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Innovation in the Italian Sector of Vending Machines. Between Growth and Search for Sustainability

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Abstract. Changes in lifestyles involve many aspects of food consumption widely analysed in literature, while the development of specific distribution forms, such as the vending machines, are less known and still perceived unsuitable to respond to the segmentation of demand. This sector is recording impressive growth rates. Italy is the country in Europe with the highest number of machines, as well as being leader in the production of machines and in the development of management services. This growth is not extraneous to the search for greater qualification of the foodstuff supply. The most recent data show numerous experiences aimed at introducing a more accurate selection of products supplied. Nevertheless, the agricultural sector doesn't seem to be adequately involved in the vending machines supply chain, except for some limited experiences. The objective of the paper is to analyse the most significant initiatives to assess whether they could contribute to the reinforcement of the role of agriculture and to the definition of new criteria within the selection procedures for vending services.

Keywords: vending machines, food consumption behaviour, public food procurement.

JEL codes: Q18, I12.

1. INTRODUCTION

Food consumption has changed dramatically in the last decades. Many issues have been added to the drivers of the consumer's choices, that go beyond the fulfilling of basic needs such as nutritional aspects and caloric intakes. Dietary and health concerns, ethical involvements, environmental issues, as well as, the needs to include services in food such as pre-cooked, portioned meals, pre-washed and dressed salads, and so on, have all modified the approach to food from consumers and, consequently, the supply of food on behalf of producers, processors and distributors.

It must also be said that, facing new determinants and drivers of consumption, consumers do not always show a very rational and consistent behaviour: even the most educated and aware consumers can choose food according to total contrasting needs and wants, so they choose one day innovative products and the next day they go for traditional meals, one day the choice is in favour of healthy food, while the following day they opt for fast food, and so on. There are many explanations for this apparently inconsis-

ent behaviour, but the result is that all categories of food are necessary on the market and increasingly demanded by the consumers. Most of the determinants affecting the evolution in food consumptions have been widely analysed in literature (Gracia, Albisu, 2001; Mazzocchi *et al.*, 2009; Sotte, 2010; Capacci *et al.*, 2012; Mazzocchi, Capacci, 2013; Ajzen, 2015; Leng *et al.*, 2017), while aspects related to the development of some specific forms of food and drink distribution are less investigated and are still perceived as distant and less suitable to respond to the deep segmentation of demand and to a positive development of desirable habits in agri-food business and food consumption. In particular, the sector of automatic distribution is gaining attention in the scientific literature and in programmatic reports by public institution in order to identify strategies to prevent the spread of undesirable eating habits.

The history of vending machines dates back to ancient times¹, but their growth doesn't seem to show a downward trend in the next future. Forecasts about the global vending machine market predict a significant rate of worldwide increase (Global Market Insights, 2019), with the most relevant growth pulled by beverage dispensing machines. In particular, the European market is rapidly growing also thanks to the development of advanced technologies, through the massive introduction of the so-called intelligent vending machines. Adding intelligence to automatic distributors helps customers in gaining information about the products, allows brands and operators to use cloud services and data analytics, leads to a reduction of operating costs and so on². A significant contribution to the growth of the sector could also arise from the introduction of new modes of payment (cashless transactions), up to the use of biometric technologies through facial or fingerprint identification³. Moreover, players of automatic vending machines are progressively developing eco-friendly behaviours aimed at introducing more sustainable technologies in all the segments of the chain, making the sector more compliant with environmental requirements.

Therefore, there are many valid reasons to explore this world without any prejudice and with a positive view. Firstly, it is a fast-growing new mean of reaching consumers in public food procurement; secondly, Italy is leader in the production of vending machines and in their presence in public venues, such as schools, offices,

universities and hospitals; finally, they can potentially spread issues that are relevant in terms of sustainability and new styles of consumption, so that they can be seen as a new relevant actor addressing the issues of multifunctionality and segmented food consumption. In this paper, we analyse the Italian sector of vending machines operating in the beverage and food sector, as a strategic component of public food distribution that is growing at a fast pace but that is still perceived as a vehicle of unhealthy lifestyles and consumption habits.

The aim of this paper is to add to the prevailing literature (presented in section 2) a preliminary analysis about the future development of the vending machine sector, in the light of the recent evolution of the consumers' behaviour (section 3) and of the structural organization of the automatic vending food chain in Italy (section 4). The attention is focused on the potential impact that can be drawn starting from the analysis of some Italian innovative experiences, also in the view of the likely introduction of specific public constraints for better regulating the automatic sale service (section 5). The paper outlines how the vending machine sector is still barely explored in Italy, even though Italy is a leading country in the production and diffusion of such machines. The analysis offers a wide range of potential material for further researches, also in order to foster the role of agricultural sector within this specific food chain.

2. LITERATURE REVIEW

Studies about automatic distribution, carried out in different parts of the world, mainly in non-European countries, have mostly been focused on healthy and dietary issues, and more recently on changes in purchasing preferences, resulting from changes in sales' mechanisms and advertisements (selection and labelling of products). In these studies, vending machines are generally pointed out as one of determinants contributing to the spread of incorrect dietary behaviours, providing easy access to snacks and beverages characterized by a low nutritional value made available in many highly populated places.

The availability throughout the day of energy-dense nutrient-poor foods and beverages, containing added sugars, fats and salt, can certainly contribute in increasing undesirable behaviours, especially if those purchasing choices are determined by the lack of valid alternatives, due the fact that in many circumstances the healthy options of choice are completely absent or barely offered (Rosi *et al.*, 2017; Grech *et al.*, 2017; Shi *et al.*, 2018).

¹ Hero Tzebus of Alexandria in Egypt was the inventor of the first automatic machine in 219 BC (Bocchini, Gambino, 2011).

² Nowadays, a share of over 25% of the intelligent vending machines installed is allocated for the sale of food and beverages.

³ In the selling of age-restricted products, such as cigarettes and alcohol, biometric machines allow to dispense the products on the base of age parameter of clients.

The analysis of the existing literature shows that, since the early 80s it has been investigated the impact of providing nutritional information on the vending items and introducing at the same time low calorie products in the machines (Wilbur *et al.*, 1981). Quite interestingly, the results indicated that the sale of lower calorie items was quite successful independently from the presence of nutrition information. More recently, a Canadian pilot study, about the introduction of healthy snacks in school vending machines, has investigated the need to combine health issues with profitability (Callaghan *et al.*, 2010). Indeed, this is a major issue for the sector: despite the upward trend of sales of healthier products, in the period analysed overall revenues in vending machines declined quite substantially, given the higher prices of these products and the mis-perceived level of quality by consumers. This shows how the whole concepts of quality and health in vending machine products are perceived differently by the purchasers, in that they are usual to look for «real healthy products» elsewhere.

On the other side, French *et al.* (2011) examined the role of price on the purchases of low-fat snacks from vending machines, concluding that reducing relative prices may be effective in promoting lower-fat food choices in the population and that vending machines may be a feasible method for contributing to modify nutritional standards. Carrad *et al.* (2015) show in their work how respondents to a survey selected among university students considered the current range of snacks and drinks in vending machines as too unhealthy. However, participants were able to identify healthier snacks when products were accompanied with any sort of front label (although participants were less likely to be able to identify the healthier products in the case of drinks).

A number of other studies around the world (Delvina *et al.*, 2010; Grechc, Alman-Farinelli, 2015; Pharis *et al.*, 2017) have pointed out that increasing the availability of healthier options, included the reduction of the size of the portions, inside the limited space of vending machines⁴, results as a suitable option in improving consumers behaviours in favour of products that are more advisable, both from the point of view of public health and of the sustainability of production processes.

In Italy most studies have focused on the vending machines as a vehicle of diffusion of unhealthy foods throughout the day⁵. A research carried out at the Uni-

versity of Parma meant at increasing the purchases of healthy foods in vending machines through nutrition communication showed that the purchase of healthy foods increased after improving the nutritional quality of the available products (Rosi *et al.*, 2017). Product replacement was successful in increasing healthy product sales, while decreasing unhealthy choices. On the contrary, the study reports how the addition of a point-of-sales nutrition information service only discouraged choices of less favourable foods without impacting notably on consumer behaviour and promoting healthy dietary patterns.

3. FROM HOME CONSUMPTION TO VENDING MACHINES

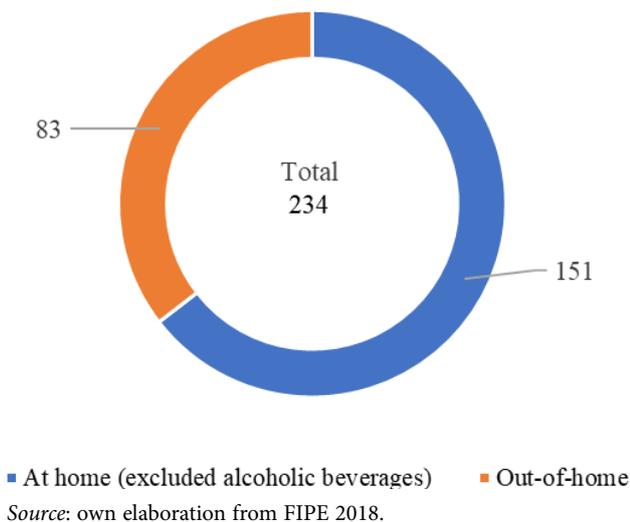
Changes in lifestyles involve many aspects of food consumption including the composition of the daily food basket, the partition into meals, the daily caloric intake, the level of transformation of foodstuff, the places where consumption takes place. They can even include issues related to the specific characteristics of products, such as: geographical origin, production method, compliance with production criteria, health aspects, compatibility with religious and ethical requirements. Vending machines, making available at all times snacks and drinks that are ready to use, are progressively taking part in the food distribution sector, with impressive growth rates both in Italy and in Europe. The services of vending have become part of the everyday life of many people staying long hours out of home, as witnessed by the fact that 52% of Italians claim to have used them at least sometimes in the last year. As a matter of fact, the analysis of consumers by age groups shows that the habit of purchasing through this channel is widespread especially among the younger generations: 73.5% of Millennials use vending machines. More in detail 27% of the Millennials use them daily, 30% from one to three times a week and an additional 19% from one to three times a month (CENSIS, 2017).

Over time, along with the sector, it seems that also the bad reputation of vending machines has grown, as one of the main factors that contribute to the spread of junk food. In fact, sales of food and beverages through vending machines are usually judged as a source for incorrect and risky food choices, linked with a low nutrient and unhealthy diet regimen. For this reason, it is worth to investigate to what extent the sector of automatic distribution is developing towards new forms of selling, in complying with new challenges in terms of sustainability and compatibility of diet. Italy represents

⁴ Usually a vending machine has the capability to offer space for the sale of about 40 items.

⁵ Other studies have focused mainly on technical issues, such as the health conditions in the sale of raw milk in vending machines (Arrigoni *et al.*, 2009; Lombardi *et al.*, 2016), while others with issues that, more generally, deal with short supply chain, direct sales of producers and food procurement (Aguilia *et al.*, 2009).

Fig. 1. Food consumptions of Italian families, 2017 (bill. of euros).



an interesting case of study, due the fact that is a leading country in this sector both for production and presence of automatic distributors in public venues.

Recent data about Italy reveal that the share of out-of-home food consumption has currently overcome 35.5% of the total (FIPE, 2017 and 2018), a percentage that is in line with the European average, equivalent to 36.7%. In addition, during the last ten years, at-home family consumption has decreased, while catering services and restaurants have increased by 5.7% their sales in real terms. Detailed information about the behaviours in food consumption put in evidence the high share of people who are used to take meals out-of-home, especially breakfast and lunch during the working days of the week (in both cases over 60% of population).

More than six Italians out of ten consume breakfast out-of-home, although with a different intensity: 14.4% is the share of those for whom this habit rises to at least 3 or 4 times a week, and 11.2% are those for whom this habit is a daily practice. The favourite venue is the traditional cafe, but some alternative channels appear progressively stronger. Among these, the vending machines result the favorite choice by 17% of people who have breakfast out-of-home. The growth of people having breakfast at vending machines is also due to the improvement in the quality of the items offered. For example, currently 85% of the coffee dispensed is made from coffee beans ground at-the-moment and kept inside vacuum-packed bells which guarantee quality and freshness. In addition, the new machines often allow the selection among different quality of products (beans from organic agriculture, fair trade etc.) and the possibility to customize the selection (adding or removing ingredients such as sugar).

An indirect confirmation of the role played by the sector of automatic food distribution in delivering meals or snacks during the first part of the day comes from the annual market Report developed by the Italian sectoral association. Data from CONFIDA⁶ reveal that vending in Italy is mainly oriented towards the breaks in the workplace (offices, schools, hospitals etc.), where represents the favourite option in comparison with coffee shops because useful in saving time. The most updated information reveals that vending machines are mainly located in private companies – factories (34%) and offices (17%) – while in the public administrations is located a further 20%, with schools and universities that cover the largest share (13%), followed by public and private hospitals (9%) and transit stations (3%), while other public spaces and leisure areas (such as parks, museums, sport centres etc.) play only a marginal role.

4. THE SECTORAL STRUCTURE OF ITALIAN VENDING

4.1. *The Italian leadership*

Italy boasts two important records in vending sector: it is the European country with the highest number of installations (machines), as well as is one of the world leaders in the production of machines and in the development of services related to their management (supply logistics, production of accessories, methods of payment, etc.).

Before describing the features of Italian food automatic distribution sector it's necessary to clarify its dual structure, that it is broken down in vending machines and portioned machines (i.e. for coffee capsules and pods), with figures that are almost equivalent in terms of volume and value of consumptions. The focus of the paper is on the former component (vending), characterized by the presence of free standing machines mostly belonging to two different categories, vending machines for hot drinks (coffee, cappuccino, chocolate, tea) and vending machines for snack, food, water and other cold drinks, whose turnover is around 1.9 billion euros (with an increase of +3% over 2017) for 5 billion worth of products consumed⁷.

Europe counts four millions vending machines operating in the automatic distribution of food and bev-

⁶ CONFIDA, established in 1979, is the Italian Association that represents the entire chain of automatic food and beverage distribution (<https://www.confida.com>).

⁷ The national market of automatic distribution (food and beverages), included the portioned sector (capsules and pods), reaches a turnover of 3.9 billion euros.

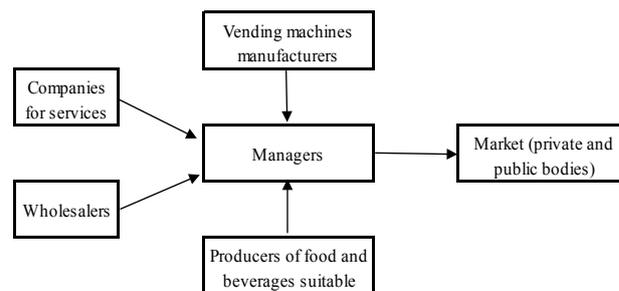
erages, equivalent to 1 unit for every 190 inhabitants, for a total annual turnover of around 15.9 billion (data by European Vending Association-EVA). In this area, Italy holds a leading position with over 822 thousand of vending machines installed (around 20% of the European total), equivalent to 1 unit for every 73 inhabitants, followed at a distance by France (600 thousand units) and Germany (550 thousand units).

The Italian vending supply chain is structured in different types of companies and actors (Fig. 2). According to Fontana (2014) it is possible to recognize three main professional players: i) vending machine manufacturers; ii) producers of food and beverages suitable for distribution in the automatic services network; iii) vending managers who hold the machines and install them at customers, selecting products offered and guaranteeing the performance of the related services. In addition, overtime two other actors have been added to the supply chain: wholesalers and specialized service companies, whose main purpose is to support vending managers in making the services more advanced and suitable to meet consumer expectations. Last but not least, it must be included the reference market, represented by venues (public or private) that grant spaces for placing the automatic distributors, that plays an increasing role through the rules adopted in determining the type and quality of the services requested.

The cornerstone of the vending chain is represented by the about 3 thousand companies of management, mainly represented by small and medium enterprises (80%). These companies purchase machines and products and make them available to customers, having the responsibility to manage all the maintenance and refills, plus the organization of the professional services required, which include many different aspects related with the use of machines, such as: systems of payment, collection of wastes and procedure for their reuse, remote control for saving transport costs and reduce emissions into the atmosphere, data download, analysis of sales and so on.

Despite the impressive figures in terms of companies, employees and turnover, the relevance of vending for the national economy become sevenmore evident considering the leading position of Italian manufacturers in the mechanical sector for the construction of machines (UCIMAC, 2019). Italy is one of the biggest world' manufacturers of automatic distributors for food and beverages, with a share of around 70% of the machines produced that are sold abroad, with significant growth rates both in Europe and in other relevant areas, such as far eastern countries. The positive results of this component of the manufacturing sector has reached such a dimension that

Fig. 2. Italian vending machines chain.



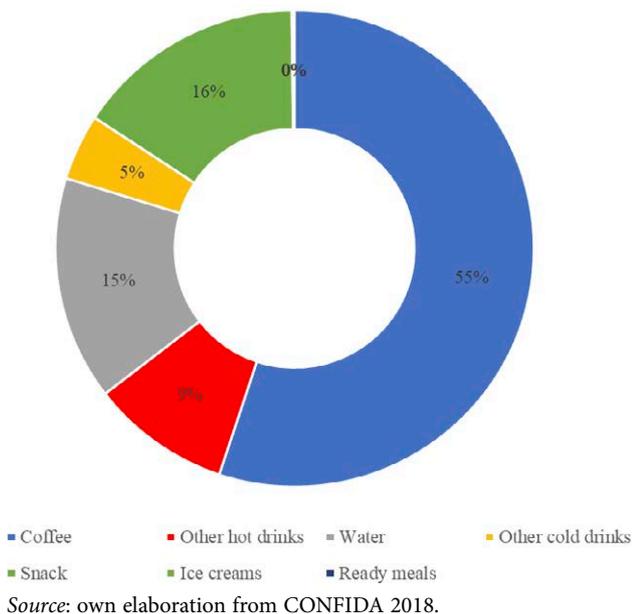
Source: own elaboration.

the production of vending machines is now considered strategic within the phenomenon of «Made in Italy» on the international markets.

4.2. What is there beyond coffee?

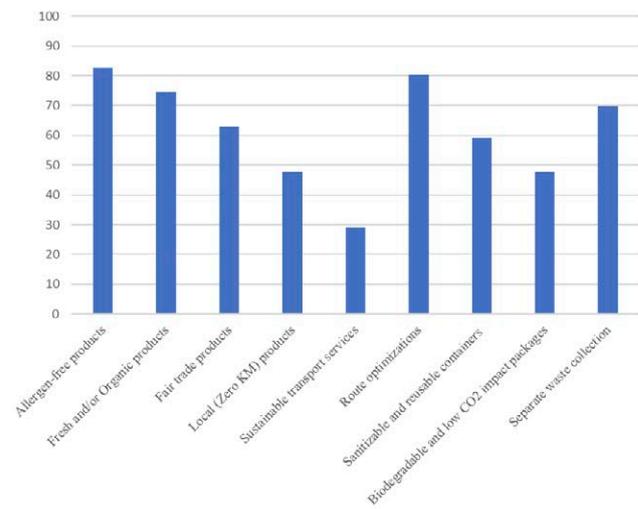
In the Italian market the largest part of sales by vending machines is currently represented by coffees and other hot drinks (64.5%), followed by water and drinks (20%), while snacks reach a comparatively lower share (15.5%), but are characterized by significant increases in more recent times, and ready meals still play only a marginal role. More in details, among the hot drinks, apart from coffee which plays a prominent role with a share of 55% (Fig. 3), the most consumed are tea and chocolate, although more recently the relevant increase of ginseng drinks must be underlined. Cold drinks are mainly represented by bottled water, but the most dynamic performance have been recorded by other products such as tea, 100% fruit nectars and juices and energy drinks. As for the snacks, together with the positive performance of bakery products, bars and chocolate products, it should be noted the constant growth of dried and fresh fruit, cheese, sandwiches and ready meals however with shares that are remaining still marginal.

Over time the supply of coffee – the most important product – has considerably developed and diversified to adjust to the needs of consumers (possibility of mix the ingredients, sugar dosage, fair trade products, grinding at the time of delivery, etc.). In the meantime, the analysis of trends in others specific segments makes evident the quick evolution and the progressive segmentation of consumer preferences in the selection of food and beverages within the vending machines market. More in details the most dynamic record in 2017 has been performed by products from the organic food chain: organic cold drinks have currently a share of only

Fig. 3. Italian consumptions by vending machines, 2017 (%).

around 1.2% of the global consumption (not considering water), but organic fruit juices and organic tea have showed an impressive increase (+90% e +120% over the previous year). Less relevant, but still significant, has been the growth of organic cereals-based snacks, which accounted for only 0.2% of total consumption, but with a +32% increase in one year. Other healthy options show a growing trend, such as sugar-free drinks (with a share of 2.7% of total cold drinks and an increase of sales of +60%), once again driven by the growth of fruit-based drinks. In the same path of preferences' evolution arises the impressive growth (+200%) of the new «slim size» of bottles/cans, which however represents only a share of 1% of consumption of cold drinks. Finally, in order to meet specific health needs, it may be observed the evolution of gluten free snacks, which cover 1.5% of consumptions, with an average increase of 35%. Summarising, within all the three main segments of the supply (hot drinks, cold drinks, snacks) may be highlighted trends which seem to indicate the development of more careful preferences in the selection of products.

Meanwhile consumer choices are evolving towards the above mentioned trends, the actors of the vending sector have experimented the introduction of innovative solutions, especially for the protection of environment and for the safety of products offered, which have allowed the sector of vending machines to take a forefront position on the technological frontier. More than 70% of the vending enterprises are involved in initiatives aiming at the improvement of the quality of items in sale

Fig. 4. Italian vending machines: examples of responsible and innovative initiatives, 2017 (%).

Source: own elaboration from CONFIDA 2018.

or at the reduction of the environmental impact of the services (Latella, 2018). So, the largest part of the companies of management offer products allergen-free, fresh or organic, from fair trade, while just less than 50% sale products from the local area (Km 0); finally, the efforts to manage behaviours more compliant with the goal of reducing wastes and the environmental consequences produced by consumptions by vending machines are significant (Fig. 4).

Summarising, data about consumption and the more recent trends in the features of Italian market of vending make possible to put in evidence at least two relevant results: the significant rates of growth of the minor products, suitable for satisfying the needs of other meals in addition to the traditional break, which suggest not to overlook the role that this form of food distribution could potentially take in the future on the eating behaviours; the widespread use of increasingly innovative solutions, which could contribute to the development of a supply more compliant with the emerging need of correct and healthy diet.

5. THE PATH TOWARDS SUSTAINABILITY: THE CASE OF ITALY

Technological innovation is usually judged as one of the main drivers in creating a healthier food environment and favouring a progressive shift toward more desirable choices in items selection by consumers. The latest generation of automatic distributors is indeed

characterized by very advanced services, for example the digital interface with touch screens allows the customization of products, especially for hot drinks, creating the desired mix of ingredients at will (e.g., the amount of sugar requested), making vending machines accessible even to people with food restrictions or specific healthy needs. Moreover, digital technology allows to give useful information to the consumer about products, ingredients, caloric intake, allergens and much more, in order to ensure a greater awareness in the selection of the items offered. But the development of smart technologies can be sufficient to grant the desirable improvements in consumer' behaviours? The Italian case study offers useful considerations not only about the role of technological innovation, but also in relation to other relevant aspects, included the management of the supply chain in supporting an effective shift in consumer preferences (Esposti, 2005; Hawkes, 2009; Barbangelo, 2009; Kim *et al.*, 2014).

The progressive shift in the preferences expressed in the vending sector is often put in relation also with the development of policy interventions, such as educational programmes in the area of healthy eating and mostly with the increase in availability of items characterized by a better nutritional quality through the introduction of minimum standards in the offer of food and beverages. Standards in vending sector may vary from the complete elimination of the less healthy items, to the modification of the mix of products in sale, till the limitations in advertising, the placing of more desirable products in the best position inside the machines, included actions for introducing mechanism of control of selling prices in favour of more desirable choices.

As showed before, the existing literature has only recently focused on mechanisms capable of promoting the development of vending machines towards more sustainable behaviours, both from the point of view of production and consumption. In this direction, the more recent literature, in addition with some technical reports, has been studying how to identify the commitments to be taken as minimum standards within the selection procedures for vending machines' services, as already widely experimented with the introduction of the Green Public Procurement (GPP) commitments within the contracts for the canteen' services in the public administration (Caldeira *et al.*, 2017; Glanz *et al.*, 2018; Grandia, 2018)⁸. In this case the concept of Public Food Procurement (PFP) represents the policy instrument identified for introducing in the public sector some

objectives about healthy nutrition and sustainability, in a multiple dimension that takes into account also the social size, rather than the only environmental dimension (Mazzocchi, Marino, 2019; Stefani *et al.*, 2017; Storcksdieck Genannt Bonsmann *et al.*, 2017). Currently the selection of vending services, especially in public administrations, is assessed mainly on the base of the economic convenience of proposals, without an evaluation of specific characteristic in terms of quality, owned by the food products and beverages. So the adoption of some minimum requirements in terms of the characteristics of products offered by vending services looks like a good practice and a well-recognized tool to be adopted for the improvement of the composition and variety of the daily diet (Rosi *et al.*, 2017; Caldeira *et al.*, 2017), due the growing relevance in the share of consumption made with vending machines.

Despite the evidence that the introduction of standards, such as commitments defined inside a mechanism of PFP, can play a relevant role in redirecting consumption behaviour, in Italy, such as in other countries⁹, there are only a limited number of local experiences aimed at introducing measures for improving the social sustainability of vending machines' services. Information about some of these experiences can be found out analysing projects supported by CONFIDA that, with the collaboration of Sodalitas Foundation, starting from 2014 has launched an initiative about sustainable vending («Vending Sostenibile»), aimed at favouring a new approach in the management of the supply chain (innovative design of machineries, reduction of energy consumption, remote supply logistics, waste collection, use of compostable and reusable materials, etc.). For the implementation of the initiative «Vending Sostenibile» a code of ethics for the sector¹⁰ has been developed, thus witnessing that the impressive growth of the vending machines' sector in Italy has not remained extraneous to the search for greater differentiation and qualification of the supply.

According to the most recent data, the initiative «Vending Sostenibile» counts more than forty projects aimed at improving the performance of services for consumers and citizens. These projects are organized in seven different topics (food security, food education, consumers' information, food safety, technology and food sustainability, technology and environmental sustainability, technology and social sustainability), correspond-

⁸ The European guidelines for the purchases by public institutions have been laid down by the Directive 2004/2018/EC, later modified by Directive 2014/2024/EU.

⁹ For example, in the United States of America, several cities (Chicago, Philadelphia, Springdale, Glendale etc.) have introduced healthy policies for the management of sales by vending machines that fall under their jurisdiction.

¹⁰ <https://www.vendingsostenibile.com/sites/default/files/Impegno%20per%20il%20vending%20sostenibile.pdf>

Tab. 1. Italian projects of sustainable vending by topics (2019).

Food security	Food education	Consumers' information	Food safety	Technology and food sustainability	Technology and environmental sustainability	Technology and social sustainability
3	4	6	1	5	21	3

Source: own elaboration from CONFIDA.

ing with different typologies of conceptual areas referred to sustainability (Tab. 1). At a first glance it is possible to highlight how most of the projects currently underway within the initiative are strongly oriented towards environmental issues linked to the concept of sustainability (around 50%), rather than to the other topics indicated.

More in details, the analysis of the description of each project highlights that only a limited number deserves attention for its contribution at the development of better dietary consumers' habits. For example, all the projects included in the topic of «food education» and four out of five of those included under «technology and food sustainability» are aimed at improving behaviours of consumptions, through the offer of a selection of fresh products or with a better and healthier nutritional profile. On the contrary, the six projects included in the topic of «consumers information» are mainly characterized for the capability to respond to specific needs. More in detail, four projects address the issue of sale products that meet specific health or ethical requirements (light, vegan, gluten-free, kosher), while the last two are aimed at improving communication towards consumers with specific needs (blind people) or at reading labels of supplied products, otherwise difficult to be read in the limited space of machines.

Among the many initiatives aimed at encouraging a healthier food consumption (food education), two projects – *Fresco benessere* (Fresh Wellbeing) and *Percorso salute* (Health Path) – offer a wide selection of fresh products and «health products» there are advertised and enhanced in the vending machines through specific labels or stickers, whose main goal is that of increasing their visibility in the distributors and consumption. Another interesting example is the project *Vending Zone*, aimed at schools and at younger consumers in general. This project is based on machines that supply mainly health products agreed with the local health authorities and based on a reduced energy density and a higher level of micro-nutrients: fresh fruits, vegetables, fresh juices, yogurts, salads. Moreover, this project involves families too, and parents can allow the purchase of a limited selection of products through a magnetic card.

Finally, only one project (*Clementine*) is strictly linked to agriculture and managed by a company that carries out its activity in the primary sector¹¹. The product is a snack made of two fresh clementines, which is suited to the needs of the vending machines (shelf life, packaging) and to the needs of the final market (quality, seasonality, naturalness, ease of consumption). This project made the promotion of a typical product of Calabria – a lagging behind Italian Southern Region – possible. Plus, clementines are highly appreciated by the consumers because they are very easy to eat (and seedless), but they do not often reach an adequate level of use and economic recognition on traditional markets given the low prices producers receive. Targeting vending machines, marketing project *Clementine* is enjoying a level of success that is going well beyond the expected results and shows upward trends. Farms involved are about 30 and they dedicate 15,000 tonnes of production to the vending channel, with a selling price that can be seven times bigger than the traditional market price. About 400 thousand boxes are sold yearly, thanks to the collaboration with 300 vending companies that market fresh fruit snacks in Italy (from Rome upward) in schools and public and private offices. More recently, boxes of clementines are marketed also abroad through vending machines (Latella, 2019).

An argument to justify the weakness in the supply of other products directly produced by farmers, such as fresh fruit, is attributable to the difficulties in organising suitable packaging and to the higher cost for the frequent replace of items characterized by a short shelf life¹², although the high level of technological innovation

¹¹ It must be said that also other projects develop the idea of sustainable vending, showing at least an indirect connection with the primary sector. For example, *Micromondo* project recycles wastes and by-products from the *espresso* preparations in vending machines, which are processed and used as organic fertilizers or as dirt beds for the mushroom production.

¹² Useful indications to overcome this kind of difficulties could be gathered from a successful experience in Italy, such as the sale of raw milk through vending machines. This experience has achieved wide success in Italy (Lombardi *et al.*, 2016). However, the sale of raw milk has not been included in this analysis, since it is not implemented through the vending machines managers, being directly managed by farmers.

in the sector could give a contribution in overcoming these drawbacks, as witnessed by the successful project *Clementime*.

With regards to the development of sustainability patterns, the collaboration of the vending system with the network of Italian municipalities is worth to be mentioned. In particular, this is a common initiative of CONFIDA and ANCI (National Association of Italian Municipalities) who are experimenting innovative forms of food marketing and wastes reduce and recycle. Such initiatives lift the vending sector up among the strategic actors of the food supply, especially in those cases where public food procurement is one of the focal points of local administrators.

6. CONCLUSIONS

In the recent period, studies about PFP are making interesting progress. In this phase, it is also been developing the discussion about the necessity to introduce specific constraints in food and beverages service provision through vending machines, especially within the public spaces managed by public administrations, in order to achieve some specific objectives of healthy nutrition and sustainability. In this view, it seems relevant to identify some minimum standards suitable for being introduced within the selection procedures for vending machines' services, as already widely and positively experimented in other fields (GPP).

To this aim, the Italian vending sector represents an interesting case study, for at least two reasons: the first one deals with the fact that the sector represents a successful component of the national production system, with sustained growth rates in all its components and a very structured supply chain, characterized by significant technological developments; the other reason is that, despite the sector is perceived as a supporter of a nutritional model which is not aligned with the principles of a healthy and correct diet, there are many interesting experiences that could show best practices for encouraging more desirable and sustainable behaviours. Indeed, a large part of researches about consumer's choices have put in evidence that increasing access to healthier foods in automatic distribution favours a change in behaviours and increases the purchase of these items, without threatening the profit of the businesses.

In this context of «deep» innovation, the analysis of the CONFIDA study case points out the action carried on by a relevant number of companies which testify the increasing attention to the need to respond to more careful and aware eating habits. Certainly, the sector

is still far from reaching a composition of products for sale in line with the expectations of a healthy and correct diet, despite the increasing trend of healthier items in the more recent years. From this point of view, one of the most surprising aspects is represented by the lack of innovative proposals coming from agricultural companies, able to offer products suitable for the sale inside the vending machines.

The introduction and success of the selling of food-stuffs within the vending machines' channel presents some evident difficulties in terms of presentation, shelf life, storage and in general terms «machinability» of the items. The efforts to overcome these constraints are not complete responsibility of the managers of machines, often considered as not able to propose a suitable offer of products, or of a specific single component of the chain. It seems clear, in fact, the necessity to launch a debate between the sector of automatic distribution and the agricultural actors, in order to better understand the respective needs and jointly define an appropriate offer of products suitable for this market segment.

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