisation:

BBRO/Broom's Barn

3. Basic features:

Formal | Non-formal ✓ Training ✓ Education ✓

Focus: IPM ✓; Safe use of synthetic chemicals ✓; Sustainable cropping ✓;

Other ✓.

Mainly for farmers ✓ Mainly for advisers ✓ (aimed at decision makers and therefore come from both sectors)

4. In your estimation, to what degree is the training or education designed to be interactive with participants' own observations in the field, experiences and practices?

Highly participatory ✓ Partially | Not at all |

What are the strengths of the training/education provided?

geared to attendees own experiences and situations
linked to current and past research
development of strategies with participants
attendees gain full understanding of problems and solutions
attendees able to follow up situations with course leader and *vice versa*
outcomes used via other pathways to inform others (either farmers or research providers)

What are the weaknesses of the provisions?

small groups (ideally 20 or less)

only cover a small range of topics at each meeting

attendees by invitation – whilst get some key multipliers this is not guaranteed for every meeting

What opportunities do they offer for reducing pesticide usage?

good opportunity as include biology and life cycle of target organism
non-pesticide solutions covered as well as pesticide options (advantages and disadvantages of each)
multipliers and further pathways used to pass message to others

What are the threats to

(a) the continuation of the training/education provisions and

- lack of trainers who understand the agronomy of crop and rotations as well as the science
- finance for such KT
- this training focuses on the decision makers' needs and then helps them to reduce inputs. Often the focus is the other way round and decision makers become less receptive.

(b) to the adoption into practice of the learning acquired?

- if the whole scene and facts are not presented in context to the decision maker - i.e. requirement to put the topics into context so decision maker understands why and how to use the learning (see (a) above)

Response no. 5

Please fill in the following identification details:

1. Title of the training/education activity:...Rothamsted Research Association workshops and newsletter

2. Responsible organisation:.....Rothamsted Research Association ...(RRA)

3. Basic features:

Formal | Non-formal X Training | Education |

Focus: IPM X; Safe use of synthetic chemicals | Sustainable cropping X;

Other | Mainly for farmers | Mainly for advisers X

4. In your estimation, to what degree is the training or education designed to be

interactive with participants' own observations in the field, experiences and practices?

Highly participatory X Partially | Not at all |

What are the strengths of the training/education provided?

These are highly participatory interactive workshops that enable real exchange between scientists and advisors and practitioners.

What are the weaknesses of the provisions?

They reach a very small number who are mostly already fairly technologically aware.

What opportunities do they offer for reducing pesticide usage?

They focus on maximising the benefit to the farmer. Where this involves reductions in pesticide usage, there is some possibility that they will have an effect.

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

RRA is a very small organisation with a declining membership

Adoption into practice is dependent on there being real benefits to the farmer

Response no. 6

Please fill in the following identification details:

1. Title of the training/education activity:.....
Update Training of Plant Protection People.....

2. Responsible organisation:

University with County Plant Health Chamber and County Plant Health Service.

3. Basic features:

Formal | Non-formal | Training | Education |

Focus: IPM ; Safe use of synthetic chemicals ; Sustainable cropping ;

Other | *Mainly for farmers* | **Mainly for advisers** |

4. In your estimation, to what degree is the training or education designed to be interactive with participants' own observations in the field, experiences and practices?

Highly participatory | Partially | Not at all |

What are the strengths of the training/education provided?

- good technical update on recent regulations, technical solutions, new requirements (environment, food, some subsidy issue,

- some exchange of experiences among participants (personal discussions outside of training hrs,

- short update

What are the weaknesses of the provisions?

too technical, limited innovative things

too one sided (top down) communication

no participatory type

What opportunities do they offer for reducing pesticide usage?

Information on:

- Rural Development Programs

- GAP issues,

- some new control options (parasitoids)

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

- people familiar and happy with short and less time consuming winter lecture hall training,
- no feedback, sharing of actual experiences on actual conditions,

Response no. 7

Please fill in the following identification details:

1. Title of the training/education activity:...plant pathology, grape pathology, forest pathology.....

2. Responsible organisation:.....Marche Polytechnic University

3. Basic features:

Formal | Non-formal | Training | Education

Focus: IPM ; Safe use of synthetic chemicals ; Sustainable cropping

Other | Mainly for farmers | Mainly for advisers

4. In your estimation, to what degree is the training or education designed to be

interactive with participants' own observations in the field, experiences and practices?

Highly participatory Partially | Not at all |

What are the strengths of the training/education provided?

Practical applications of lab techniques and observation of experimental fields where trials are carried out

What are the weaknesses of the provisions?

Short time of the course (45 h), difference in basic knowledge

What opportunities do they offer for reducing pesticide usage?

Integration of alternative means to chemical pesticide to control diseases is encouraged whenever its application is feasible and give good results, to carry on an integrated pest management

What are the threats to (a) the continuation of the training/education provisions and (b) to the adoption into practice of the learning acquired?

It is necessary that students follows over time the new findings by participation to congresses and try to apply practically every acquired information in their and other farms trying to optimise the conditions of application in the specific site or situation.