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European and Chinese Consumers' Attitude for Food with Reduced Use of Chemicals: Results from a Survey

Global food consumption is increasing, and natural resources are limited. A change in consumers' purchase behavior is fundamental to cope with the objectives of sustainable development. Our focus is on consumers' attitude toward those products that reduce the dependence on pesticides (integrated pest management – IPM). Through a survey analysis, the paper aims at illustrating the factors that influence the food choices of European and Chinese consumers. The results obtained through descriptive statistics and regressions allow us to identify which consumer categories are more aware of IPM products and which are still far from a complete knowledge of IPM and their potentialities. The results arising from this chapter can be used to suggest policies useful to achieve a more sustainable consumption behavior.

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11.1. Introduction

Consumer behavior is fundamental to move toward a more sustainable consumption pattern, hence it is necessary to analyze and understand it [SHA 17]. The increase in food consumption has serious consequences on the environment and requires a more convincing approach to sustainable development and, in this, a responsible consumer behavior plays a vital role. Misra *et al.* [MIS 91] showed how people were already interested in organic products since the 1990s. This attitude is still strong, and people are more and more aware of the importance of environmental issues [BOZ 12]. However, even though a more aware consumption pattern is growing, it is still marginal with respect to total consumption, as shown by different empirical research studies such as that by Ankeny [ANK 12] and Viorel *et al.* [VIO 17]. Most consumers are willing to buy green products, but only a small group actually does it [HUG 07]. A research developed by Yin *et al.* [YIN 10] showed how consumers consider a reduced use of pesticides important in their purchasing patterns. Many studies have been developed along this narrative: the most common explanation is related to the attitude–behavior gap [JOS 15], [YOU 10]. It occurs when people's behavior is not correlated with their attitude, especially when it concerns the gap between the high value people give to environmental issues and the low level of actions taken to face them. Other possible explanations are related to the fact that people are willing to buy healthier and environment-friendly food only if its price is not (or just a little) higher than its equivalent for traditional food [WAN 97], [YIN 10] or if it is familiar or a well-known brand [SCH 15]. According to McCarthy [MCC 15], in China, it is not still convenient to buy green products.

Starting from these premises, this chapter aims at investigating consumers' attitude and behavior toward food produced with a reduced use of chemicals: the case study is about integrated pest management (IPM) products. A survey is at the basis of the investigation. This study is part of the EUCLID project – *Europe China Leverage for IPM Demonstrations*, funded by the EU Commission under Horizon 2020 Program. EUCLID aims at developing IPM measures in Europe and China to promote food safety

and security, by reducing the negative effects of chemical pesticides on human health and the environment, to reduce economic losses in agriculture due to pests, and to provide scientific support to EU and China policy makers[1].

11.2. Background

The idea of IPM was introduced into national policies for the first time in 1972 in the United States, even if the concept behind it was developed some years before[2]. The first idea of a form of integrated control was already defined by Stern *et al.* [STE 59] in 1959. IPM is an approach that combines different protection practices to manage the use of pesticides to reduce environmental and health risks [CHA 11]. However, there is not a unique definition of IPM, as presented by Bajwa and Kogan [BAJ 02] in their work: more than 60 definitions were found. The most currently used is "the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment" [FAO 14]. It is necessary to introduce the European and the Chinese legal frameworks to better understand the whole dynamic in the consumption of green products.

Since the 1970s, European environmental policy has been implemented to reach a healthier and safer environment. In the European framework, a legislation related to the use of pesticides was first introduced in 1979 and then reinforced in 1992 [EUR 07]. During the late 1990s, Europe faced food scandals: consequently, additional regulations have been adopted in the following years to solve the issue [CHE 15], and general principles concerning food safety have been established. In 2002, the European Food Safety Authority (EFSA) was

1 To understand which policies are needed to further promote IPM, the EUCLID project is studying the behaviors and attitudes of the different actors included in the agro-food system, for example, farmers, retailers, and consumers. http://www.euclidipm.org/.

2 The concept was defined during an event held in Rome sponsored by the FAO in 1965.

established to supervise the risks associated with the food chain, and in the same year the General Food Law was promulgated to guarantee high standards for the protection of human life. A milestone in the use of pesticides in the European framework is Regulation (EC) 369/2005 concerning the maximum residue level of pesticides to which consumers are exposed at the end of the food chain. The following year, the EC adopted a thematic strategy related to pesticides and their sustainable use. Directive 2009/128/EC is an essential step concerning IPM: it encourages their introduction, development, and improvement of other techniques to reduce the dependence on pesticides. Starting from 2014, it obliges producers to implement the principles of IPM. In the same year, the European Pesticide Regulation (EC) 1107/2009 was enacted: it refers to the use of less harmful pesticides such as biopesticides instead of synthetic ones [VIL 14]. In 2018, a committee regarding the evaluation of the implementation of Regulation (EC) 1107/2009 highlighted how the targets are, however, still far to be reached.

China has not a unique legal framework related to food safety and the use of pesticides. According to Zolin *et al.* [ZOL 17], legal regulations are implemented at the level of the province. However, provinces must follow central directives and laws. An improvement in the regulatory system, in the same way as for Europe, was required due to the high number of scandals and food safety incidents [CHE 15], [CUI 18]. Chinese products must reach Western standards to be commercialized. In 1965, the first regulation related to food hygiene was promulgated [YON 04]. A trial implementation concerning the Food Hygiene Law was enacted in 1983 with the aim of regulating the standards for food contents, containers, and additives. Subsequently, the law was updated in 1995 [JIA 13]. Nowadays, China is the world's leading user of pesticides [LI 14]. On the one hand, pesticides help producers to avoid food damages; on the other hand, their use has an environmental impact. To balance these two opposite forces, two ordinances were approved in 1982. The regulation related to the use of pesticides in China was introduced in 1997 and amended in 2001 to meet WTO requirements [ZOL 17]. In 2006, the law of the People's Republic of China on Agricultural Product Quality Safety was enacted. The main goal is marked in the first article: "The present Law is formulated for the purpose of

guaranteeing the quality safety of agricultural products, maintaining the health of the general public […]." In 2009, the Food Safety Law was enacted and it was revised in 2015. It includes an article (no. 26) that states the "limits on such pollutants as invasive organisms, pesticide residues, veterinary drug residues, biotoxins and heavy metals, and other materials endangering human health contained in food, food additives, and food-related products." Moreover, enterprises are encouraged to strengthen these standards [USD 15]. IPM measures are still adopted by a marginal part of Chinese farmers as they are in all other developing countries [PRE 15].

11.3. Data and Methodology

Data to investigate consumers' behavior relating to food purchase were collected through a survey that gathered 657 questionnaires in 2016–2017[3]. The questionnaire aimed at collecting information on consumers' habits and their disposition to fruits, vegetables, and cereals grown using IPM methods. Data processing and analysis were addressed at discovering whether there are patterns of consumers' behavior and, in particular, on their willingness to pay, in relation to IPM.

Descriptive statistics were used to identify possible different patterns of behavior between the European and the Chinese respondents. Then, the regression models, ordinary least-squares method, allowed to verify the relationship between the perceived familiarity with IPM and the willingness to pay a higher price for IPM products and *vice versa*, as well as the relationship between the purchase of IPM products (in the six months before the survey) and the willingness to pay a higher price for IPM products. Four empirical specifications of the regression equation have been carried out:

Specification 1 – individual characteristics: dummy of gender (*Gender*), dummies for the age group (*Young* for interviewees from 18 to 30 years old, *Middle-age* for interviewees from 31 to 50 years old,

3 All Euclid partners contributed to the survey dissemination, in particular, the collaboration by the University of Lleida, ACTA, Agroinnova, and INRA was fundamental to reach a high number of responses in different countries.

and *Elderly* for interviewees from 51 years old), dummies for country of residence (*China*, *France*, *Italy*, and *Spain*), dummy for the high education (*High_education*), and a dummy for the household size (*High_size*).

Specification 2 – income characteristics: dummy indicating whether the interviewee's household class of income is below the average household income of the country of residence (*Low_income*) and a dummy stating whether the interviewee believes that the income of his/her family influences the quality of the fruits and vegetables products purchased (*Income_influence*).

Specification 3 – employment characteristics: dummies for the employment status (*Employees, Entrepreneur/freelance, Student*).

Specification 4 – shopping habits: dummies for where the interviewee is used to purchase food (*Mass_distribution* for supermarkets and discounts or purchases online, *Retail_distribution* for greengrocers, markets or open-air markets and *Ethical_producer* if he/she usually buys directly from the producer or the farmer or indirectly through ethical purchasing groups), a variable indicating whether the interviewee has a prevalent horticultural diet (*Horticultural_diet*), a dummy whether the interviewee is responsible for the food choices of his/her family (*Food_choice*) and a dummy indicating whether the interviewee considers the price as a discriminating factor in the food purchasing choice (*Price*).

11.3.1. *The sample*

The sample consists of 657 interviewees, in which, approximately 60% are women. The main variables related to the interviewees' personal information divided by gender are summarized in Table 11.1.

Almost half of the respondents (42.5%) are concentrated in the youngest age group (18–30 years old), 36.7% in the middle age group (31–50 years old), and a scarce 21% in the oldest one (more than 50 years old). Most of the respondents are either employees (54%) or students (31%). There is almost an equal distribution between highly educated (at least an academic study) and poorly educated people.

Focusing on the household composition, more than half of the interviewees (56%) live in families with three or four components. More than 90% of the respondents are resident in four countries: France (28%), Spain (27%), Italy (27%), and China (12%). Considering the household income, a distinction between Chinese interviewees and the others is required. People who live in China, in fact, are strongly concentrated in the category 3,001–5,000 Yuan[4]. Since the countries considered have different purchasing power, we created a variable stating whether the respondents have a household income above (or below) the national average of the country of residence. Some 62% of people reside in Italy have a household income below the national average, against 44% of people reside in France, 39% in Spain, and only 5% in China[5]. For what concerns the percentage of respondents responsible for their family food purchasing, the great majority of the sample (93%) stated as being at least "sometimes" in charge of the task. Almost all of the respondents (93%) are used to purchase food at supermarkets and/or discount stores. The percentage falls to 66% when considering the retail distribution sector (e.g., greengrocer, markets, etc.) and it further decreases (32%) when considering those used to buy food directly from the producer or the farmer or through ethical purchasing groups.

Comment [Lapiz1]: Please provide complete reference details for "EUROSTAT (2017)" and "National Bureau of Statistics of China (2017)", if required.

A comparison between the European and the Chinese respondents was run. The EU sample consists prevalently of women (62.5%), whereas the Chinese of men (55.1%). Almost 45% of the Europeans are 18–30 years old against 27% of the Chinese, whereas almost 60% of the European surveyed population have a high educational level against 36% for the Chinese respondents. Some 48% of the European respondents have a household income lower than the average household income (according to the household size) of the country of residence. This value is significantly lower if considering the Chinese sample (5.4%). This is mainly due to the high-income discrepancies manifested in China. The majority of both the European and the Chinese samples consists of employees (52.4% and 75.3%, respectively) followed by students (32.5% and 13%, respectively).

4 Corresponding to about €375–625.

5 Data have been collected through the following sources: EUROSTAT (2017) for France, Italy, and Spain, and National Bureau of Statistics of China (2017).

Moreover, there is a big difference in the purchasing behavior. Only a small number of Chinese interviewees (6.4%) with respect to the Europeans (36.2%) are used to purchase food directly from the producers or from ethical purchasing groups.

		Total (%)	Male (%)	Female (%)
Age	18–30	42.6	34.0	48.5
	31–50	36.7	38.5	35.3
	>50	20.7	27.5	16.2
Residence	France	27.6	20.2	32.6
	Spain	27.4	30.8	25.2
	Italy	27.1	25.5	28.2
	China	11.9	16.3	8.9
	Other EU	4.1	4.6	4.1
	Other non-EU	1.5	2.7	1.0
Education	Low	54.5	57.6	52.4
	High	45.5	42.4	47.6
Income	Low	42.5	34.5	47.8
	High	57.5	65.5	52.2
Occupation	Employee	54.5	52.3	56.0
	Student	30.8	28.9	32.0
	Self-employed	5.8	9.2	3.6
	Other	8.9	9.6	8.4
Food choice	Always	46.9	33.3	57.5
	Sometimes	46.5	56.3	37.9
	Never	6.6	10.4	4.6

Table 11.1. *Individual characteristics of the interviewees of the sample (%)*

11.4. Results

With the aim of verifying consumers' attitude toward IPM, the results obtained through the data analysis are reported in the following sections.

11.4.1. *Descriptive analysis on consumers' behavior on food choice*

Almost 57% of the sample thought to know IPM. A control question was in the questionnaire. Therefore, if looking at the actual knowledge, what emerges is that only 30% actually did know what IPM means. Therefore, a lack of awareness is what arises. Table 11.2 provides insights into the respondents who have previously stated of being familiar with IPM methods who are willing to pay a higher price for IPM fruits and vegetables and cereal and derived products as well as those who are instead not willing to pay more for IPM products. On average, more than 60% of the sample is willing to pay a 1%–20% higher price for fruits and vegetables, whereas about 50% for cereal. There is a substantial difference considering the type of product when looking at those who are not willing to pay more (39% for cereals, whereas 19% for fruits and vegetables) and when looking at those who are willing to pay more than 20% (10% for cereals, whereas 18% for fruits and vegetables).

Cereals	**IPM**					
Organic		**0%**	**1%–20%**	**21%–50%**	**>50%**	**Total**
	0%	26.9	6.4	0.2	0.0	33.5
	1%–20%	10.3	38.1	1.9	0.2	50.5
	21%–50%	1.2	6.8	4.5	0.9	13.4
	>50%	0.3	0.2	0.9	1.2	2.6
	Total	38.7	51.5	7.5	2.3	
F. & V.	**IPM**					
Organic		**0%**	**1%–20%**	**21%–50%**	**>50%**	**Total**
	0%	10.6	4.9	0.5	0.0	16.0
	1%–20%	6.2	49.3	3.4	0.3	59.2
	21%–50%	1.5	8.5	8.5	1.2	19.7
	>50%	0.5	0.3	1.2	3.1	5.1
	Total	18.8	63.0	13.6	4.6	

Table 11.2. *Willingness to pay a higher price: organic versus IPM products (%)*

An important factor is that the percentages of respondents willing to pay a higher price (1%–20% more) for organic fruits and vegetables and organic cereal are very close to those of IPM (Table 11.2). The percentage of those who are not willing to pay more for organic products, however, is lower than of those for IPM products. In the upper-right there are those respondents who are willing to pay more for IPM products than for organic products; in the lower-left part, those willing to pay more for organic products. Another interesting comparison between IPM and organic products is related to the percentage of respondents who have declared of having (or of not having) purchased IPM and/or organic products in the last six months (Table 11.3). Less than 30% of respondents have bought IPM products in the previous six months. However, if considering only those who have stated of being familiar with IPM, the percentage rises to 35% (40.6% men and 31.5% women). The contrary happens considering organic products where 72% of respondents have bought organic products (75% women and 66% men).

	Purchased	Total (%)	Male (%)	Female (%)
Organic	Yes	71.5	66.2	75.1
	No	28.5	33.8	24.9
IPM	Yes	25.9	32.3	21.7
	No	74.1	67.7	78.3

Table 11.3. *IPM and organic purchase in the last six months by gender (%)*

Among the respondents who have stated of having bought IPM products, the main reasons that have influenced their purchasing decision are the greater perceived safety of those products (79.5%), ethical reasons (e.g., environment, human, and animal health) (47%), higher quality (28%), and the lower environmental impact (27.3%). Among the respondents who have stated of not having bought IPM products, the main reasons are instead the lack of knowledge about IPM and the inability to recognize these products (56.8%), the belief that conventional products are good as well (25.9%) and the fact that they are considered too expensive (10.3%). For what concerns organic products, there is not a predominant reason on why respondents did not purchase them. In general, people consider them too expensive

(29.1%) and believe that conventional products are good too (24.1%). One of the main results is that consumers buy IPM and organic products because they consider them healthier than conventional products. In our sample, the great majority (84.4%) either considers IPM products totally or partially safe; no significant differences in the answers between males and females are highlighted. The same happens for organic products: the majority (87.7%) either considers them totally or partially safe. Respondents who do not consider IPM products safe believe that there is still the possibility of using pesticides (54.6%).

11.4.2. *Regression analysis*

Four regressions were run to verify the relation among the principal variables considered and the control variables[6].

The results of the regression of the IPM familiarity dummy on the dummy variables indicating whether the interviewee is willing to pay a higher price for IPM cereals and for fruits, vegetables, and the vector of controls previously described are reported in Table 11.4. What emerges is the existence of a correlation between the willingness to pay a higher price for IPM cereals and the knowledge of such products: in all specifications, in fact, the coefficient of the IPM cereal dummy is positive and statistically significant: people willing to spend more have a higher probability (+8.8%) to consider themselves more informed about IPM methods. The IPM fruits and vegetables dummy is always statistically significant but in the fourth specification. A strong positive correlation between IPM familiarity and high education level has been detected: in particular, highly educated people have a higher probability (+39%) to know IPM methods. In addition, men are 7.6% more likely to consider themselves familiar with it. The lack of significance of the income variables implies that there is no correlation between the household economic condition and the perceived knowledge of IPM.

6 All the regressions are reported in the Annexes of the work of Mazzarolo *et al*. [MAZ 19].

	(1)	(2)	(3)	(4)
Variables	**Familiarity**	**Familiarity**	**Familiarity**	**Familiarity**
Cereal_higher_price	**0.0974****	**0.0899***	**0.0937***	**0.0875***
	(0.0475)	(0.0480)	(0.0481)	(0.0479)
F&V_higher_price	**0.115****	**0.118****	**0.0974***	0.0772
	(0.0573)	(0.0581)	(0.0590)	(0.0590)
R^2	0.240	0.245	0.254	0.279

Table 11.4. *Regressions of IPM familiarity on willingness to pay*

Comment [Lapiz2]: Please provide significance for "*, **, and ***" in Tables 11.4–11.6, if required.

	(1)	(2)	(3)	(4)
Variables	**Cereal_higher_price**	**Cereal_higher_price**	**Cereal_higher_price**	**Cereal_higher_price**
Familiarity	**0.181*****	**0.176*****	**0.167*****	**0.141*****
	(0.0461)	(0.0470)	(0.0475)	(0.0482)
R^2	0.067	0.065	0.071	0.102
	(1)	**(2)**	**(3)**	**(4)**
Variables	**F&V_higher_price**	**F&V_higher_price**	**F&V_higher_price**	**F&V_higher_price**
Familiarity	**0.158*****	**0.156*****	**0.138*****	**0.115*****
	(0.0386)	(0.0392)	(0.0391)	(0.0397)
R^2	0.111	0.117	0.145	0.168

Table 11.5. *Regressions of willingness to pay for IPM cereals and fruits and vegetables on IPM familiarity*

Table 11.5 shows the results of the two regressions of the dummy indicating whether the interviewee is willing to pay a higher price (1%–20% more) for cereals and for fruits and vegetables grown through IPM methods on the IPM familiarity dummy in the four different specifications. The results confirm the existence of a positive correlation between the perceived knowledge of the IPM method and the willingness of consumers to pay a higher price for cereal and for

fruits and vegetables. In fact, in all specifications, the coefficient of the variable *Familiarity* is positive and statistically significant. Specifically, those consumers who stated a familiarity with the IPM methods are more likely to pay a higher price for IPM products, more for cereals (+14.1%) than for fruits and vegetables (+11.5%). For those consumers, who usually purchase food directly from the producer/farmer or through ethical purchasing groups, a higher willingness to pay for IPM cereals is associated. Those who consider the price a discriminating factor in the food purchasing choice are less willing to pay an extra price for IPM cereals but are more willing to do it for fruits and vegetables. Another difference concerns the variable *Low_income* which has a negative coefficient statistically significant only for fruits and vegetables. Income variables are instead not significant.

	(1)	(2)	(3)	(4)
Variables	**Purchasing**	**Purchasing**	**Purchasing**	**Purchasing**
Cereal_higher_ price	**0.128**** (0.0532)	**0.122**** (0.0539)	**0.124**** (0.0548)	**0.108*** (0.0551)
F&V_higher_ price	–0.0245 (0.0699)	–0.0306 (0.0707)	–0.0255 (0.0747)	–0.0405 (0.0748)
R^2	0.079	0.093	0.100	0.126

Table 11.6. *Regressions of IPM purchase in the last six months on willingness to pay for IPM cereals and IPM fruits and vegetables*

Table 11.6 shows the results of the regression of IPM purchasing in the last six months dummy on the dummy stating whether the interviewee is willing to pay a higher amount (at least 1%–20% more) to buy IPM products (cereals and fruits and vegetables) in the four different specifications. The results of the regressions show the existence of a correlation between the willingness to pay a higher price to buy IPM cereals and the purchase of IPM products. People willing to spend more have a higher probability (+10.8%) to buy IPM products. The dummy for the willingness to pay a higher price to buy IPM fruits and vegetables is not statistically significant. Families with a high number of people are less likely to buy IPM products (−14.1%).

What also emerges is that those consumers who usually purchase food directly from producers and/or farmers are more likely to have bought IPM products (+9.7%). This result is in line with the expectations since such consumers should be moved by a more aware food-purchasing choice. Consistent with the expectations, those who consider income as a determinant factor in their food choice have a smaller probability to buy IPM products (–3.5%).

11.4.3. *Descriptive analysis on different patterns of behavior on food choice between European and Chinese respondents*

The comparison between Europe and China of consumers' behavior regarding the purchase of IPM products started with the analysis on the perceived and the actual familiarity with IPM products (Table 11.7). Almost 57% of the Europeans thought of being familiar with IPM, against 60.2% of the Chinese. Looking at the actual knowledge, however, only 29% of Europeans and 32% of Chinese know what IPM means. There are significant differences between the two regions only for what concerns those who are willing to pay for IPM products a price 21%–50% higher than its equivalent for traditional products (fewer European consumers in percentage terms) and those who are instead not willing to pay more (fewer Chinese consumers in percentage terms).

IPM familiarity				**IPM actual knowledge**			
	Total	EU	China	**Knowledge**	Total	EU	China
Yes	57.1	56.7	60.2	**Yes and correct**	52.4	52.3	53.2
No	42.9	43.3	39.8	**Yes, but incorrect**	47.6	47.7	46.8

Table 11.7. *IPM familiarity and knowledge, EU and China (%)*

In both regions, about 60% of respondents are willing to pay a 1%–20% higher price for fruits and vegetables, whereas more than 50% for cereal (Table 11.8). The percentages related to the willingness to pay for organic products are very close to those reported in Table 11.8. Another comparison refers to the percentage of respondents who

have declared of having (or not) purchased IPM products and/or organic products in the last six months. Less than 27% of the respondents have bought IPM products. European consumers are more likely to buy IPM products with respect to the Chinese consumers. The same trend occurs if we consider organic products, but the percentage is much higher especially for the European consumers (73.5% against 40% for Chinese consumers).

	Willingness to pay a higher price	IPM		Organic	
		EU	China	EU	China
Fruits and vegetables	0%	23.4	6.2	19.1	7.2
	1%–20%	57.1	60.4	53.0	58.0
	21%–50%	14.2	29.2	22.0	27.6
	More than 50%	5.3	4.2	5.9	7.2
Cereals	0%	40.5	18.9	34.4	13.9
	1%–20%	51.1	54.7	52.5	56.9
	21%–50%	6.3	22.6	10.4	26.4
	More than 50%	2.1	3.4	2.7	2.8

Table 11.8. *Willingness to pay higher prices for IPM and organic products, EU and China (%)*

The majority of European and Chinese respondents familiar with IPM methods buy IPM products because they consider them healthier (72% of Europeans and 66% of Chinese), for ethical reasons (Europeans are more sensitive to the ethical aspect, 49.2% against 21.3% of Chinese), and because they are aware that they have a lower impact on the environment (Chinese present a higher percentage, 51.1% against 29.6% of Europeans). The main reason for which respondents do not purchase IPM products remains the lack of knowledge and the inability to recognize these products (44.1%): some 51% of Chinese and 43% of Europeans stated so. The second main reason is related to the lack of offers (around 36% of Europeans and 28% of Chinese). Around 13% of Europeans and 7% of Chinese prefer instead organic products. For what concerns organic products, there is not a predominant reason. The two main reasons for not

purchasing those products are that people consider them too expensive (30% of Europeans and 25% of Chinese) and believe that conventional products are good too (35% of Europeans and 28% of Chinese).

There are significant differences in the answers between European and Chinese respondents also for what concerns the safety perception of IPM and organic products. About 40% of European respondents consider IPM products safe against only 17% on the Chinese side. Moreover, there is a smaller number of Europeans who think that IPM is not safe (2.9% against 7.5% of the Chinese). The trend related to organic products present a similar behavior. Principally, respondents do not consider IPM products safe because there is still the possibility of using pesticides (more than a half of the interviewees). Chinese respondents tend to be more afraid about the safety of products than Europeans; however, they are less afraid about the use of pesticides (8% against 64%). Considering organic products, the main problem is related to the fear that they still might contain chemicals (e.g., copper and cyanide). Around 17% of respondents do not trust the certification because of the lack of controls. There are no significant differences between the two considered areas.

11.5. Discussion and conclusions

Many insights have been found through the data analysis of the survey. Most of the findings are consistent with the mainstream literature. Likewise, in Ma and Qin [MA 09] and Zhang [ZHA 11], highly educated people are more likely to be familiar with IPM. The youngest generation is instead less likely to know what IPM is. Different from the majority of the literature, in our analysis, there is a higher number of males who consider themselves familiar with IPM. This contrasting result confirms what was found in the research conducted by Ma and Qin [MA 09]. In strong contrast with the prevailing literature, income was not found correlated with the respondents' consumption choices, but a similar result was reported in the studies conducted by Smith *et al.* [SMI 09] and McCarthy [MCC 15]. However, the size of the household affects the probability to buy IPM products: the larger the family, the smaller the probability to purchase such products. Household size can be considered as a

proxy for income. The size is a factor often found significant in many researches such as in Zhang and Han [ZHA 09]. Another interesting result is given by the fact that the respondents are willing to pay a higher price to buy IPM food; however, the increase must not exceed 20% of traditional food prices. Consumers' acceptance to pay only for a relatively low-risk premium was already highlighted by Lefebvre [LEF 15]. A better knowledge of IPM, however, generates an increase in the purchase and in the safety perception. It is also interesting to note that even if the EU Directive 2009/128/EC introduced the requirement to follow IPM principles for all farmers, meaning that all agri-food present in the market should be IPM, none of the respondents mentioned it, highlighting the lack of awareness. On the basis of the results of the research, the following policy recommendations have been elaborated to boost IPM diffusion. The analysis has highlighted how most of the respondents (both European and Chinese) are not aware about the IPM approach and its characteristics. In addition, it showed a positive relation about the knowledge of IPM and its purchasing (even at a slightly higher price than normal products). Therefore, it is necessary to activate actions to make (potential) consumers more familiar with these products. Information and raising-awareness campaigns should be based on the diffusion of a message about the quality and the safety of such products since a considerable part of the interviewees still have some concerns about them. In addition, it is recommended to increase the recognition of IPM products once placed in the market, since consumers tend to have difficulties in identifying them during the purchasing process. At the same time, it is necessary to introduce specific regulation rules regarding nonchemical methods in order to control plant diseases and insect pests to guarantee, on the one hand, the safety of the products and, on the other hand, fast, informed, and science-based choices. Lastly, it is fundamental to economically support farmers for the production of IPM food since there is an insufficient availability of IPM products in the market.

11.6. References

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