IMPLEMENTATION OF INTEGRATED FRUIT PRODUCTION (IFP) IN SOUR CHERRY ORCHARDS: CASE STUDIES IN THE LIPSKO NAD WISŁĄ DISTRICT

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A B S T R A C T

First recommendations for integrated fruit production in cherry orchards were prepared by the scientists of the Research Institute of Pomology and Floriculture at Skierniewice in 1999 and revised in a special publication in 2002. However, few cherry orchard owners applied for certificates in cherry integrated production until 2004. The implementation of IFP in cherry orchards has obviously faced some constraints in Poland. The experience of a number of programmes on integrated crop and pest management (ICPM) has already indicated that the farmer is the key factor in ICPM implementation. At the same time it is important to be realized that ICPM is a knowledge intensive and farmer-based management approach.

Our surveys were conducted in the 2002 and 2003 growing seasons in a selected region traditionally specializing in cherry production – Lipsko n/Wisłą. Farmers' knowledge, attitude and present practices were compared to the recommended IFP practices. Special attention was given to practices and farmers' knowledge of pesticide selection, application and storage indicating their attitude to environmental issues. The farmers' needs in further training, new extension materials and specialized advisory services were also identified. Farmers' requirements should be used to assist the extension service in the newly established governmental initiative of mass training of farmers in the integrated fruit and vegetables production to meet consumers' demand for high quality products in Poland.

Key words: integrated fruit production, cherry, cherry pests, pesticide management, ICPM

INTRODUCTION

The preliminary recommendations on IFP-soft fruits for Europe were proposed during the international workshop at Universita Cattolica del Sacro Cuore in Piacenza, Italy, and later confirmed during the conference

in Saragossa, Spain, in May 1997. Priorities included application of biological, genetical, biotechnical and cultural methods as the basis for integrated crop and pest management with stone fruits (Cross et al., 1997, Olszak, 1999). Synthetic pesticides selective for natural enemies and pollinators with low mammal toxicity should be used only when necessary. Producing cherries in accordance with IFP rules is a common practice in Switzerland and Hungary (Muller, 1998; Balazs et al., 1998).

Integrated Fruit Production was initiated in Poland in 1991, first by releasing recommendations for apple orchards by the staff of the Research Institute of Pomology and Floriculture (RIPF) (Niemczyk, 1993). The following crops were later included: strawberries (1995), pears (1997), blackcurrants (2002) and blueberries (Niemczyk, 2002). The following numbers of farmers applied for IFP certificates in 2003: 831 for apples; 96 for strawberries; 55 for black currants; and 21 for blueberries (Niemczyk, 2004).

The first recommendations for integrated cherry production in Poland had already been prepared in 1999 (Olszak, 1999). The revised version of the recommendations was released in 2002 (Olszak, 2002). Twenty courses were organized, which were attended by 1360 orchard owners. However, the total area under integrated cherry production was only 42.5 ha in 2003 (Mochecki, personal communication). Only six farmers applied for certificates in integrated cherry production in 2003.

An informal survey appeared to be the best way to identify these bottle-necks. This survey provided researchers with the opportunity to meet farmers and to directly observe the farm environment and the approach and techniques used by each farmer. Discussions with the farmers also allowed researchers to become acquainted with farm terms, concepts and ideas, which lead to a much deeper understanding of the farmers' circumstances, farming systems, reasoning and decision processes. These informal, largely unstructured interviews and observations made by researchers on the condition of crops, occurrence of pests and diseases and pesticide storage facilities provided an overview of the farmer's circumstances (Reichelderfer, 1989). The results of this survey can also be used to direct research, to highlight potential areas for changes, and to identify gaps in the researchers' knowledge (Dąbrowski, 1994). Field surveys on the constraints involved in the adoption of integrated crop and pest management were undertaken in a number of countries following the recommendations of social scientists (Dąbrowski, 2000).

The project on farmers' knowledge, farmers' attitudes, and crop and pest management by farmers in orchards was undertaken by the staff and graduate students of the Department of Applied Entomology, Warsaw Agricultural University in 1998 with the objective to use IFP as a model for other crops. Poland is one of the leading cherry producers in Europe. The Lipsko nad Wisłą district was chosen because orchard owners in this region have a long tradition of cherry production. They represent a typical farm community in Poland.

The three objectives of our field survey were as follows:

a) to determine farmers' knowledge of good production practices in cherry orchard establishment and management;
b) to examine plant protection practices currently carried out by farmers *versus* pro-ecological approaches;
c) to determine farmers' knowledge of integrated fruit production-cherries *versus* their production practices.

METHODOLOGY

The studies were based on surveys carried out personally among randomly selected farmers in the Lipsko nad Wisłą district. In spite of some specialization in cherry fruit production, the owners represented a typical group of Polish cherry orchard farmers. Sixty five randomly selected farms were located in similar soil and climatic conditions in 23 villages in four townships: Lipsko, Solec, Sienno and Rzeczniów. Two groups of farmers were included in the survey: graduates of the IFP courses, and farmers trained in general orchard management and pesticide application. The structured questionnaire was designed to provide information on general characteristics of farms and producers, the extent and distribution of fruit tree cultivation, farmers' knowledge, management attitudes and practices.

Special attention was given to pest management and approach to pro-ecological practices. The farmers' current practices were compared to the official recommendations for integrated cherry production prepared by the RIPF. Selected farmers were interviewed at their farms using structured questionnaires. Random sampling was used in each village. Descriptive statistics, frequency distributions and cross tabulation were employed as data analysis tools.

RESULTS AND DISCUSSION

General characteristics of farms and fruit producers

Official statistics showed that the total amount of land in the Lipsko district dedicated to fruit production was 3293 ha, with 1288 ha dedicated to cherry production. Most farms had an area of 5 to 10 hectares, with cherry trees occupying 29 to 64% of the cultivated area (Tab. 1). The surveyed farmers, who made decisions on cherry production, included 91% men and 9% women. A plurality of orchard owners (43%) were between 45 and 55 years old, 29% were between 35 and 45 years old, 15% were between 25 and 35 years old, 5% were under 25 years old, and 8% were over 55 years old. 52% of the farmers had secondary education, 34% had higher education, and 14% had primary education. 62% of the farmers had participated in obligatory courses on toxic pesticide use, and 21% had participated in additional courses on Integrated Fruit Production (IFP) (Tab. 2).

Table 1. Frequency of cultivation of different crops in the surveyed farms in Lipsko n/Wisłą district (2002-2003) (% of all sampled farmers)

Farm area [ha]	Portion of farms [%]	Crops grown [in % of farms]					
		cereals	cherries	apples	black/red currants	vegetables	other fruit crops
1-2	5.7	-	51.0	4.0	45.0	-	-
2-5	17.0	13.0	63.0	7.0	5.0	-	6.0
5-10	41.5	13.0	46.0	22.0	10.0	4.0	5.0
10-15	24.5	4.5	36.0	36.0	5.0	8.7	8.5
15-20	7.5	32.0	29.0	24.0	11.0	4.0	-
> 20	3.8	15.0	64.0	21.0	-	-	-

Comments: Some farmers (6%) in the class of 2-5 ha were growing mustard plants (*Sinapis arvensis* L.), probably as forecrop reducing population of grubs in soil.

Table 2. Farmers' participation in various group training courses

Title of course	No. of participating farmers	% of participating farmers
Purchasing and usage of toxic pesticides	41	62.0
Techniques of pesticide application in commercial agriculture/horticulture production	12	18.0
Integrated Fruit Production – cherries	14	21.0
Ecological production of cherries	1	1.5
Obeying safety precaution in the farm	1	1.5
Techniques of proper pesticide application	2	3.0
Lack of response	17	26.0

Basic production practices

The selection of field locations for cherry tree planting was made in the majority of cases according to recommended conditions. Only a few farmers planted cherry trees in depressions exposed to light spring frosts, higher air humidity and ground frosts which promote infectious diseases. Knowledge of the effect of previous crops on the establishment and health of newly planted cherry trees is an important factor which should be considered before planting a new orchard. Most of the farmers surveyed did not realize or consider the importance of the previous crop and planted new cherry trees after crops susceptible to *Verticillium* ssp., such as strawberries, cucumbers, tomatoes, cabbage, potatoes and legumes, or on fallow land infested with cockchafers (*Melolontha melolontha* L).

Nutrient management in IFP should be based on regular chemical analysis of the orchard soil. 39% of farmers regularly take soil samples for chemical analysis, with 15% sampling every two years, 32% sampling irregularly, and 29% never sampling. 30% confirmed that nutrient content in their orchard soil is optimal. 62% of farmers were aware that the soil pH was neutral.

Knowledge of IFP definitions and recommendations

IFP is principally based on knowledge and practices of integrated pest management, which was confirmed by 54% of the farmers surveyed. 17% answered incorrectly and 29% gave no answer. 86% of the IFP trainees answered correctly, whereas only 45% of non-trainees answered correctly. Surprisingly, 76% of the farmers were familiar with the principles of biological control, 9% provided an incorrect definition and 15% gave no answer. Unfortunately, none of the farmers surveyed have implemented biological pest control in their orchards.

80% of the farmers were familiar with the descriptions and conditions of organic production systems, but did not risk switching because they expected lower yields, problems with marketing and lack of subsidies, which was true at that time, although subsidies have recently been introduced.

The questionnaires confirmed that the farmers were knowledgeable and applied basic plant protection recommendations such as:

a) waiting period after the last pesticide application: 97% positive answers, 100% for IFP trainees;
b) regulatory preventive period for mammals: 89% positive answers, 93% for IFP trainees;
c) selectivity of pesticides: 79% positive answers, 85.7% for IFP trainees and 76.5% for non-trainees.;
d) special sprayers for herbicide application: only 42% positive answers;
e) using certified sprayers, which has been mandatory by government decree since 2002: 74% positive answers, 100% for IFP trainees);
f) using protective clothing: 100% positive answers.

In providing positive answers to all of the above questions, farmers with higher education were significantly better than farmers with secondary or primary education.

IFP trainees and non-trainees differed in how they approached and practiced pesticide storage. 43% of IFP trainees kept pesticides in a special room away from children and farm animals. 29% even stored pesticides in a special ventilated room. A serious problem was the disposal of empty pesticide containers. Official directives previous allowed burning empty containers, and 43% of the farmers did so. A new law based on EU regulations gives clear directives on handling empty containers, depending on the toxicity of the pesticide.

Decision making on pest chemical control

Monitoring pest occurrence and disease severity and applying economic threshold levels provide the farmer with decision-making tools on necessary chemical treatment in IFP. In the surveyed group of orchard owners, 83% confirmed that they regularly monitored their orchards, with compliance significantly higher among IFP trainees. 72% of non-trainees acknowledged

that they had problems with identifying pests and diseases, whereas only 57% of IFP trainees did. The farmers surveyed made the following recommendations to upgrade their knowledge in correct pest and disease identification:

a) practical specialized training with demonstration under field conditions;
b) more relevant information in specialized journals on pest management;
c) handbooks, pocket books and books on pest and disease identification;
d) improved descriptions of pests and diseases in professional publications;
e) access to specialized equipment such as magnifying glasses, microscopes and stereo-microscopes;
f) access to small local laboratories;
g) direct personal contact with a plant protection specialist.

65% of both IFP trainees and non-trainees had problems with using economic thresholds to make decisions on chemical treatment. Only 31% claimed that they had no problems.

A farmer's approach and first, second and third priority in selecting a specific chemical for spraying may indirectly indicate what the farmer thinks about caring for the quality of the environment. 80% cited effectiveness was the highest priority, 46.2% cited cost as the second priority, and 55.4% cited environmental safety as the third priority. 91% of the farmers who followed the official recommendations prepared by the RIPF published regularly in the „Calendar of orchard protection" had a positive approach in selecting the proper pesticides (Tab. 3). 86% responded that another important factor in selecting a specific pesticide is the farmer's experience and discretion.

Table 3. Farmers' criteria in choosing a specific pesticide for chemical treatment

Type of criterion	No. of responses	% of responses
The official „Calendar of orchard protection" by Research Institute of Pomology and Floriculture	59	90.8
Own experience and discretion	56	86.2
Advise from extension officers	17	26.2
Advise from seed and pesticide salesman and shop-assistance	11	16.9
Following neighbour's experience and recommendations	9	13.8

Recognition of pest and disease damage by the farmers surveyed

In the farmers' experience, diseases caused higher losses in cherry yield than arthropod pests such as spider mites and insects. Insects were not considered to be serious pests in the 2002 and 2003 growing seasons. Most farmers used fungicides belonging to two groups of chemicals recommended in the IFP and in the RIPF official calendar. Most of farmers rotated fungicides as suggested by the

RIPF scientists. The number of fungicide treatments in most of the orchards studied did not indicate excessive chemical control.

Surprisingly, 28% of farmers considered cockchafers (white grubs) as a serious pest which could even kill young trees. When grubs were found in a young orchard, farmers had locally used chlorpyriphos. We identified spider mites (*Tetranychus urticae* and *T. viennensis*) during our surveys in the orchards. About 20% of the farmers considered them to be serious pests. Most pesticides used by farmers to control spider mites and aphids were listed as recommended for IFP orchards.

63% of farmers stated that they were satisfied and 25% that they were not satisfied with the effectiveness of the pesticides they used in their orchards.

The farmers' practices *versus* IFP recommendations in the Lipsko nad Wisłą district

Table 4. Implementation of various crop and pest management practices recommended for the IFP–cherries in surveyed orchards in Lipsko n/Wisłą district

Proper practices	% of farmers	Incorrect practices	% of farmers
1. Selection of optimal location for cherry orchard:		**1. Selection of unsuitable location for cherry orchard**	
– suitable previous cropping	51.0	– unsuitable previous cropping	49.0
– suitable soil type	85.0	– lack of soil analysis	29.0
– soil chemical analysis	39.0	– soil pH too low	15.0
– optimal soil pH	62.0	– lack of knowledge on optimal nutrient content	43.0
– knowledge on optimal nutrient content in soil	30.0		
2. Planting certified trees from nursery			
– class II	93.0		
3. Selection of suitable cherry cultivar for local conditions			
– correct choice	100.0		
4. Adequate knowledge on integrated crop and pest management		**5. Inadequate knowledge on proper crop and pest management**	
– training in IFP	21.0	– not trained in IFP	79.0
– basic knowledge of pest control	80.0	– lack of basic knowledge of pest control	20.0
6. Appropriate pest control		**7. Unproper decisions on pest control**	
– regular monitoring	83.0	– lack of regular monitoring	17.0
– proper criteria in pesticide selection (environmental consideration)	8.0	– environmental issues are not considered during selection of pesticides	55.0
8. Proper techniques of pesticide management		**9. Incorrect techniques of pesticide management**	
– using certified sprayers	74.0	– uncertified sprayers are used	26.0
– using a separate sprayer for herbicide treatments	50.0	– no separate sprayer for herbicide is available	50.0
– proper handling of used pesticide containers	24.0	– improper handling	74.0
– appropriate storage of pesticides	67.0	– inappropriate storage	33.0

The farmers' current crop and pest management practices in comparison to IFP recommendations are critically summarized in Tab. 4. Most studied farmers, IFP trainees and non-trainees alike, follow recommendations on: selecting the correct location for the cherry orchard; choosing the correct cherry cultivars; monitoring pests; using pesticides listed in the official „Calendar of orchard protection"; and using protective clothing while spraying pesticides.

The following practices should be improved: planting trees after the right previous crop to prevent soil diseases and grub damage; management of nutrients based on regular chemical soil analysis; special attention to the use of the same sprayer for herbicides, fungicides and insecticides; pesticide storage and disposal of pesticide containers according to the new parliamentary law and governmental ordinances based on EU directives.

CONCLUSIONS

The primary aim of this study was to document the farmers' knowledge, attitude and practices in managing cherry orchards in one specialized production region, the Lipsko nad Wisłą region. Some economical and training problems hampering adoption of integrated fruit production were identified through personal informal surveys with cherry orchard owners.

In the meantime, laws and decrees regulating the wide scale implementation of integrated fruit and vegetable production have recently be promulgated by the Polish Parliament (Dz.U. 2004, Nr.11, poz. 94 and Nr. 96, poz. 959) and by the Ministry of Agriculture and Rural Development (Dz.U. 2004, Nr. 178, poz. 1834). Our survey provides a baseline for future evaluation of the governmental action on the adoption of IFP by Polish farmers. The indices used for validating the implementation of IFP should include not only technical factors such as the optimum use of synthetic fertilizers and pesticides and the number of certified farms, but also human resource development to enable farmers to make sound decisions and to self-organize. At the same time, integrated crop and pest management is a technology which cannot be transferred using conventional approaches. Ambitious farmers expect access to advanced expertise on pest and disease management. This is presently limited by budget constraints on agriculture and horticulture specialized extension services. These increasing demands for specialized information in integrated crop and pest management can probably be met by only new local private advisory services. In fruit and vegetable cultivation, the risk of pesticide overuse is particularly high. 6,600,000 PLN has been allocated by the PHAPA project to train farmers in integrated fruit and vegetable production. This is a positive signal for human resource development in pro-ecological production systems in Poland.

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WDRAŻANIE INTEGROWANEJ PRODUKCJI OWOCÓW W SADACH WIŚNIOWYCH NA PRZYKŁADZIE POWIATU LIPSKO NAD WISŁĄ.

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S T R E S Z C Z E N I E

W Polsce pomimo opracowania zaleceń Integrowanej Produkcji (IP) wielu gatunków owoców przez Instytut Sadownictwa i Kwiaciarstwa: dla jabłoni (1991 r.), truskawki (1995 r.), gruszy (1997 r.), wiśni (1999 r.) i porzeczek (2002 r.), to do 2003 r. stosunkowo niewielu producentów wprowadziło te zasady do produkcji. Aby poznać przyczyny powolnego wdrażania metod IP, wybrano powiat Lipsko nad Wisłą, w którym sadownicy specjalizują się od wielu lat w produkcji wiśni. Badania ankietowe prowadzono w losowo wybranych gospodarstwach w gminach: Lipsko, Solec, Sienno i Rzeczniów. W latach 2002-2003 indywidualne wywiady z sadownikami przeprowadzono z zastosowaniem technik ankiet anonimowych. Kwestionariusz zawierał 34 pytań z zakresu: (a) ogólnych danych o sadowniku i jego

gospodarstwie, włącznie ze strukturą upraw; (b) procedur wyboru stanowiska i stosowanych technologii związanych z uprawą wiśni; (c) problemów ochrony roślin przed chwastami, chorobami i szkodnikami; (d) proekologicznego podejścia sadowników wyrażone zasadami wyboru, stosowania i przechowywania chemicznych środków ochrony roślin (ch.ś.o.r.), w tym postępowania z pustymi opakowaniami po ch.ś.o.r.; (d) uczęszczania w szkoleniach, ich oceny, dostępności do materiałów szkoleniowych i potrzeb w zakresie doradztwa i (e) stanu wiedzy sadowników o zasadach IP wiśni. Porównano aktualnie stosowane praktyki produkcyjne i ochrony roślin zgodnie z zaleceniami IP przez ankietowanych sadowników. Uzyskane wyniki wskazują, że sadownicy z powiatu Lipsko nad Wisłą mają dobrą wiedzę i stosują zalecenia dotyczące: optymalnego wyboru stanowiska pod sad wiśniowy, zalecanych zabiegów uprawowych i ochrony roślin. Nie uwzględniają jednak oni znaczenia przedplonów zapobiegających wystąpieniu chorób odglebowych i szkodników. Jest to potwierdzone przez ok. 20% sadowników mających problemy z pędrakami chrabąszcza majowego. Znaczna część producentów nie wysyła próbek gleby do analizy i nie zna wymagań pokarmowych drzew wiśni. O ile wykazali oni dobrą znajomość ogólnych zasad ochrony roślin, to niewłaściwie postępowali z pustymi opakowaniami i przechowywaniem ch.ś.o.r. Sadownicy wysunęli wiele konkretnych postulatów dotyczących programu szkoleń, dostępu do materiałów szkoleniowych i przede wszystkim ich treści.

Ośrodki doradztwa rolniczego i inne instytucje upoważnione Rozporządzeniem Ministra Rolnictwa i Rozwoju Wsi (Dz.U. Nr 178, poz. 1834) do prowadzenia szkoleń w zakresie IP powinny odejść od tradycyjnych metod szkoleń, a wykorzystać metodykę Systemu Wiedzy i Informacji Rolniczej. Jednostki te powinny przede wszystkim wykonać w swoich regionach badania ankietowe zalecane w innych krajach, które dotyczą: stanu wiedzy, proekologicznego nastawienia i stosowanych praktyk produkcyjnych przed podjęciem działań zmierzających do wdrażania metod integrowanych. Program działań powinien wynikać z potrzeb sadowników danego regionu, bo najważniejszym ogniwem we wdrażaniu metod integrowanej produkcji jest producent owoców. Obecne inicjatywy Parlamentu, Ministerstwa Rolnictwa i Rozwoju Wsi, a przede wszystkim Głównego Inspektoratu Państwowej Inspekcji Ochrony Roślin i Nasiennictwa we wprowadzeniu IP do powszechnej produkcji (tak, jak w innych krajach UE) znacznie przyspieszą rozwój proekologicznych metod produkcji i ochrony roślin gwarantujących produkcję owoców wysokiej jakości, bez niebezpiecznych pozostałości substancji szkodliwych dla konsumentów.

Słowa kluczowe: integrowana produkcja owoców, wiśnie, choroby wiśni, szkodniki wiśni, ochrona roślin, stosowanie ch.ś.o.r.