From space food research and innovation to immediate advantages for Earth eating habits: an aerospace - food producer company case study

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Author(s):

Erica Varese, (Management, Commodity Science Area, University of Turin, Turin, Italy)

Paola Cane, (Argotec, Turin, Italy)

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Abstract:

Purpose

The purpose of this paper is to analyse how the food innovation strategies carried out by an Italian firm, Argotec, responsible for the development and supply of space food (SF) for European astronauts on the International Space Station (ISS), can also be applied to food suitable to be eaten on Planet Earth. This study aims at showing the relationship between SF innovation and terrestrial strategies directed at implementing this kind of food also on terrestrial tables.

Design/methodology/approach

This research focusses on a case study. The subject of the case study under analysis is Argotec, an internationally recognised Italian aerospace engineering company, dealing with research, innovation and development in various sectors, including engineering, information technology, system integration, small satellites and “Human Space Flight and Operations”. The company produces innovative SF for European astronauts performing long-duration missions on-board the ISS. Moreover, the SF is made available also for terrestrial beings as a solution for everyday eating necessities.

Findings

Argotec is characterised by strong innovation in terms of products and processes. Throughout the case study, the authors focus on the relationship between SF innovation and its terrestrial applications, since this company also manufactures products, traded under the brand “ReadyToLunch”, suitable for daily meals on Earth. Innovation applied to SF can thus offer advantages also for terrestrial daily meals and therefore help the company achieve other competitive advantages: as to the authors’ knowledge, this is a unique case.

Research limitations/implications

This study also has some limitations, typical of the applied methodology. In relation to the interview technique, further interviews would be required in order to fully understand the end-user perspectives regarding the importance and interest of this kind of “ready-to-eat” food.

Practical implications

Practical implications relate to astronauts and to terrestrial consumers. For astronauts, SF is not any more intended only to satisfy humans’ basic needs, and to provide the necessary nutrients during space missions, but has become an important factor in the quality of life in space. For terrestrial consumers, SF may represent a healthy, tasty and nutritious “ready-to-eat” choice: single courses for the main meals and snacks for a break.

Originality/value

This research fills a gap in literature: to the authors’ knowledge, this is the first paper presenting a case study on a company responsible for the development and supply of SF for European astronauts on-board the ISS, as well as encouraging the consumption of SF by terrestrial beings, as an ordinary “ready-to-eat” lunch/dinner.

Keywords:

Marketing, Innovation, Astronauts, Consumers on Earth, Ready-to-eat healthy food, Space food

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Article

1.Introduction

Section:

The first humans to eat in space were the Soviet cosmonauts Yuri Alekseyevich Gagarin (April 1961) and Gherman Stepanovich Titov (August 1961). Then, a few months later, on February 1962, it was the American, John Herschel Glenn.

Only after this period, space food (hereafter SF) research developed also because before these events, it was unknown whether humans would be able to swallow and, hence, eat in weightlessness (Perchonok and Bourland, 2002, p. 913).

Long-duration missions in space changed some required characteristics of SF. Nowadays SF is considered no longer an “uninspiring source of nutrition that allows astronauts to survive in space” but “an important factor in the quality of life in space” (Matsumoto, 2008a, p. 37).

SF has become so innovative, healthy and tasty that also terrestrial beings want to buy and eat it in order to respond to their needs.

This research is based on a qualitative methodology and focusses on a case study. We analysed Argotec, an international Italian aerospace engineering company based in Torino, with a long and recognised history in human space flight and operations. It provides a wide range of professional and engineering services, and has designed and developed many products as well as engineering solutions, usable on the International Space Station (hereafter ISS), which also have immediate applications on Earth (Argotec, 2016).

In recent years, the European Space Agency (hereafter ESA) contracted Argotec as the organisation responsible for the SF development and supply for European astronauts on the ISS. To meet this ambitious innovation, characterised by technological challenges, Argotec has developed the “Space Food Lab”, a new research area for the study of nutritional and tasty food dedicated to the astronauts. Products are traded with the brand “ReadyToLunch” and are designed to respond also to the needs of terrestrial beings who, obviously, live on Earth (ReadyToLunch, 2014).

In this paper, we analyse how the food innovations strategies carried out by Argotec can also be applied for food suitable to be eaten on Earth.

This study aims at showing the relationship between SF innovation and terrestrial marketing strategies directed at implementing this kind of food also on terrestrial tables.

Practical implications relate to astronauts and to terrestrial consumers. For astronauts, SF is not any more intended only to satisfy humans’ basic needs, and to provide the necessary nutrients during space missions, but has become an important factor in the quality of life in space. For terrestrial consumers, SF may represent a healthy, tasty and nutritious “ready-to-eat” choice: single courses for the main meals and snacks for a break.

This research fills a gap in the literature: to the authors’ knowledge, this is the first paper that presents a case study on a company responsible for the development and supply of SF for European astronauts on the ISS, as well as advocating SF for terrestrial beings, as an ordinary “ready-to-eat” lunch/dinner.

This paper is divided into six sections: Section 2 presents a brief theoretical framework on which the case study is based; Section 3 shows the research methodology; Section 4 offers considerations regarding the case study, Argotec; Section 5 presents the results; and in Section 6, the final conclusions, implications and limitations of the work are summarised.

2.Literature review

Section:

Open innovation and innovations in the food and drink industry (FDI)

The new era of innovation started at the beginning of the twenty-first century when Chesbrough (2003) stated that open innovation processes (hereafter, OIs), in which human capital inputs are – to a large extent – purposively sourced outside the firm, replaced and are opposed to OIs in which such inputs were sourced mainly within a firm's boundaries. OI has the "intent of accelerating internal innovation processes and establishing additional, external paths for the commercialisation of their outcomes" (Sarkar and Costa, 2008, p. 574).

As reported by Martinez and Briz (2000, p. 155), the FDI is typically classified as a "low research intensive industry" (Sandven and Smith, 1993; Connor and Schiek, 1997) and the empirical substantiation of these companies engaging in OI strategies is poor (Knudsen, 2007; Saguy and Sirotinskaya, 2014a, b).

Even if, according to Gassmann et al. (2010, p. 219), the next logical OI step should be "trading intellectual property and, especially, patents, which holds huge potentials for both patent owners as well as traders", the number of patented inventions in the FDI seems less dynamic than the one in other manufacturing sectors (Christensen et al., 1996; Martínez and Rama, 2010).

It has been noted (Pellegrini et al., 2014, p. 76) that during the recent period, some circumstances such as the growth of competition on a more international scale, the increasing number of actors, the development of new technologies, and the requirements of intermediate customers, end-users and legislators "are creating new working conditions compelling FDI firms to make their boundaries more porous".

This statement has recently been confirmed by Bayona-Saez et al. (2017): after measuring the OI of Spanish FDI companies (final sample of 10,771 firms), they argue that in their findings, "contrary to the traditional view of the Food and Beverage sector as a low-innovation industry, this sector actually has a strong commitment to OI practices" (p. 539).

For example, OI has successfully become a strategic priority for General Mills, a US-based food company, which, in 2007, created the General Mills Worldwide Innovation Network. This approach to innovation connects employees with inventors, academics, entrepreneurs, suppliers, customers and consumers throughout the entire OI, in order to help the manufacturer "to meet its business needs most effectively" (Bellaris, 2010, p. 4). Enzing et al. (2011, p. 245) have similarly demonstrated that in the FDI, "the more open and diversified the innovation network is, the better the product's short- and long-term market performance will be".

OI is undoubtedly a chance for all market actors (shareholders, suppliers, customers, academia, research institutions, etc.) to proactively gather future challenges and opportunities (Saguy and Sirotinskaya, 2014a, b) and to share the costs incurred during the OI (Seyfettinoglu, 2016). However, according to Martinez et al. (2014, p. 231), during the transition period towards OI, managers of the FDI have to challenge and orchestrate different aspects which might rise issues difficult to solve: "for instance, how can firms encourage people to collaborate and to share knowledge? How can firms monitor the progress of the collaborations, particularly if several partners are involved? How can firms avoid conflict when sharing innovation outcomes?".

For the FDI, in any case, innovation is a highly challenging and complex process to manage. According to Bigliardi and Galati (2013), innovations in this sector may occur in all the stages of the food chain, and a possible classification of innovation is the following: new food ingredients and materials; innovation in fresh foods; new food process techniques; innovations in food quality; new packaging methods; and new distribution or retailing methods.

Innovations in the FDI are requested also to respond to consumers wants and needs such as, for example, preservation methods (Costa et al., 2001); storage conditions; packaging (Silayoi and Speece, 2004; Rundh, 2005; Rundh, 2009); green innovation (Arcese et al., 2015); smart labels (Varese et al., 2016); ease of preparation, consumption and less waste (Brody et al., 2008); and nutrition and health characteristics (Kozup et al., 2003) such as functional foods, as defined by Diplock et al. (1999). The latter – the emerging sector of functional foods – seems to show tendencies to partly converge with the pharmaceutical industry: in fact, "the effects of increasing health care costs as well as a greater consumer interest in preventing diseases by making distinctive food choices are shown to be central reasons for an on-going process of industry convergence at the intersection of the pharmaceutical and the food industry" (Bröring, 2013, p. 39).

SF literature

There is a broad literature focus on SF, and this topic is certainly considered by its intrinsic nature, an innovative one.

According to Scopus, the world's largest abstract and citation database of peer-reviewed research literature, the first paper on this topic was published by Klicka (1964) and was about the development of SF.

Most of the papers are about "SF and its nutritional concerns" (e.g. Heidelbaugh et al., 1973; Rambaut et al., 1977; Luigi, 1989; Smith et al., 2002; Chen and Zhou, 2003; Matsumoto, 2008b; Zwart et al., 2009).

Another very broad topic is related to the importance of offering astronauts food from their home countries: this is considered very important because food can maximise their abilities in performing tasks (by eating such food, they feel more at home) and promote cultural exchanges (Matsumoto, 2008a). For example, following authors have studied planned food for space consumption: Okuda (2008): black sugar candy and peppermint candy; Song et al. (2012): chicken curry rice; , Ginseng-chicken porridge; Dakgalbi; Matsuo and Tanaka (2008): instant noodles; and Di Tana and Hall (2015): espresso coffee.

The literature on SF is also dedicated to analysing packaging evolution for space missions. Pieces of relevant research were written by Bourland et al. (1981), Bourland (1993), Vodovotz et al. (1997), Perchonok and Bourland (2002) and Douglas (2014).

To the authors' knowledge, the topic of SF lacks a systematic literature review, a classification of researches and an analysis of companies engaged in producing food suitable for space missions.

This paper fills a gap in the literature: to the authors' knowledge, this is the first paper offering a case study on a company responsible for the development and supply of SF for European astronauts on the ISS, as well as encouraging the consumption of SF by terrestrial beings, as an ordinary "ready-to-eat" lunch/dinner.

3.Methodology

Section:

With the purpose to achieve the aim of this research, the following hypothesis has been developed:

Hypotheses

H1.In order to satisfy the increasing needs of astronauts during space missions, the business model of an SF company has to be intrinsically an innovative one. The nutrition characteristics of this kind

of food have been an extremely crucial aspect since the beginning of space missions; additionally, during most recent years, home-country food has become increasingly important to astronauts. In fact, food is a key aspect not only for health and wellness, but also for its social and psychological role. All these properties are characteristics of both astronauts' and terrestrial consumers' needs. Since SF is obviously a healthy ready-to-eat meal, consumers on Earth may be very interested in approaching it.

The research methodology was structured as follows: the first stage consisted in a review of existing literature, focussed on OI and innovation in the FDI and on SF as to its nutritional concerns as well as its connections with food eaten by astronauts in their home countries, and on food packaging; and the second stage consisted in applying a qualitative case study methodology helping to explore this phenomenon within its context (Yin, 1984; Baxter and Jacks, 2008).

According to Yin (2003), the choice of this methodology is justified by the need to answer "how" and "why" and by the facts that authors cannot manipulate the behaviour of those involved in the study, and that the research focusses on a contemporary phenomenon (Yin, 2013).

We feel that it would be impossible to gain a true picture of the chances for marketing SF on Earth without considering the context in which it has been developed and produced for space missions.

In fact, the relationship between SF innovation and strategies on the one side, and implementation plans for this kind of food also among terrestrial beings living on Planet Earth on the other side seems crucial to us.

We chose this case, Argotec, because it is unique (Stake, 1995; Yin, 2003; Noor, 2008) and, as there are no other cases available, it is a "single case" (Tellis, 1997b; Zainal, 2007). In 2013, Yin adopted a new term to define this kind of case, calling it "unusual".

Argotec undoubtedly shows the above mentioned characteristics because: it has been contracted by ESA as the organisation responsible for the SF development and supply for European astronauts on the ISS; its activity is fully pervaded by innovation; and it produces and trades SF also for terrestrial beings.

According to Eisenhardt (1989), this essay uses a wide range of sources of information in order to develop and analyse the case study. In the interest of data triangulation, we observed directly, analysed company documents and made interviews.

Direct observation was conducted at the company premises in 2016, as to catch the reality and analyse events in real time: we enjoyed the opportunity to observe several meetings. We are conscious of the weaknesses of such observation: time-consuming; selectivity (might miss facts); reflexivity (observer's presence might cause change); and cost (observers need time) – (Tellis, 1997b; Yin, 2013).

On these occasions, we asked to be granted access to company documents in order to better understand the firm and to increase our knowledge about the enterprise, especially concerning the evolution of the requirements regarding nutritional properties of SF, food packaging and the company attitude to satisfy the astronauts' need to eat typical food from their home countries. We were also eager to better understand the innovative strategy related to the SF market for terrestrial consumers.

We had the opportunity to analyse scientific papers, letters, memoranda, study reports, etc. The validity of these documents was carefully reviewed so as to avoid incorrect data being analysed. We

spent almost a week collecting data emerging from this documentation. Further information was collected from the Argotec website.

In order to capture different dimensions of the same phenomenon, in 2016, we interviewed the managing director and other Argotec personnel, including the chef responsible for the Space Food Lab, a food technologist and some engineers.

We interviewed various people in the company (semi-structured interview) so as to clarify some important topics (Eisenhardt, 1989; Corbetta, 2003; Alvesson, 2003). Each interview lasted for approximately two hours and was conducted by both of us. With a view to reducing the subjectivity of data interpretation, on permission by the interviewee (Yin, 2013), the interviews were recorded and later transcribed.

We autonomously analysed all data obtained by direct observation, company documentation and interviews, and we finally compared our individual interpretation of the results.

We did a triangulation of data sources (data triangulation) (Patton, 2002).

According to Ying categorisation of case studies, this is a “descriptive” one: this type of case study is used to describe a “phenomenon and the real-life context in which it occurred” (Yin, 2003; Baxter and Jacks, 2008).

4.Case study: Argotec

Section:

The company

Argotec S.r.l., established in March 2008, operates in the aerospace sector, aiming its activities to research, innovation, and development in different fields: engineering, information technology, system integration, and “Human Space Flight and Operations”. Moreover, Argotec conducts research and development activities in the food sector, addressing both the aerospace industry, through the supply of SF for astronauts, and commercialisation on Earth. The company is a small and young enterprise, with approximately 35 employees, whose average age is 29 years.

Research and development

Argotec research and development activities in the aerospace sector have always been intended to design innovative systems and services able to obtain terrestrial applications useful for improving living conditions.

Since the beginning, the company has developed its experience in the training activity. An Argotec team of specialised personnel is located in Germany, at the European Astronaut Centre, in Cologne. Certified instructors train European astronauts about to leave for long-duration missions on-board the ISS, and they also instruct the ground crew (the so-called flight controllers) with regard to voice protocol, ISS operations, control centres on Earth and flight rules.

Subsequently, Argotec canalised the gained abilities into new activities in the aerospace field. In particular, a research and development area intended for the study, planning and creation of systems and experiments for the ISS was developed. At the moment, Argotec includes electronic, thermal, and multifunctional laboratories, in which engineers specialised in several branches (aerospace, mechanics, electronics, information technology, and chemistry), cooperate in synergy for the implementation of engineering systems.

Currently research and development activities are directed towards the improvement of solutions in the field of renewable energies. Moreover, the company has recently expanded its activities with the creation of a new unit intended to design and build small satellites.

Innovation in SF (products and processes)

During the training sessions, Argotec instructors have the possibility to spend long time with astronauts and difficulties and problems related to the long permanence on the ISS come to light. During long-duration missions, astronauts live for many months far from home, family, friends, and personal habits, in a place where the psychological pressure is high. Moreover, microgravity has a notable impact on the human body and its physiology. In weightlessness conditions, different muscles are used in a different way. For this reason, astronauts must perform physical exercise everyday, in order to prevent muscles atrophy and bone tissue weakening. Microgravity causes also problems linked to blood circulation and body fluids redistribution. In particular, fluids tend to accumulate in the upper part of the body, in proximity of mouth and nose, causing an effect which is similar to the congestion experienced on Earth due to a cold, and which alters the perception of smells and tastes. Other negative effects, due to the space adaptation syndrome, include nausea, migraine, and vestibular diseases (Anderson, 2015).

From the consideration about all these issues, Argotec had the idea of producing the bonus food for European astronauts. The aim was to provide a psychological support through foods which are known and familiar to astronauts, who can feel less far from home. Nutrition is important not only for health and wellness, but also for its social and psychological role, and for enhancing work performances. In 2010, Argotec founded the Space Food Lab, a unique laboratory in Europe, in which a team of engineers, food technologists, nutritionists and chefs deal with research and development in the field of food.

Approaching the study of the SF, it was necessary to analyse in depth the key requirements imposed for SF:

low weight and reduced volume;

packaging able to protect food, and to facilitate storage and usage;

ease of preparation and consumption;

palatable texture, but without crumbles;

extended shelf life at room temperature for 18-24 months; and

nutritional requirements.

The first astronaut who had the possibility to benefit from Argotec bonus food was Luca Parmitano. Argotec developed for him Italian regional recipes, such as “Lasagna alla Bolognese”, “Parmigiana di melanzane”, and “Tiramisù”.

With Samantha Cristoforetti, Argotec undertook a turning point. Good, healthy and nutritionally balanced food has been produced starting from functional ingredients, able to provide the correct support and to prevent cellular aging. The first step in this direction is the selection of high-quality organic raw materials, including high amounts of fruit and vegetables, nuts, legumes, whole grain cereals, blue fish, and lean meat. Meals are then scientifically studied and produced according to the concept of the single course, developed by the Harvard University. A single course contains one-fourth of carbohydrates, one-fourth of proteins and one-half of vegetables. For the production of

food, innovative methods of freeze drying and thermo-stabilisation are applied, always with the maximum respect for the organoleptic and nutritional characteristics of food.

In general, for the preparation of Argotec bonus food, the following principles are adopted:

organic ingredients;

no added salt or sugar (except for what is naturally contained in the ingredients);

no artificial colours, preservatives or additives;

seasonality;

careful use of spices;

extended (18-24 months) shelf life;

preservation of natural colours and texture;

single course; and

tradition and sustainability.

Another aim for Argotec is to unify tradition and innovation, matching Italian traditional excellence in the cuisine field and innovative food technologies. In particular, the goal is to develop foods which are scientifically studied to respect high-quality standards and to be nutritionally balanced and healthy, but, at the same time, good and appetising.

One of the engineering systems that have been developed by the company is ISSpresso, the first capsule espresso machine to work in microgravity conditions (Di Tana and Hall, 2015). This innovative multifunction system is able to prepare not only the typical Italian espresso, but also long black espresso and warm beverages such as tea, infusions and broth, which can be used to rehydrate freeze-dried food.

The experiment was successfully carried out by Samantha Cristoforetti on 3 May 2015 with the support of Argotec Control Centre. The scientific objectives focus on improving the knowledge about fluid and blend dynamics in microgravity conditions.

Terrestrial strategies aimed at implementing SF among human beings

The know-how developed in the aerospace field has been applied on Earth with the brand ReadyToLunch. Starting from October 2014, SF has been made available to all those people who, despite limited time, do not want to sacrifice a healthy, tasty and complete diet. This is an example of how a small company, operating in the engineering sector, has been able to deeply innovate offering new solutions in the food sector, drawing inspiration by its activities in the aerospace field, sector in which high-quality standards are unavoidable.

The products destined to “terrestrial beings” are exactly the same produced for astronauts. The only adaptation that has been made is the labelling, in compliance with Regulation (EU) No 1169/2011 on the provision of food information to consumers, entered into force on 13 December 2014.

ReadyToLunch products can be preserved at room temperature for up to 18/24 months. They do not need refrigeration, since they are processed with thermo-stabilisation. Thanks to these favourable characteristics, they do not need particular storage conditions. It is a fundamental advantage also in terms of transportation, since it is not necessary to maintain the cold chain. In this way, the

innovation can bring also a reduction of costs and risks, typically related to the transport of fresh and perishable food.

SF represents a product innovation, since consumers are not familiar with this kind of food. But it constitutes, at the same time, a process innovation because the thermo-stabilisation procedure has been perfected and adapted in order to obtain products that are safe, stable at room temperature for up to two years, without preservatives or additives and, at the same time, nutritionally balanced.

On the basis of empirical evidences, obtained observing demand and sales, a tight correlation between astronauts' needs and normal people's needs came to light. SF is often a good solution able to combine logistic, sensorial and nutritional advantages. Table I represents the main correspondences between SF characteristics and consumers' needs and expected benefits.

The consumers' profiles which have been defined are summarised as follows:

sportsmen with practical needs or requiring a specific calorie intake;

people who cannot access fresh food and who need provisions of food with extended shelf life;

people who do not have enough time for food preparation (business men/women, students, etc.);

travelling people (by train, boat, plane or car); and

people with pathologies that impose particular food and nutrition.

5.Results

Section:

Argotec's SF innovations occur in all stages of the food chain described by Bigliardi and Galati (2013): new food ingredients and materials; innovation in fresh foods; new food process techniques; innovations in food quality; new packaging methods; and new distribution or retailing methods.

Innovative strategy is mainly managed internally, thanks to the combination of the competencies and know-how owned by different professional figures with cross-sectorial and multi-disciplinary backgrounds.

In the Argotec Space Food Lab, a team of chefs, nutritionists, food technologists and engineers cooperate in a synergic way for the development of high technological content products, combining innovation and Italian culinary excellence.

Moreover, the company cooperates and has partnerships in place with international research centres and universities, Michelin-starred chefs and remarkable organisations, as the Italian slow food.

ReadyToLunch products display a strong competitive formula; in fact, existing research on consumers' perception of food characteristics as determinants of their purchase intentions have mostly explored the key characteristics of these meals and snacks: organic (Zanoli and Naspetti, 2002; Lee and Yun, 2015; Nuttavuthisit and Thøgersen, 2017); nutritional content (Cowburn and Stockley, 2005; Grunert and Wills, 2007; Buckland et al., 2015); and ready-to-eat meals (Larson, 1998; Ana et al., 2007).

ReadyToLunch products assume an innovative and avant-garde value within the food offer available at the moment, and allow for immediate usability on Earth. The harmonic and nutritionally balanced structure of the recipes constitutes a positive contrast against incorrect and dysfunctional food

patterns which are currently widely in practice. Ingredients are carefully selected and combined in order to exploit their intrinsic properties, with particular consideration towards food with anti-inflammatory, anti-oxidant and anti-aging functions. For the company, it is fundamental to make available for “terrestrial beings” products originally created for space, which are innovative and able to respond to daily nutritional necessities. The most important objective is to extend to Earth the benefits of products studied and developed for astronauts performing long-duration missions in space. According to the company vision, all that is designed to be utilised on-board the ISS must have an immediate return on Earth, bringing benefits to daily life and responding to needs which have not been satisfied yet.

At present, consumers can buy the products on the e-commerce platform (www.readytolunch.com). The current strategy aims at making ReadyToLunch products and their benefits more easily accessible for normal people, with a widespread distribution.

6.Conclusions, implications and limitations

Section:

Nowadays people are still deeply fascinated by space and all its concerns. Future human exploration of Mars is no longer a utopia and the curiosity for space missions is growing again. Just as an example, on 22 February 2017, the journal Nature published a study, which announced that scientists have found at least seven Earth-sized planets orbiting the same star 40 light-years away (Snellen, 2017) and this lifted up again the interest in space exploration.

On the other hand, life on Earth keeps bringing new challenges. “‘Lack of time’ is certainly the one we can least argue against. For most of the active population there is not much time to eat and even less for shopping and cooking” (Costa et al., 2001, p. 1).

Starting from these assumptions, in this paper, we have analysed the Argotec case study, which we consider relevant because innovation is a key factor for this company: innovation drives its daily mission in various sectors, including the research and development of SF destined to be eaten in space. But commercialising SF on Earth, as everyday meals for terrestrial beings, is an innovation too. For the first time SF, with its high-quality standards, has been made available for terrestrial beings, responding to unsatisfied needs and having immediate terrestrial applications useful for improving living conditions.

ReadyToLunch ready meals are prepared according to the single course model developed by Harvard School of Public Health experts. The healthy eating plate is a complete meal, containing one-fourth of proteins, one-fourth of carbohydrates and one-half of vegetables and fruits. The interest in healthy, natural and organic food is growing among population (Rana and Paul, 2017), but generally it is satisfied by fresh and perishable food, which however needs refrigeration and can be preserved just for short periods.

One of the innovations in ReadyToLunch products is to provide healthy, natural and organic solutions for a complete meal preservable at room temperature for up to 24 months. These products, deriving from years of research and development in the SF field, have been made available, affordable and accessible to everybody, thanks to a dedicated e-commerce platform.

The price for a complete ready-to-eat meal is in line with, or even lower than, the average cost of a basic lunch in a normal bar/restaurant.

This company combines both internal and external knowledge in order to win competitive advantage through innovation.

Even if, according to Tellis (1997a) and Zainal (2007), common criticisms of the case study method are that it lacks rigour and that the dependency on a single case exploration makes it difficult to reach a generalising conclusion, authors believe that through the Argotec case study, they have described their views of a relevant innovative reality.

We realise that this research has some limitations due to the applied methodology: we have adopted a qualitative method for a single case study); the findings of the study are based on the first results of prospected deeper research; and further interviews would be required in order to understand consumer perception of this kind of food.

As companies must still perform the difficult and challenging work necessary to convert promising research results into products and services that satisfy customers' needs (Chesbrough, 2003), we firmly believe that there is a clear necessity to better understand consumers' attitudes towards this kind of food.

For this reason, we are planning to carry out further studies on consumer perception of SF for "terrestrial beings".

Table I Correspondences between SF characteristics and consumers' needs and expected benefits

Table 1 of 1

SF characteristics	Consumers' needs and expected benefits
Practical aspects	
Shelf stable	Avoiding the cold chain
Reduced weight and volume	Solving transport problems
Flexible packaging	Facilitating storage
Rapid preparation	Preparation without kitchen tools
Ease of consumption	Facilitating meals in particular/extreme situations
Cross aspects	

SF characteristics	Consumers' needs and expected benefits
Single course	Complete meal in short time
Healthy and balanced	Correct nutrition
Texture	Sensorial satisfaction
Sustainable ingredients	Aware and sustainable consumption
Nutritional aspects	
No preservatives, artificial colours or additives	Natural nutrition
Spices properties	Curative properties of food
No added salt and sugar	Special diet imposed by medical conditions or disease
Organic ingredients	Sustainable and healthy nutrition
Seasonal ingredients	Variety of nutrients

- **Source:** Authors' elaboration

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