

József Lehota, Zoltán Szabó, Zsuzsanna Lehota

Szent István University in Gödöllő, Hungary

INTRODUCTION AND SPREADING OF IPM AND INTEGRATED APPLE PRODUCTION IN HUNGARY

WPROWADZANIE I ROZWÓJ ZINTEGROWANYCH METOD OCHRONY PRZED SZKODNIKAMI ORAZ INTEGROWANEJ PRODUKCJI JABŁEK NA WĘGRZECH

Key words: IPM, integrated apple production, retail chains

Słowa kluczowe: zintegrowane metody ochrony przed szkodnikami, integrowana produkcja jabłek, sieci handlowe

Abstract. No accurate statistics are available concerning the amounts and value of the crop protection chemicals used in fruit production in Hungary. The quantity of chemicals used dropped dramatically between 1990 and 2001, to 2.1 kg/ha. One important consideration from the aspect of evaluating the decrease in the quantities of chemicals used is that the crop protection technology and the range of the chemicals used changed significantly during the period concerned. The research project took place in the framework of the No. 6 Network of Excellence frame programme and the European Network for Durable Exploitation of Crop Protection Strategies programme (No. 3.5 sub-programme: Societal Assessment of Current and Novel Low Input Crop Protection Strategies), between 2007 and 2010. Possibilities of integrated crop protection and integrated production in apple production were studied in the framework of the sub-programme with the involvement of six countries (Switzerland, France, the Netherlands, the United Kingdom, Hungary and Poland). Five main elements affecting the spreading of integrated production were studied in the framework of the sub-programme: public politics, research and consultancy (advisory) services, farmers' cooperation, the development of marketing strategies and the role and impacts of civil society organisations. The Marketing Institute studied the impacts of the development of marketing strategies and those of retail chains playing a dominant role in the supply chain.

Food consumer behaviour and the perception of food risks

The work of Simon [1957] and his theory of bounded rationality marked a milestone in consumer behaviour research as well. A food consumer needs to make his decisions on the basis of limited available information, i.e. he has a limited range of options to choose from in terms of evaluating decision making rules and in comparing the solutions of complex decision making processes. The limitations concerned apply to the gathering, storing, retrieving and transmitting of information alike. Information processing entails expenses too and these also affect food consumers' decisions. Limited information leads to uncertain situations in consumers' decision making and this is the basis of the risks and hazards faced by consumers. The risks entailed by consumer decisions are perceived risks [Bauer 1960]. The types and levels of perceived risks may vary by individual, social group and culture [Cunningham 1967], since they are based on the negative consequences experienced by the consumer and the subjective (likelihood) judgements formed of the strength of the consequences. According to Yates and Stone [1992] the perceived risk is a system determined by the combination of loss, significance and uncertainty. Perceived risk is a multi-dimensional concept, comprising [Kaplan et al. 1974] physical, functional, financial, psychological, social and temporal losses and risks. Applied crop protection technologies and the resulting chemical residues are linked primarily to the consumer's physical risk by endangering the health and, indirectly, the life of the food consumer. Negative impacts on the natural environment also fall in the category of physical risks.

The risks perceived by the consumer depend – besides the characteristics of the customer as an individual (demographic factors, personality type, knowledge) – on the degree to which the consumer is actually interested in such issues (involvement), on the buyer's position (e.g. the type of the purchased product) and on social factors. Two main theories have been adopted with regard

to the spreading of risk information [Renn 1992]: the theory social risk exaggeration and the social arena concept. Different – opposing – social groups (interest groups, civil society organisations) are interested in intensifying social risk perception and in increasing thereby the risk perception of the consumer as an individual. Various media organisations are included among the institutions working towards intensifying people's risk perception. They intend to affect not only consumers and the public in general but also political and economic decision makers, thus the consumer's risk perception is to be regarded as not only individual but also community perception. Smink and Hamstra [1994] identified as many as the following eight social participants in social debates over GMO products: government, scientists, farmers, food producing companies, participants of the distribution chain, consumers, consumer organisations and environmental protection organisations.

Hungarian food consumers' risk perception concerning chemical residues falls in the highest category by international standards. According to a survey carried out by Eurobarometer [2006] in the 25 EU Member States perceived risks are high in Hungary in relation to both food risks and to chemical residues contained in foodstuffs. As many as 54% (EU-25 average 42%) of all Hungarian food consumers assume that the food they eat is likely to have negative effects on their health. This ratio was exceeded only in Italy (62%) and in Greece (67%). According to an assessment of spontaneous associations with foodstuffs 23% of Hungarian food consumers associated food with the concept of the application of chemicals (EU average 14%). This ratio was exceeded only in Greece (31%) and in Germany (32%). The chemical residue contents of vegetables and fruits as well as cereals are considered to be hazardous by 80% of the Hungarian consumers (EU-25 average 71%). This percentage was exceeded only in Malta (81%), Italy (86%), Cyprus (87%) and Greece (87%). No research findings are available in Hungary concerning the media's food risk exaggerating activities. According to the data yielded by an Eurobarometer (2006) survey the media is one of the important sources of risk exaggeration. Some 19% of the Hungarian food consumers (EU-25 average 9%) heard or saw news during the week of the survey and 26% of them during the month concerned, about chemicals' adverse impacts on human health. In both categories the proportion of respondents who had heard or seen information concerning chemicals' detrimental impacts was the highest in Hungary among the 25 EU Member States.

The Marketing Institute of the Faculty of Economics and Social Sciences of the Szent István University has been conducting national representative studies (involving 1000 respondents) since 1994 (1994, 1998, 2006) concerning perceived risks relating to foodstuffs. From among the 19 risk factors concerned consumers assigned the third highest grade to risks entailed by crop protection chemical residues (4.23 on a scale of 1 to 5). The highest food risk grades were given to food infections (4.33) and to the consumption of foodstuffs preserved by irradiation treatment (4.31). By using the method of factor analysis the perceived risks relating to foodstuffs were assigned to three factor groups [Fürediné-Kovács 2009]: nutrition health factors (consumption of meat, eggs, butter, fatty, smoked, salted, sugar-sweetened and over-spicy foods), the food safety factors (soil and water pollution, infections of foodstuffs, GMO foodstuffs, foodstuffs treated by irradiation and crop protection chemical residues), along with the category of lifestyle risks (alcohol consumption, smoking, obesity and lack of physical exercise).

Jonge et al. [2007] concluded from a number of studies in regard to food consumers' perceived risk that risks have the strongest influence on product choice (preference of certain products), the choice of brands as well as that of the stores. According to studies conducted by Roe et al. 2001 in the case of health impairment caused by foodstuffs consumers decide primarily to change their preferred brands, then to change their preferred outlet and thirdly to pay more attention to the information on the packaging and the label. Another important way of categorising product attributes is that applied in information economics [Nelson 1970, Bodenstein-Spiller 1998], identifying search, experience, credence and so-called Potemkin attributes. Customers can find out about search attributes before purchasing the product, based on their knowledge, experience and the details presented on the labels and markings.

Possibilities of producers and (wholesale and retail) traders in mitigating consumers' risks

The intensification – or industrialisation – of agricultural production expanded into a global trend from the 1960s on and it entailed a massive increase in the use of fertilisers and chemicals. The early 60s saw the introduction of the first insecticides, while the early seventies witnessed the introduction of fungicides and herbicides. Some serious impacts and risks of the increased use of

chemicals started to appear from the mid-80s, for example in the forms of fungicide resistance or multi-resistance [Lamine et al. 2009]. The intensive use of chemicals for crop protection may entail a very wide range of negative consequences [Cannell 2007], for instance, in the form of the impacts of chemical residues on human health, contamination of surface waters and groundwater, the health hazards faced by those working with chemicals as well as the natural hazards (decrease in biodiversity, extinction of species). Chemical residues have been found in 40% of fruits and vegetables in the EU-25 Member States, with 3% of the samples containing residues exceeding the limit values. Low input technologies – including integrated pest management and integrated production technologies – were introduced from the second half of the eighties. Social debate concerning chemical use and its impacts on human health became increasingly heated in the European Union [Haynes et al. 2009].

Use of crop protection chemicals and its impacts in Hungary

No accurate statistics are available concerning the amounts and value of the crop protection chemicals used in fruit production in Hungary. According to Pálmai [2005] the amount of crop protection chemicals (insecticides, fungicides and herbicides) used in Hungary varied between 7.8-10 kg/ha during the period between 1975 and 1990 and it was 10 kg/ha in 1990. The quantity of chemicals used dropped dramatically between 1990 and 2001, to 2.1 kg/ha. One important consideration from the aspect of evaluating the decrease in the quantities of chemicals used is that the crop protection technology and the range of the chemicals used changed significantly during the period concerned.

The background and methods of the research

The research project took place in the framework of the No. 6 Network of Excellence frame programme and the European Network for Durable Exploitation of Crop Protection Strategies programme (No. 3.5 sub-programme: Societal Assessment of Current and Novel Low Input Crop Protection Strategies), between 2007 and 2010. Possibilities of integrated crop protection and integrated production in apple production were studied in the framework of the sub-programme with the involvement of six countries (Switzerland, France, the Netherlands, the United Kingdom, Hungary and Poland). Five main elements affecting the spreading of integrated production were studied in the framework of the sub-programme: public politics, research and consultancy (advisory) services, farmers' cooperation, the development of marketing strategies and the role and impacts of civil society organisations. The Marketing Institute studied the impacts of the develop-

Table 1. Impact of factors affecting the spreading of integrated apple production in the participating countries

	Impact of factors of integrated apple production in countries			
	Switzerland	France	Netherlands	United Kingdom
The role of the procedure	strong: ecological regulations for direct payments	it is likely to grow stronger on the national and local level (e.g. in the case of catchment areas)	Pesticide action plan 1991 and 2001	UK Pesticide strategy 2006
Involvement of research	strong in the first phase	in experiment sites (research projects in IP fruit production)	strong in the preparation of the pesticide action plan, thereafter: weakening	strong in the Pesticide Safety Directorate
Collective dynamics among farmers	strong, particularly in the initial stages	market driven (producers' marketing groups)	market driven (cooperatives) + study groups	-
Integration in marketing strategy	not successful	supermarket schemes	MRL requirements on the part of retail trade	supermarket schemes
Civil society involvement	strong, the community's responsibility for agriculture and the environment	low, except for CSA schemes	owing to MRL activities and NGOs it is on the increase towards supermarkets	on the increase (PAN activities)

Source: own study.

ment of marketing strategies and those of retail chains playing a dominant role in the supply chain.

The following methods were used in our studies:

- face to face questionnaire-based consumer behaviour surveys (in 1 hypermarket and in 1 supermarket):
 - 161 customers interviewed in hypermarket,
 - 167 customers interviewed in supermarket,
- semi-structured expert interviews with retail and wholesale procurement employee:
 - expert interviews with employees of 2 retail chains in charge of fruit and vegetable procurement (1 international hypermarket chain and 1 domestic supermarket chain),
 - semi-structured interviews with representatives of 6 undertakings participating in the distribution of apples, supplying the two retail chains (3 wholesalers of fruits and vegetables and 3 producers' sales organisations (POs)),
- semi-structured interviews with 11 fruit and vegetable farms:
 - of the 12 fruit producing farms (of over 20 hectares used for fruit production) 5 units were limited liability companies (Kfts), 3 family farms, 2 cooperatives and 1 private shareholding company (Zrt.),
 - the sample included units operating in every fruit growing regions: North Great Plain, North Hungary, South Great Plain, West Transdanubia and Central Hungary,
 - the average apple growing area (productive and unproductive) was 52.2 hectares (varying between 10 hectares and 120 hectares),
 - most producers have long years of agricultural experience and with secondary or tertiary qualifications,
 - every fruit growing farm had at least one full-time or part-time employee with tertiary qualification in crop protection,
 - half of the fruit growing farms were established before 1996, the other half were established thereafter,
 - 6 farms were established in the course of the „compensation process”, 4 units were established by transforming socialist cooperatives and one was founded after the privatisation of a socialist state farm.

Results

Due to limitations in size we introduce only the key findings and conclusions drawn from interviews with apple growers:

1. The main changes that have occurred in apple production technologies are summed up below:
 - all of the new plantations are fully equipped with drip irrigation technologies, while in some of the older plantations conventional irrigation was also still in use,
 - the majority of the apple farms in the sample (with the exception of two units) have refrigerated storage capacities, partly with controlled temperature storage space, partly based on the ULO technology; most (72.9%) of the apple farms have machinery and technology for sorting and packaging the produce,
 - all of the farms comprised in the sample had adopted the integrated crop protection and/or integrated apple growing technologies; some of them had been using such technologies ever since 1996; later on they continued integrated apple production in the framework of the Agricultural and Rural Development Operative Programme (ARDOP) (2004-2009).
2. Description of the crop protection technologies applied in apple production:
 - the process of the spreading of what is referred to as integrated pest control or the integrated apple production technology is comprised of two main phases, an integrated crop protection research programme was conducted by the Fruit Production Research Institute of Újfehértó between 1992 and 1994 in the framework of an international cooperation programme, according to the interviewees state subsidies played a dominant role in spreading the technology; in the first phase, from 1996 on plantations suitable for integrated production were provided an extra subsidy (of 5%) in the system of subsidies for new plantations; in the framework of the agricultural environmental management target programme of the ARDOP the farms that had adopted integrated apple production technologies were provided with an extra amount in the form of area payment (99,000 HUF/ha),

- the representatives of the apple farms comprised in the sample stated unanimously that neither retail chains and fruit and vegetable wholesalers, nor the POs played any role in the spreading of integrated apple production, the process was not significantly affected by the behaviour of those purchasing apples or of consumers, or by the impacts of their behaviour either; on the whole, the spreading of the integrated apple production technologies was a predominantly supply side process, driven by a subsidy-oriented push strategy,
 - the apple producers comprised in the sample said that the risks of chemical use are rarely discussed by stakeholders in public forums, some debates have taken place in the press and in the electronic media primarily about chemical contaminations exceeding the applicable limits that have been identified in the course of tests carried out by the authorities.
 - the apple producers were members of the Apple Product Council (which has dissolved in the meantime) and of Fruitweb (Hungarian Organisation and Product council of Vegetables and Fruits), but they considered that the role played by these organisations in spreading the integrated apple production technology to be hardly more than marginal,
 - all of the apple producers were dissatisfied with the domestic advisory/consultancy system, including crop protection advisory/consultancy,
 - the interviewed representatives of apple farms considered that the quantity of crop protection chemicals used in Hungary is some 25-30% lower than the quantities used by apple producers in the main apple producing countries in West Europe, some 35.4% of producers considered that during the past 10 years they managed to reduce the amounts of chemicals used, while 63.6 of the respondents considered that the amount of chemicals used either stagnated or increased somewhat, the saw or see primarily the following possibilities for reducing the quantities of chemicals used: continued improvement of the spraying technologies (up-to-date machinery), development of the crop protection forecasting system, spreading pest/disease-specific crop protection approaches, improving the knowledge of apple growers (training, extension training) and considerable improvements in the advisory services; a total of 45.5% of the farms (mainly the larger apple growing farms) themselves had their produce tested for chemical residues after harvest.
3. The roles of the sales channels and the channel relationships in apple sales:
- the apple growing farms participating in the interviews used the produce for the following purposes: processing (owing to its apple production experiments one farm had a high: 40-50% – proportion of apples fit for processing only), selling on the local market („pick it yourself”, local retailers) 8-10%, retail chains 10-15%, wholesalers and POs 50-60%, 27.3% of the producers sell their produce only to wholesalers, 9.1% of them only to POs; the proportion of apples sold directly to retail chains is diminishing; the most important retail chains include: Metro, Cora, Match, Lidl, Coop Hungary and Reál Hungária; only 36.4% of the apple growing farms are PO members, but only two of them sell the largest part of their produce through the Pos; the apple growers that do not have their own storage, sorting and packaging capacities sell their produce in bulk (usually in large plastic containers),
 - the apple growers comprised in the sample tended to have a negative view of the POs, using these as a sales channel only to a minor extent; they said that the POs are more important for smaller apple producer units without their own storage, sorting and packaging capacities.

Conclusions

1. Public policies and agricultural policy have played a major role in the introduction and spreading integrated apple production technologies. According to the interviews the Crop Protection Department of the then Ministry of Agriculture and the positive attitude and international experience of the Crop Protection and Soil Health Service played a major role in disseminating information concerning the technology. By contrast, state organisations played no positive and initiative roles in creating the effective conditions and requisites for the efficient implementation of the technology.
2. The role played by research and advisory services in the introduction and effective application of the technology was rated very poor by the interviewees. No advisory services can be operated effectively without an adequate research background.

3. Mention should be made of the role played by the more innovative apple producers, who started to build up the technological requisites for integrated apple production during the period when subsidies were given to new plantations.
4. The farms applying the integrated apple production technology could not convert their technological advantage into competitive advantage in the domestic or in the export markets. The farms that had participated in the first research programme tried to develop a marketing strategy for apples from integrated production. The Agricultural Marketing Centre provided even financial assistance to the Guaranteed Healthy Apples Programme and the trade mark programme.
5. The interviewees said that civil society organisations played little role and showed little signs of intent to participate in spreading integrated apple production technologies. The trade/professional organisations failed to pay adequate attention to this area and the environmental and consumer protection groups also failed to play any major role. The press and the electronic media made the main contributions to the process predominantly by exaggerating crop protection risks but that debate did not take place in scientific forums.

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Streszczenie

W artykule dokonano analizy wpływu integrowanych metod produkcji na strategie marketingowe sieci detalicznych na Węgrzech.

Corresponding address:

Zsuzsanna Lehota, assistant lecturer
Szent István University
Faculty of Economics and Social Sciences
Institute of Business Management
Gödöllő, Páter Károly u.1., H-2100, Hungary
phone: 0036-28-522-098
e-mail: lehota.zsuzsanna@gtk.szie.hu

prof. József Lehota
prof. dr Zoltán Szabó, Ph.D. MBA
Szent István University
Faculty of Economics and Social Sciences
Institute of Marketing
Gödöllő, Páter Károly u.1., H-2100, Hungary
phone.: 0036-28-522-098, e-mail: lehota.jozsef@gtk.szie.hu
phone: 0036-28-522-098, e-mail: szabo.zoltan@gtk.szie.hu