Conventional and organic food styles in a multidimensional perspective of sustainability

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Abstract

Conventional and organic food styles have been analysed to describe behavioural, nutritional and environmental profiles, and to propose research hypothesis for a multifaceted analysis of food consumption. A pilot group of 30 households (96 individuals) was investigated to understand their attitudes towards nutritional and environmental issues in food choices, and to assess their diets in terms of nutritional adequacy and of environmental impact. The descriptive analysis point out different profiles of food styles that need to be further tested. Organic consumers seem to follow nutritional recommendations; their diet is characterized by a reduced fat content and a higher intake of dietary fiber, fruit and vegetables, and vitamins minerals; they present a better environmental profile. Conventional diet has a high lipid content and a reduced intake of fiber, fruits and vegetables; moreover, it has a higher environmental burden. Our descriptive findings show the enrichment of a multidisciplinary approach.

Keywords
conventional diet, organic food style, food consumer behaviour, nutritional adequacy, environmental assessment

Introduction

Food consumption style is a complex theme influenced by a range of internal and external factors whose comprehension is essential in the analysis of consumer choices and purchase decisions, and also in supporting the supply side of the market through effective marketing tools.
Literature has developed theories on behaviour, attitudes and determinants of sustainable consumer food choices (see Boccaletti, 2008; Higgs, 2015; Verain *et al.*, 2012), proposing different categories of relevant attributes, as well as assessing this behaviour from distinct perspectives and disciplinary approaches. Apart from many economic, social and cultural

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drivers, consumer behaviour is also influenced by environmental concerns. Environmentally responsible food choices are related to individual awareness about environmental and food safety problems; furthermore, these choices may have environmental and health effects. By purchasing environmentally responsible food products - including a wide range of products, among which organic foods- consumers are responsible for the effects of their food consumption choices (Boccaletti, cit; Lockie *et al.*, 2006). Recently, social responsibility in food consumer behaviour, ethical and cultural issues (Coff, 2006; De Tavernier, 2012; Johnston *et al.*, 2011; Michaelidou and Hassan, 2008; Pecoraro and Uusitalo, 2014) and a growing concern about nutritional and health issues, have been highly considered (Salvatori *et al.*, 2011).

Attention has been devoted to organic food choices, considering how and in what measure several aspects -such as health, quality, value and ethics, price, trust and food safety, as well as environment and animal welfare-, play a role in influencing consumer behaviour. Many studies assessed the environmental impact of food consumption and dietary habits, among which some focused on GHG emissions (Carlsson-Kanyama *et al.*, 2009; Duchin, 2005); this impact is linked to energy requirements for farm production, transport, domestic and industrial processing and cooking. GHG emissions from agriculture are linked to production techniques, natural processes in soils, and animal metabolism. Carbon dioxide emissions are mainly due to the intensive agriculture and the related fossil fuel and fertilizer requirements; methane emissions origin from fermentative digestion by ruminant livestock, stored manures, and rice grown under flooded conditions. Thus, different diets with similar caloric contents may be quite different in GHG emissions level (Pirog and Larson, 2007).

The paper describes food consumption styles in the socio-economic, environmental and nutritional perspectives. Organic and conventional diets have been compared with the aim to get some perceptions of differences in the attitudes towards nutritional and environmental aspects related to food choices, in the nutritional adequacy of food habits, and in their environmental impact. Explorative findings of a pilot research that suggests some hypothesis to be further investigated are reported. As far as the socio-economic analysis is concerned, the paper investigates consumer attitudes towards the nutritional and environmental dimensions of food choices, both of conventional and of organic consumers. As some studies highlighted (Verbeke, 2006), there may be a gap between positive attitudes towards sustainable behaviour and the purchase of sustainable food products; in this paper, the sustainable attitudes measured trough the socio-economic survey were complemented by the sustainable food consumption revealed trough the nutritional and environmental analysis of the diets. The nutritional analysis addresses the following issues: a. the evaluation of food intake from conventional and organic foodstuffs; b. the assessment of nutritional dietary obtained by the two methods of production; c. the assessment of the nutritional adequacy of the diets. Regarding the environmental perspective, the environmental impacts of diet habits characterized by different organic and conventional foods consumption have been compared. The three perspectives have integrated attitudes in food choices and actual food consumption, and have been tested on the same group of units. The group was small sized and non-random, thus results had just a descriptive aim and could not be generalized.

Data and methods

A peculiar aspect of the present research is the joint collection of economic, nutritional and environmental data on the same units. Households with a homogeneous composition were recruited. Household characteristics (household size and components, age, education level) were defined according to some literature about the profile of organic consumers, even though consistent findings are not always found (Ismea, 2005; Cicia *et al.*, 2007; INEA, 2009; Annunziata *et al.*, 2009; Lockie 2002; Denver *et al.*, 2007): households with 3-4 components, with at least one child not of age, and with at least one parent graduated. Households were recruited in five Italian cities (Rome, Bari, Campobasso, Perugia, Torino). A group of 30 households (96 people) was considered and categorized homogeneously for number in Conventional, Bio-Weak and Bio-Strong profiles. Bio-Weak and Bio-Strong profiles were defined according to at least two of the following criteria (Forleo and Di Nocera, 2014): the percentage of organic food expenditure on total food expenditure (cut point: 20%); the percentage of organic food quantities (in weight) on total food intake (cut point: 20%); and the frequency of purchase of organic food (cut point: once a week). People defined as "Conventional" did not buy organic food. Data collection started at the end of 2012 and continued to the end of 2013 to get food diets in the four different seasons.
A questionnaire was administered to that household member with the primary responsibility in food purchasing to collect data regarding attitudes and food consumption behaviour. Socio-economic analysis started from a survey of the consumer's knowledge on organic food features, production technology, and health benefits of their consumption. Then, consumers were asked to motivate organic or conventional food consumption, and about socio-economic aspects that might lead them to purchase organic food. One section of the questionnaire focused on attitudes towards nutritional and environmental issues in food choices, on the information needs, and on the individual willingness to pay (WTP) for purchasing foodstuffs with high nutritional and environmental values. Moreover, every participant was asked to record all foods eaten on hard-copy diaries that were structured by meal and administered during three consecutive days in each season. All foods and beverages ingested had to be registered, indicating the name and specifying whether organic or conventional. The assessment of individual diaries allowed to estimate the dietary intake of several nutrients and to compare eating behaviour of conventional and organic individuals with reference to the Italian population (LARN 2014) (protocol and methodology detailed in Leclercq *et al.*, 2009). Finally, the data of the personal diaries was used to measure the environmental impact of each food through the Life Cycle Analysis (LCA) using PrèConsultant SimaPro rel.7. The "Environmental Product Declarations (EPD)" method was selected in order to express the environmental impact of the various foods according to the GHG emissions, because of its handiness in comparing many foods using a single indicator (gCO_2 eq/kg). Results of LCA have been compared to available literature data base and confirmed according to foods origin, production technique, quality, transport, processing, etc. (Hoolohan *et al.*, 2013; Roma *et al.*, 2015; Roy *et al.*, 2009; Sonesson *et al.*, 2009).

Results and discussion

Respondents' attitudes towards some nutritional and environmental aspects related to their food choices have been investigated. Table 1 summarizes respondents' answers reporting the frequencies by consumer groups.

Table 1. Attitudes towards nutritional and environmental diet related issues (% of answers by consumer's type).

	Conv	BIO-Weak	BIO-Strong		Conv	BIO-Weak	BIO-Strong
Importance given to the nutritional fact label				*Importance given to the ingredients of food*			
Never	44.4	0.0	0.0	Never	22.2	0.0	0.0
Seldom	0.0	33.3	16.7	Seldom	22.2	22.2	16.7
Frequently	44.4	33.3	50.0	Frequently	33.3	22.2	16.7
Always	11.1	33.3	33.3	Always	22.2	55.6	66.7
Information needs about the nutritional content of food				*WTP for buying food with high nutritional contents*			
No/few	0.0	11.1	0.0	Nothing	22.2	11.1	0.0
Some	66.7	33.3	33.3	Small amount	0.0	22.2	16.7
A lot of	33.3	55.6	66.7	Fair	55.6	22.2	50.0
				High amount	22.2	44.4	33.3
Information needs about the health benefits of food				*WTP for buying food with high health benefits*			
No/few	0.0	11.1	0.0	Nothing	22.2	11.1	0.0
Some	33.3	22.2	16.7	Small amount	0.0	0.0	0.0
A lot of	66.7	66.7	83.4	Fair	33.3	22.2	0.0
				High amount	44.4	66.7	100.0
Information needs about the environmental impact of food				*WTP for buying food with low environmental impacts*			
No/few	22.2	11.1	0.0	Nothing	22.2	0.0	0,0
Some	44.4	22.2	16.7	Small amount	22.2	0.0	0,0
A lot of	33.3	66.7	83.3	Fair	33.3	55.6	33,3
				High amount	22.2	44.4	66,7
*Household's pro-environmental behaviour - Mean aggregated index**					1.21	1.65	1.92

* This index measures the average score that respondents gave about the frequency of some of their consumption choices that could benefit the environment (Recycling; Use of public transportation; Separate waste disposal; Non plastic bags; On tap products; Renewable energy; Environmental association; Energy efficiency of products). Single scores were from 0=never, to 4=always.

Source: own elaboration

Respondents considered themselves quite diligent to the household's diet: indeed, slightly less than half of the respondents declared to follow a "healthy" diet (see also Grunert and Wills, 2007; Idda *et al.*, 2008; Naspetti and Zanoli, 2009). However, more than 75% of the respondents did not know their caloric needs; in this case, no differences appeared between Conventional and Organic food consumers. Regarding the importance given to the nutritional label, 25% of participants declared they always read the labels, 41% of them frequently considered them, 17% rarely and 17% never read the nutritional labels. Those who never care about nutritional facts were all Conventional consumers; in the Organic groups, the 33% declared they regularly look at the nutritional table. Moreover, respondents paid more attention to the ingredients than to the nutritional facts. Regarding information

needs, Organic consumers asked for "a lot" of information both about nutritional and health aspects, while Conventional households put a priority on having information about the health benefits related to their food consumption (see Table 1). Finally, the disposition to pay more, to buy food with better nutritional contents was positive and seemed slightly higher for the Strong Organic consumers (nothing 0%; a small amount 16.7%; quite a lot 50%; very much 33.3%) than for the other groups.

The weak attention respondents gave to the nutritional facts would be an interesting topic to explore further in order to understand its determinants: on the one hand, consumers might have less confidence and knowledge about the nutritional information; on the other hand, they might fail in linking nutritional adequacy and health benefits, benefits on which they seemed highly attentive.

As far as the nutritional assessment of the diets is concerned, results for single nutritional variables revealed a statistically significant difference between those following a Conventional diet, and those adopting a Bio-Weak and a Bio-Strong diet (Table 2).

Table 2. Mean daily intake of nutrients stratified for consumers' styles.

Nutrients	Conventional		Bio-Weak		Bio-Strong		P
	Mean	SE	Mean	SE	Mean	SE	
Protein (%En)	16.67 ^{a}	0.19	16.42 ^{ab}	0.21	15.81 ^{b}	0.19	< 0.05
Fat (%En)	37.73 ^{A}	0.39	35.81 ^{B}	0.39	35.27 ^{B}	0.49	< 0.001
Saturated fatty acid (%En)	11.73	0.19	11.29	0.19	11.13	0.24	n.s.
Monounsaturated fatty acid (%En)	17.69	0.24	16.91	0.25	16.97	0.28	n.s.
Polyunsaturated fatty acid (%En)	4.89 ^{A}	0.14	4.44 ^{B}	0.07	4.19 ^{B}	0.08	<0.001
Oleic acid (g)	35.3 ^{A}	0.81	30.99 ^{B}	0.71	44.82 ^{C}	1.47	<0.001
Linoleic acid (g)	8.19 ^{A}	0.27	6.92 ^{B}	0.21	9.43 ^{C}	0.34	<0.001
Linolenic acid (g)	1.28 ^{aA}	0.04	1.12 ^{bA}	0.03	1.51 ^{B}	0.05	<0.001
Dietary cholesterol (mg)	269.21 ^{A}	10.24	212.44 ^{B}	7.61	283.44 ^{A}	12.79	< 0.001
Available Carbohydrates (%En)	45.38 ^{A}	0.48	46.26 ^{a}	0.48	48.24 ^{Bb}	0.54	< 0.001
Starch (g)	143.85 ^{A}	3.44	138.63 ^{A}	3.85	199.99 ^{B}	6.61	< 0.001
Sugar (g)	69.39 ^{A}	1.69	67.65 ^{A}	1.50	101.13 ^{B}	3.24	< 0.001
Beta carotene (µg)	2,472.29 ^{A}	130.06	2,598.18 ^{A}	138.63	6,652.6 ^{B}	664.41	< 0.001
Vit C (mg)	108.9 ^{A}	4.18	104.03 ^{A}	4.63	161.17 ^{B}	7.91	< 0.001
Vit E (mg)	12.24 ^{A}	0.31	10.62 ^{B}	0.26	15.35 ^{C}	0.52	< 0.001
Total folate (µg)	310.86 ^{A}	9.69	248.79 ^{B}	9.85	479.03 ^{C}	19.47	< 0.001
Iron (mg)	10.8 ^{A}	0.48	9.75 ^{A}	0.28	15.3 ^{B}	1.19	< 0.001
Water (g)	1,590 ^{A}	32.91	1,433 ^{B}	22.61	1,964 ^{C}	43.96	< 0.001

Superscript letters refer to the results of the Scheffè method applied to test the hypotheses that the means of all pairs of groups are equal in post hoc multiple comparisons.

^{a,b,c} Scheffè test, unequal letter within same row indicate significative difference (P < 0.05).

^{A,B,C} Scheffè test, unequal letter within same row indicate significative difference (P < 0.01).

n.s. = not significant. En: total energy of a diet.

Source: own elaboration

Regarding the proteins, all groups were in the normal range 12-18% (LARN, 2014) of the total energy of a diet (En), although a smaller percentage in Bio-Strong individuals was observed compared to the Conventional ones. Also regarding the lipid profile, a lower

percentage level was obtained in Organic consumers (both Bio-Strong and Bio-Weak), with statistically significant differences between these groups and the Conventional one.
The fat percentage was over the upper limit of the range (35 % En) for the Conventional and at the upper limit for Bio-Strong and Bio-Weak. These data were similar to a previous study of the Italian population, which showed an average intake of total lipids of about 36% of total energy (Sette *et al.*, 2011).
The acidic profile did not show statistically significant differences for both saturated and monounsaturated fatty acids, even if the Bio-Strong participants take a greater amount of oleic acid, contained mostly in extra virgin olive oil. The values of polyunsaturated acids, although greater in Conventional, were similar (4-5 % En) to those reported by Sette *et al.* (2011) indicating not high intakes in the Italian population. As regards the amount of essential polyunsaturated fatty acids (Linoleic and Linolenic acids) intake, in Bio-Strong individuals a higher value than Conventional was observed. In Bio-Strong the diet contributions of Linolenic acids were higher than those recorded (1.4 g/day) in the Italian population survey INRAN-SCAI 2005/05 (Leclercq *et al.*, 2009). All groups were below the maximum value (300 mg/day) of cholesterol intake. Bio-Weak group had an intake of cholesterol lower than the other two groups. Carbohydrate intake was in the reference range for all nutrient profiles, even if the Bio-Strong respondents assumed a greater amount of starch and soluble sugars.
Bio-Strong subjects had a daily consumption of fruit and vegetables that was higher (509 g) than the other groups. and even higher than the recommended level (the FAO/WHO report published in 2004 recommends a minimum of 400 g of fruit and vegetables per day). Consequently, they showed a significantly higher value of dietary fiber intake compared to the other groups (Figs 1-2).

Figure 1. Dietary fibers intake (g/day)

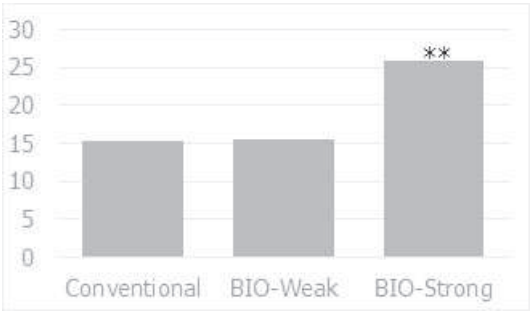
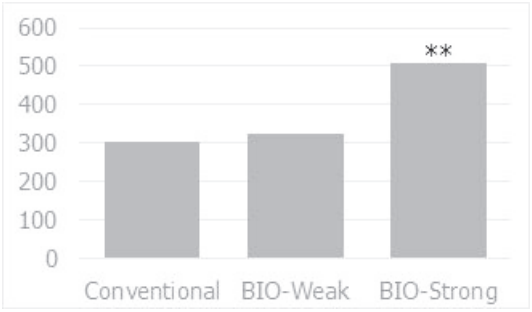


Figure 2. Fruits and vegetable consumption (g/day)



** Scheffè test, P<0.001. See the legend of Table 2.
Source: own elaboration

A characteristic feature of Bio-Strong diet was also a higher consumption of antioxidant pro-vitamin and vitamins (Table 2): β-carotene (about 1100 RE/day, well below the maximum tolerable level), vitamin C (even if all groups are above the recommended values) and vitamin E (that only in this group exceeds the adequate intake value of 13 mg for male adults). Even if folates are contained in animal and vegetal food, a marginal deficiency of

them may occur; in fact, only in the Bio-Strong group they reached the recommendations value for adults (400 µg/day). Iron deficiency is the most common cause of anaemia; in the Bio-Strong individuals, this element was above the average intake of 11.4 mg/day in the Italian population (Sette *et al.*, 2011). Finally, water intake level over 1400 mL/day (excluding the 250-350 mL/day of metabolic water production) seemed adequate in sedentary adults to compensate the losses (LARN, 2014).

As far as the environmental impact of food consumption styles is concerned, the hypothesis suggested is that the environmental impact of food matters most the Organic consumers, at least in terms of respondents' information needs on the environmental impacts of their food choices, and in terms of their WTP for a less impactful food (see Table 1). Among Conventional respondents, the 22% seemed insensitive to the environmental food related issues, in that they did not appear interested in having information and they were not willing to pay anything to reduce the environmental burden of their food consumption. These results are in line with some research findings about organic food consumption, individual lifestyle and people's environmental awareness (Pellegrini and Farinello, 2009; Gracia *et al.*, 2008; Nie *et al.*, 2011; Pino *et al.*, 2012), and with studies that focused on consumer' information needs and willingness to pay (Annunziata *et al.,* 2009; Cicia *et al.*, 2009; Krystallis *et al.*, 2012). In addition further testing this hypothesis, it might be interesting to see if informed people, both of conventional and organic types, would actually change their diet accordingly to their environmental burden; and whether the WTP disposition and the amount declared would be really paid to reduce the environmental impact of food consumption. Furthermore, the Organic food consumption appeared related to other pro-environmental behaviour. We asked respondents about the frequency (from 0=never; 1=seldom; 2=sometimes; 3=often to 4=always) with which they made some consumption choices with low environmental impact (Recycling; Use of public transportation; Separate waste disposal; Non plastic bags; On tap products; Renewable energy; Environmental associations; Energy efficiency of products) and then aggregated the scores into a global index. The mean value of this index (see Table 1) appeared higher in the Strong Organic group that in the other groups, even if on the whole the scores were not very high.

Moving on to the environmental assessment (Table 3), our findings suggested that the differences in environmental performances of diets have to be ascribed both to the differences in food quality (organic or conventional), and to quantitative differences in the composition of diets that, as shown by nutritional analysis, resulted with some best indexes in organic dietary habits. The Conventional diet had a total daily impact of 1,886.7 g CO_2eq/day, 19% higher than the Bio-Strong diet (1,583.8 g CO_2 eq/day); Bio-Weak diet GHG emission resulted quite similar to the Conventional one because of the small amount of organic food consumption. The top four food items (carbohydrates, meats, milk and dairy products, and fruits and vegetables) are responsible for about 80% of the overall impact in the Conventional diet model, and for 77% in the Organic one.

Results showed that carbohydrates (bread, pasta and rice, potatoes and desserts) had the highest responsibility of the total diets' GHG emission (28% of the total impact, both in Conventional and Organic diets), due to their great consumption. Meats returned about 22% of the total impact in Organic and 26% in Conventional diets. Meats groups were different between Organic and Conventional diets: Organic consumers eat more poultry and pork (unit

impacts about 6,000 g CO_2eq kg^{-1}) than cattle meat (unit impacts more than threefold times higher), so that the organic meats unit impact resulted about 42% lower than the Conventional one. Organic milk and dairy products showed a unit impact less than the conventional one (17% *versus* 20%). In importance of impacts, fruits and vegetables classified fourth; they were responsible for nearly 10.3 % of the emissions of the Organic diet and for 6.4% of the Conventional diet. The biggest impact of fruit and vegetables in the Organic diet comes from two causes: a. higher and more frequent consumption; b. poor environmental performance of organic vegetable products (with an impact 15% higher than the conventional), due to their yield, on average lower than that of conventional fruits and vegetable.

Table 3. Daily GHG emission

	Bio-Strong diet		Conventional diet	
	g CO2 eq emission/day	%	g CO2 eq emission/day	%
Carbohydrates	443.4	28.0	528.6	28.0
Meats	348.8	22.0	487.2	25.8
Milk and dairy	269.5	17.0	372.7	19.8
Fruits and veg.	163.0	10.3	121.5	6.4
The and coffee	94.8	6.0	98.6	5.2
Fish	89.7	5.7	79.5	4.2
Wine and beer	60.3	3.8	65.0	3.4
Others	114.4	7.2	133.4	7.1
Total	1,583.8	100.0	1,886.7	100.0

Source: own elaboration

Conclusions

In the paper, socio-economic, nutritional and environmental topics have been described in relation to organic and conventional food consumption styles. Our results might have only a descriptive value, due to limitations represented by the small size and the representativeness of the group of respondents. Hypothesis are drawn about consumption styles that should be studied in depth in order to give a high value results.

Organic food consumer. This consumer appeared more aware of nutritional aspects. Indeed, the Organic consumer, mainly the Bio-Strong, followed more careful nutritional recommendations, with particular attention to the intake of fruit and vegetables, fiber and some micronutrients -particularly the antioxidant vitamins-. Moreover, Strong Organic consumers showed a better environmental profile. Finally, Organic food consumers, mainly the Bio-Strong, were more aware of the environmental impact of the household lifestyle compared to other groups. Still, organic consumers cannot be considered as a single homogeneous category, presenting a more definite and peculiar trait in some cases, and a mixed profile in others. From a methodological perspective, a further research refinement concerns the criteria that it might be more suitable to define organic consumers, opening towards a definition of food styles (not simply conventional *versus* organic) wider than that usually adopted.

Conventional consumer. This consumer paid less attention to the nutritional value of the diet, especially the fat content, with a low consumption of fruits and vegetables. This diet was more impactful. Environmental impact and nutritional characteristics of foods did not trigger a significant need for information, nor a high willingness to pay a premium price.
The definition of food styles. The definition of food styles should consider multiple perspectives. In this study, the socio-economic, nutritional and environmental perspectives have been considered. A multiple approach requires an integration of surveys databases and a joint acquisition of data about the same consumption unit. Nevertheless, it is recommended to use some indexes (i.e., the food expenditure and/or another socio-economic indicator, the GHG emissions and/or the ecological footprint, an aggregate nutritional index and/or some critical nutrients) to synthetize the complexity of the different perspectives and to give a better definition of a food style.
In a research perspective that goes beyond the explorative aim of this pilot study, a larger size and representativeness of the sample are necessary to verify the robustness of our preliminary results and to validate some research hypotheses. If these hypotheses were verified, significant implications could derive for the economic, nutritional, and environmental perspectives and the sustainability of food styles. Assessing that being organic is an expression of a general lifestyle; that has a better nutritional balance; that causes a lower environmental impact, all hypotheses explored in this study, would lead to define a model of conscious and responsible food consumption and to give a more complete meaning to the "value" of food and of the organic diet. A global "value" of the organic food styles, that considers the nutritional and environmental motivations and implications, could be placed at the core of marketing tools, of information campaigns, and of public policies useful to increase the size of the organic market and to support the organic chain.

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References

Annunziata A., Pascale P. (2009). *Consumers' behaviours and attitudes toward healthy food products: The case of organic and functional foods*. 113th EAAE Seminar, Chania, Crete, Greece, September 3-6.
Boccaletti S. (2008). *Environmentally responsible food choice*. OECD Journal: General Papers, 125–162.
Carlsson-Kanyama A., Gonzalez A. D. (2009). Potential contributions of food consumption patterns to climate change. *American Journal of Clinical Nutrition*, 9, 1704S–1709S.
Cicia G., Del Giudice T., Ramunno I. (2009). Environmental and health components in consumer behaviour perception of organic food: estimation of willingness to pay. *Journal of Food Products Marketing*, 15(3), 324–336.

Coff C. (2006). *The taste for ethics: An ethic of food consumption*. The International Library of Environmental, Agricultural and Food Ethics Series, Volume 7, Springer Netherlands.
Di Nocera A., Fanelli R. M., Forleo M. B. (2013). *Drivers of consumer behaviour and green food attributes*. 134th EAAE Seminar, Paris, March 21-22.
Duchin F. (2005). Sustainable Consumption of Food. A Framework for Analyzing Scenarios about Changes in Diets. *Journal of Industrial Ecology* 9 (1–2), http://mitpress.mit.edu/jie Journal.
De Tavernier J. (2012). Food Citizenship: Is There a Duty for Responsible Consumption? *Journal of Agricultural and Environmental Ethics,* 25(6), 895–907.
FAO/WHO (2004). *Fruit and vegetables for health*. Report of a Joint FAO/WHO Workshop Kobe, Japan, September 1-3.
Forleo M. B., Di Nocera A. (2014). Sustainable choices: from motivations to purchases, from food to the lifestyle. In: de Gennario B.C., Nardone G. (Eds.), *Sustainability of the agri-food system: Strategies and Performances*. Proceedings of the 50th SIDEA Conference, ISBN 978-88-97683-60-5.
Gracia A., De Magistris T. (2008). The demand for organic foods in the South of Italy: A discrete choice model. *Food Policy*, 33(5), 386–396.
Grunert K. G., Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health*, 15, 385–399.
Higgs S. (2015). Social norms and their influence on eating behaviours. *Appetite*, 86(1), 38–44.
Hoolohan C., Berners-Lee M., McKinstry-West J., Hewitt C.N. (2013). Mitigating the greenhouse gas emissions embodied in food through realistic consumer choices. *Energy Policy*, 63, 1065–1074.
Idda L., Madau F. A., Pulina P. (2008). *The Motivational Profile of Organic Food Consumers: a Survey of Specialized Stores Customers in Italy*. EAAE 2008 International Congress, Ghent, Belgium, August 26-29.
Johnston J., Szabo M., Rodney A. (2011). Good food, good people: Understanding the cultural repertoire of ethical eating. *Journal of Consumer Culture*, 11(3), 293–318.
Kesse–Guyot E. (2013). Profiles of Organic Food Consumers in a Large Sample of French Adults: Results from the Nutrinet-Sante´ Cohort Study*. PLoS ONE,* 8(10): *e76998*.
Krystallis K. A., Grunert K. G, de Barcellos M. D., Perrea T., Verbeke W. (2012). Consumer attitudes towards sustainability aspects of food production: insights from three continents. *Journal of Marketing Management,* 28(3-4), 334–372.
LARN-*Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione italiana*. IV Revisione (2014).
Leclercq C., Arcella D., Piccinelli R., Sette S., Le Donne C., Turrini A. (2009). On behalf of the INRAN-SCAI 2005-06 Study Group. The Italian Nutritional Food Consumption Survey INRAN-SCAI 2005-06: main results in terms of food consumption. *Public Health Nutrition,* 12, 2504–2532.
Lockie S., Lyons K., Lawrence G., Halpin D. (2006). *Going Organic: Mobilizing Networks for Environmentally Responsible Food Production*. CAB International.

Michaelidou N., Hassan L.M. (2008). The role of health consciousness, food safety concern and ethical identity on attitudes and intentions towards organic food. *International Journal of Consumer Studies*, 32(2), 163–170.
Naspetti S., Zanoli R. (2009). Organic food quality and safety perception throughout Europe. *Journal of Food Products Marketing*, 15(3), 249–266.
Nie C., Zepeda L. (2011). Lifestyle segmentation of US food shoppers to examine organic and local food consumption. *Appetite,* 57, 28–37.
Pecoraro M. G., Uusitalo O. (2014). Conflicting values of ethical consumption in diverse worlds – A cultural approach. *Journal of Consumer Culture,* 14(1), 45–65.
Pellegrini G., Farinello F. (2009). Organic consumers and new lifestyles: an Italian country survey on consumption patterns. *British Food Journal*, 111(9), 948–1074.
Pino G., Peluso A., Guido G. (2012). Determinants of regular and occasional consumers' intentions to buy organic food. *The Journal of Consumer Affairs*, 46(1), 157–169.
Pirog R., Larson A. (2007). *Consumer perceptions of the safety, health, and environmental impact of various scales and geographic origin of food supply chains*. Leopold Center for Sustainable Agriculture – Iowa State University.
Roma R., Corrado S., De Boni A., Forleo M. B., Fantin V., Moretti M., Palmieri N., Vitali A., De Camillis C. (2015). Life Cycle Assessment in the Livestock and Derived Edible Products Sector. In B. Notarnicola et al. (Eds.), *Life Cycle Assessment in the Agri-food Sector*. Springer Publishing, Switzerland, DOI 10.1007/978-3-319-11940-3_5.
Roy P., Nei D., Orikasa T., Xu Q., Okadome H., Nakamura N., Shiina T. (2009). A review of life cycle assessment (LCA) on some food products. *Journal of Food Engineering,* 90, 1–10.
Salvatori G., Forleo M. B., Di Cesare C., Bracale R., Martino F., Di Iuorio E., Recchia R. (2011). Alimenti biologici e regime alimentare equilibrato. In: *Contributo delle Scienze Merceologiche per un Mondo Sostenibile,* Proceedings XXV Congresso Nazionale di Scienze Merceologiche, Trieste-Udine, September, 26-28.
Sette S., Le Donne C., Piccinelli R., Arcella D., Turrini A., Leclercq C. (2011). The third Italian National Food Consumption Survey, INRAN-SCAI 2005-06. *Nutrition Metabolism and Cardiovascular Disease*, 21(12), 922–932.
Sonesson U., Davis J., Ziegler F. (2009). *Food Production and Emissions of Greenhouse Gases,* SIK Report Swedish Institute for Food and Biotechnology, Göteborg.
Verain M.C.D., Bartels J., Dagevos H., Sijtsema S.J., Onwezen M.C., Antonides G. (2012). Segments of sustainable food consumers: a literature review. *International Journal of Consumer Studies*, 36(2), 123–132.
Verbeke W. (2006). Sustainable Food Consumption: Exploring the Consumer "Attitude – Behavioral Intention" Gap. *Journal of Agricultural and Environmental Ethics,* 19(2), 169–194.