IMPACT ASSESSMENT, ANNEX II
Alternatives in agriculture for endocrine disrupting pesticides.

Introduction

This Annex shows the results of the investigation undertaken by PAN Europe on the alternatives available in agriculture for endocrine disrupting pesticides- the ones under debate in recent years. In 2013, UK Health and Safety Executive HSE published a report on the costs of the potential ban of pesticides[1] and evaluated the pesticides previously listed by CRD/HSE as being potentially banned in the EU[2]. Many subsequent reports, such as the ones from the pesticide umbrella organisation ECPA[3] and UK-farmers organisations[4], used the data collected by CRD/HSE and others in a more or less repeated message. Pesticide producer BASF and another farmer organisation, ELO, focussed on azoles in cereals[5]. From this collection of pesticides that the UK, industry and farmers expect most problems for, we took the most debated 13 pesticide-pest combinations to look into alternatives and the seriousness of the expected problems and claimed costs. We also included a pesticide which is part of the endocrine interim criteria, and a pesticide qualified endocrine disruptor based on independent literature.

Methodology

PAN Europe first collected all the available alternatives for the 13 pest-pesticide combinations from public available sources in the different EU countries[6]. We looked at available synthetic alternatives, at non-chemical alternatives, and especially at the 'Integrated pest management' (IPM) system as described in EU Directive 2009/128, Annex III, a system all farmers in the EU have to apply from January 1, 2014 onwards. The draft collection was then sent to a panel of independent experts for peer-review. The experts are actively working as specialists in biological control, integrated pest management and sustainable use of pesticides; they can be consulted for the IA on request[7].

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1 Agronomic and economic impact assessment for possible human health and ecotoxicology criteria for endocrine disrupting substances, Report to Chemicals Regulation Directorate, June 2013, http://www.pesticides.gov.uk/guidance/industries/pesticides/News/Collected-Updates/Information-Updates-2014/January/Regulation+_EC_No_1107_2009-progress_on_endocrine_disrupters_and_candidates_for+substitution

2 Extended impact assessment study of the human health and environmental criteria for endocrine disrupting substances proposed by HSE, CRD, January 2013, http://www.pesticides.gov.uk/guidance/industries/pesticides/News/Collected-Updates/Information-Updates-2014/January/Regulation+_EC_No_1107_2009-progress_on_endocrine_disrupters_and_candidates_for+substitution

3 ECPA lobby paper on endocrines, March 2013

4 http://www.fwi.co.uk/news/eu-pesticide-review-could-cost-uk-industry-905m.htm, December 2014

5 BASF ELO on azoles, 2012.

6 It concerns the following website with information on alternatives: Swiss, IOBC, http://www.iobc-wprs.org/pub/index.html, UK HGCA, http://www.hgca.com/ , DE, Julius-Kühn Institut, http://www.jki.bund.de/en/startseite/home.html, FR, Arvalis, http://www.arvalis-infos.fr/index.html , DK, DAAS, Arhus, http://www.vfl.dk/system/404.htm#.VJh7IcgU , NL, "Groen Kennisnet", http://www.groenkennisnet.nl/plant/Pages/default.aspx, NL, "Kenniscentrum Wageningen", http://www.kennisakker.nl/kenniscentrum/kenniscentrum ,

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Results

Overall, the experts consulted by PAN Europe disagreed that the ban of the indicated pesticides will result in substantial yield losses, taking into account the availability of synthetic alternatives in every case. In some difficult cases, such as Septoria in cereals, a lot of attention and knowledge is needed but still available alternatives are sufficient to control the pest.
The list of alternatives for the 13 pest-crop combinations is given below in Table 1.

Table 1. Alternatives for 13 pest-crop combinations.

Pesticide	Main plant pest use	Claimed costs by industry in case of banning (UK Fera, BASF)	Synthetic alternatives	Non-chemical alternatives/IPM, resistant varieties, rotation, biological control, etc.
Azoles (epoxiconoczaole, cyproconazole, etc.). **Eight azoles are banned in DK.(**); Four in FR (***)**	Septoria tritici in cereals	4,6 billion for Europe assumed, yield loss, from net exporter to net importer (UK); resistance problems due to massive use of chemicals	SDHI pesticides: Boscalid, Isopyrazam, Bixafen, Fluxapyroxad Cyprodinil and Strobilurimn such as Azoxystrobulin	Bacterial seed treatment (e.g., Cerall from Bioagri); less vulnerable varieties towards Septoria (Bristol, Robigus, Fortissimo, Tabasco, Lincoln, Tulsa, Carenius), avoid early planting
Azoles, Difenoconazole, Flusilazole, Prothioconazole	Phoma stem canker in winter oil seed rape	Many millions, assumed reduction yield 9,8% (UK); the Agri Chamber in Schleswig-Holstein has shown that there is rarely a benefit of spraying; in fact azoles are misused for stem growth reduction.	Fludioxonil, metalaxyl, thiram, penthiopyrad, picoxystrobin	Resistant varieties (Escort, Twister), crop rotation, cultural control measures (burning stubble), bacterial seed treatment
Myclobutanil (azole)	Grape, powdery mildew	Not considered an endocrine by UK	trifloxystrobin, azoxystrobin, spiroxamine	Ampelomyces quisqualis (parasitic fungus), Aureobasidium pullulans, a yeast, sulphur, resistant varieties, low spraying frequency to prevent resistance, spray forecast model
Mancozeb	Downy mildew in Brassica/Grapevine/Lettuce	No yield reduction but other costs assumed by UK Fera	Mandipropamid (Brassica), Copper, Metalaxyl, Cymoxanil (Grapevine)	Resistant varieties (Brassica); Sulphur, Potassium bicarbonate, cropping density (Lettuce), field location (lettuce), many biologicals in development
Mancozeb	Late blight in potatoes	Not mentioned as increasing costs by UK Fera; resistance problems due to massive use of chemicals.	Cyazofamid, fluazinam (preventive), cymoxanil, dimethomorph, ametoctradin, fluopicolide, propamocarb, fenamidone, potassium phosphite.	Resistant varieties (Carolus, Bionica, Sarpo Mira, Vitabella), planting distance, early harvesting,
Ioxynil	Broad-leaved herbs in onions and leeks	Assumed 20-40% yield reduction (UK)	Bromoxynil (leek), Pyridate, Pendimethalin, Oxyfluorfen, Fluazifop-P-butyl, Clethodim	Use 'false' seed bed, soil solarisation, mechanical weeding; pyro-weeding
Thiacloprid	Oil seed rape/ pollen beetle - seed coating	No yield reduction; other pesticides are more expensive (UK); (this claim is questionable, pyrethroids are cheaper)	Indoxacarb Pymetrozine	Beetle resistant to pyrethroid insecticides, monitoring for thresholds necessary (*), use of kaolin, of entomopathogenic fungi, parasitic wasps in- and off-filed (parasitation up to 80% if no pesticides are used).

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Pesticide	Main plant pest use	Claimed costs by industry in case of banning (UK Fera, BASF)	Synthetic alternatives	Non-chemical alternatives/IPM, resistant varieties, rotation, biological control, etc.
Thiacloprid	Aphids in strawberries	No yield reduction (UK); Thiacloprid kills many beneficial mites and repels beneficial wasps.	Pirimicarb, Pymetrozine,	Various types of biological control, wasps in greenhouses (aphidius ervi), parasitic flies, lacewings and ladybirds. Entomopathogenic fungus and also physical killers like soaps, polysaccharides, pyrethrin
Pyrethroids (cypermethrin, deltamethrin, L-cyhalothrin)	Aphids in grain (transmitting virus)	No yield reduction, higher price of synthetic alternatives (UK); much resistance against pyrethroids	Pirimicarb, Pymetrozine, Flonicamid, Rynaxypyr	Use is not needed; if left untreated, natural enemies will develop and balance the pest (virus concerns exaggerated); avoid early sowing to escape main aphid migration period, natural pyrethrin
Amitrole (part of endocrine interim criteria)	Non-selective herbicide in orchards	Not ranked as an EDC (UK)	Chlorotoluron (dismissed because it's a C2R2), Clopyralid, glyphosate (dismissed because it's a EDC)	Mechanical weeding, covered soil; pyro-weeding
Abamectin (Vertimec)	Tarsonemid control (mite) in strawberries	Impact expected but unknown (UK); other synthetic are more effective	Cyromazin, Spinosad, Bifenazate, Hexythiazox, Spiromesifen	Heat treatment of plants, Biological control with a range of Amblyseius spp. (predatory mites) and Hymenopteran parasites with very good results
Chlorpyrifos	Apple blossom weevil	Significant yield losses for some apple varieties (UK)	Thiacloprid (dismissed because it's a EDC), Spinosad	Earwigs, Quassia extract, pheromones
Dimethoate (endocrine as determined by independent literature)	Aphids in (seed) potatoes	Not considered an EDC (UK)	Pymetrozin, Flonicamid, Pirimicarb,	Encouraging predators and parasitoids like wasps, ladybirds; paraffin oils

(*) Monitoring for thresholds (for all pest organisms) is a prerequisite for IPM and organic production. This can be done by pheromone traps, colour traps, direct observation (counting), presence of diseases, forecast models, etc. Should be compulsory in all countries and crops to prevent/reduce resistances of many pest organism.
(**) bromuconazole, cyproconazole, fluquinconazole, flusilazole, flutriafol, ipconazole, prochloraz, tetraconazole
(***) bromuconazole, fluquinconazole, fuberidazole, ipconazole.

All experts stress the need to move to another system, the integrated crop management, to prevent further resistance against current pesticides used, to make better use of available predators, and to reduce the amount of toxic agrochemicals that is released into the environment causing environmental pollution and degradation of ecosystems. The pesticide groups of Azoles and Pyrethroids are almost at the end of their life-stage. Resistance of pests is at such a level that the use of pesticides- in higher doses and in mixtures (pesticide cocktails)- has become futile.

It is important to note that the resistance to pests is the result of the current system: too high pesticide spraying frequency, too narrow crop rotation and vulnerable crop varieties. This system encourages resistance and creates a continuous loop where stronger and higher pesticide quantities are necessary. To escape from this loop we need to move towards sustainable agricultural practices.

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The system of IPM is the most developed for changing current practices and it is not only an option but a legal requirement. IPM is much more knowledge-based (such as monitoring & need to know the lifecycle of pests, thresholds & timing of intervention, use of mechanical weeding etc) and therefore extension services should be used to stimulate and encourage farmers. A EU-wide program should be adopted and proper incentives (such as CAP) should be used.

An element of the current system is the lack of innovation. Substituting one synthetic chemical by another is no real innovation but just the continuation of 'calendar' spraying. IPM on the other hand is very innovative, working with predators, ecosystems, sounds, heat, etc and a range of other non-chemical based options to control pests. Choosing for IPM means profit and jobs for many SMEs in Europe to provide for extension services. Food quality will increase and this will give Europe a competitive advantage on the market. The environment will improve and this will protect biodiversity and species extinction and will also have a positive socioeconomic impact as it will stimulate tourism in agricultural areas. Undoubtedly, the application of IPM is beneficial for all sectors.

Conclusion

The conclusion drawn by PAN Europe is that the ban of a number of harmful pesticides with endocrine disrupting properties from the market not only is favourable but also feasible. There are a range of alternatives available, even synthetic alternatives that there will be hardly any substantial yield loss. Certainly not the huge yield-losses claimed by UK and industry, who ignore the implementation of IPM by member states. Many alternatives are readily available and additional alternatives can be introduced with the use of proper extension services.

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