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Chapter

Trends Shaping the Future of Agrifood

John Stanton and Rosa Caiazza

Abstract

In agriculture innovation is the main driver of productivity growth. Innovative technologies and methods have to help increase firms’ productivity in a sustainable way. Technology diffusion is important as developing new technologies for sustainable production processes. Current innovations can lead to define the composition of foods with impoverishment or enrichment of nutritional and sensory characteristics. New technologies play a central role in adapting agricultural practices to environmental change. New agricultural practices help to preserve environmental integrity. Competition for an alternative use of natural resources is increasing and agricultural practices and technologies will have to adapt to climate change and more extreme weather-related conditions. This multifunctional approach needs to be directed towards increasing knowledge about the relationship between microstructure, process, product characteristics and technological innovation to protect the quality and origin of products. Innovations are not enough if they are not accompanied by a regulatory environment conducive to business development. Think first of all about the issues of security, rationalization of controls and the embargo of bureaucracy. But also, to the sustainability of food production and the need for common rules on supply conditions in crucial international commodity markets for the development of certain products.

Keywords: supply chain, agribusiness research, agribusiness trends, agribusiness pillars, distribution

1. Introduction

Agriculture refers to the production of food and non-food items through farming or animal husbandry [1]. It encompasses the realization of both agricultural products (the rearing of livestock and the growing of crops and horticulture), as well as agricultural services (agricultural animal husbandry and horticultural services and the operation of irrigation systems). It is highly dependent on natural resources (land, soil, climatic conditions and water) that differ significantly across the countries, with implications for the pattern of industry, investment and trade [2]. It also requires private investmentments in innovations and institutional support for technological improvements. According to FAO world agricultural production will grow (from 10 to 20%) in the next years if policy-makers will realize institutional and technological support to firms involved in agriculture.
Policy-makers play a crucial role in agricultural extension, development of new seed varieties and supporting agricultural production. The government can contribute to such support by providing agriculture-related infrastructure facilities aimed to increase the productive capacities of firms. However, the extent to which institutions contribute to agricultural production varies by country and by type of institution. Budgetary constraints in developing countries limit their capacity to establish relevant institutions in support of agricultural development.

Technological improvements play an important role in increasing agricultural productivity. Modern agricultural technologies can help increase agricultural productivity in a more sustainable way. In agriculture, innovation is the main driver of productivity growth [3]. It can also improve the environmental performance of firms and the quality of products. Some innovations help firms better deal with production uncertainties and increase profits. In some countries, the challenge is to adapt agricultural production to consumer needs.

Consumers’ behaviors are changing according to living standards, higher participation rates of women in the labour force, and reduced time available for meals [4]. Innovation must address such changes in consumers’ behaviors, provide raw materials for non-food use, alleviate natural resource depletion, and enable adaptation to the expected changes in natural conditions caused by climate change [5]. Developed countries invest considerably more in agricultural innovations than developing countries. Therefore, it is essential to increase public budgets for both institutional and technological support to competitiveness of firms involved in all the stages of the global value chain in the food industry [6].

2. General framework

The global value chain in agribusiness comprises the suppliers of inputs, processors of agricultural goods and retailers. It assumes a global form involving both local or foreign players. In general, value creation resides mainly in the non-agricultural segments of agribusiness chains. Some global value chains are coordinated by transnational corporations (TNCs). The universe of agriculture-related TNCs, including suppliers of inputs, food manufacturers [7] and retailers [8] are usually larger than agricultural TNCs [9]. The United States is home to the largest number of food processing TNCs (ex. Kraft Foods and Coca-Cola), followed by the United Kingdom, Netherlands, and Switzerland [10]. In the developing world, Hong Kong (China), Singapore and Mexico are the most important home economies of food processors. Behind the TNCs, the food processing industry is populated by a huge number of small and medium-sized firms (SMEs) that must compete through specialization in high-quality products and affiliation to a global network [11].

To face the challenges of an increasingly global market, small and medium-sized firms need to base innovations on the local tradition to meet the changing needs and lifestyles of consumers. Thanks to such investments SMEs that realize traditional products (preserves, cheeses, wine, oil, etc.) are more and more involved in the production of new goods (frozen, ready-made sauces, fresh condiments, etc.). Most of SMEs associate technological innovation (new products integrated with new production processes) to non-technological innovations (organization or marketing). The growth strategy of many SMEs has to focus on strengthening the markets in which they already operate and entering new markets through organizational innovation in networks with other actors. In implementing both technological and
non-technological innovations in the agro-food industry, firms have to consider the new trends of sustainability, healthy and smartness proposed in the ‘2030 Agenda’ from the United Nations. The 2030 Agenda for Sustainable Development identifies Sustainable Development Goals, with a view to stimulating action over the next 15 years in all economic, social and environmental areas of critical importance for sustainable development (Table 1) [12].

As stated in the 2030 Agenda, an important characteristic of the agro-food industry is its close association with the environment. Food production contributes to climate change, water scarcity and the destruction of biodiversity. Agro-food firms have to avoid environmental degradation through pollution, greenhouse gas emissions and deforestation.

The first challenge facing the food industry is to intensify production by reducing the environmental impact and pressure on natural resources, but at the same time producing safe products that allow people to have a diet that ensures good health. The objective of firms has to promote a development model based on the balance between environmental, economic and social needs. The sustainability of agri-food production contributes to economic, social and environmental development. Firms have to extend the reuse of materials, bioenergy, more efficient use of energy and water in the production processes of foods. Policy-makers must stimulate the development of models for sustainable production that make agro-food firms able to satisfy the present and future needs of the world’s population [13].

The second challenge facing the food industry is to reduce health problems. In developed countries, an increasing number of people have health problems due to what is commonly referred to as lifestyle (ex. mainly diet, physical activity, mental and emotional stress, etc.). People’s lifestyle has had huge changes in the last decades. Social and economic change due to globalization has had a strong impact on society leading to pervasive changes in people eating habits and behaviors (ex. eating out of the home, personalized diets, consumer preferences, e-commerce, etc.).

Another challenge is to reduce toxic substances that residue from ingredients used in production processes or move from the environment to the food chain [14]. Great attention should also be paid to the so-called emerging contaminants (organostannic biocides, brominated flame retardants, perfluorinated organic compounds) reported by scientific literature for food but not yet considered by law. To address this second challenge, it is necessary to use multidisciplinary strategies able to combine advanced technologies to offer safe products with consumers’ information [15]. Food security is now linked to innovation and sustainability of production systems and is perhaps the most important element of business competitiveness [16]. The research must cover all phases of the value chain from the production to the final consumption (from farm to fork) [17].

The last challenge is to become smarter and smarter in the organization of firms’ activities. Collecting and transforming more and more data into strategic and usable information is not a process sufficient to ensure greater rationality in economic

<table>
<thead>
<tr>
<th>Value chain</th>
<th>Suppliers</th>
<th>Processors</th>
<th>Retails</th>
</tr>
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<tbody>
<tr>
<td>Innovation</td>
<td>Technological</td>
<td>Non-technological</td>
<td></td>
</tr>
<tr>
<td>New trends</td>
<td>Sustainability</td>
<td>Health</td>
<td>Smartness</td>
</tr>
</tbody>
</table>

Table 1. Pillars of agro-food system.
decisions [18]. The third challenge is to improve firms’ ability to know how to fully exploit the generated information. From this point of view, the agri-food sector is ideally suited to take full advantage of information and communication technologies (ICT) in all the stages of the value chain for both specific activities (ex. supply, processes, marketing, distribution, sales, retail, etc.) and support activities (ex. technology transfer). ICT in the agri-food industry aims to enable firms to become more and more efficient in realizing managerial purposes using data available throughout the value chain. This allows for a natural metamorphosis of business models, production processes and redefinition of relationships between the members of the chain. With the aim to evidence main innovations to face such challenges an empirical analysis of innovative brands was realized.

3. Empirical analysis

The empirical analysis evidenced that innovation is not limited to just one category or just one company. The chart indicates that innovation is spread across both. Many of these innovations are related to the challenges (Table 2).

The packaging we use is the best way to keep our crisps crunchy. However, the new consumers looking for new products want to see more sustainable packaging, 100% recyclable packaging and still be delicious. TerraCycle is trying to make this a reality.

Philadelphia Cream Cheese has focused on the third challenge by solving the problem of technology in that they can now make 13 different flavors of cream cheese such as Salmon, Pumpkin spice, honey nut, chive, onion, etc. Bird’s eye also demonstrated a focus on Health by introducing steaming pouching that permits cook-in-the-bag technology. New Covent Garden bringing chilled soup to market for the first time a technology-driven innovation. Genius Foods makes Gluten-free bread where the focus is not on just the gluten but that it is tastier, softer and smells delicious. This type of innovation captures both perceived health and consumer attributes not generally met by gluten foods. Nontechnical innovation can be seen in the perception of brands as fun and vibrant and appears more likely to be influenced

<table>
<thead>
<tr>
<th>Brand</th>
<th>Main market the brand operates in</th>
<th>Innovative brands %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkers Crisps</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Müller Yogurt</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Ben &amp; Jerry’s Ice cream</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>New Covent Garden Soup</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Birds Eye Frozen food</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Philadelphia Cream cheese</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Haribo Sugar confectionery</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Genius Gluten-free baked goods</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Magnum Ice cream</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Activia Yogurt</td>
<td>37</td>
<td></td>
</tr>
</tbody>
</table>

*Base: Approximately 2000 internet users aged 16+.

Table 2. Innovative brands.
by the category they operate in, rather than inherent perceptions of being innovative. Brands like Müller, Ben & Jerry’s, Magnum and Walkers all operate in treat categories, which lends an image of fun and vibrancy to the brands compared to those operating in more staid and functional markets. The new social media has prompted more interest in new products. One in 10 are prompted to buy new products by social media and 12% of food shoppers are encouraged to buy a new food product by related social media content from brands. However, this is low in comparison to the usage of social media. A total of 67% of food buyers are prompted to buy a new food when it has been recommended by a friend or family member and 47% of adults like to recommend new food products to others. This indicates that any steps to drive word of mouth could be used to support new product launches. It is ironic that the new social media and technology have made the old “word of mouth” more effective [19].

Value chain at all levels is one of the most important factors in the successful introduction of a new product about this factor all three levels are shown in Table 3. The number one factor in encouraging a trial purchase is a price promotion. In this case, every level from Suppliers, processors and retailers all have the obligation to keep costs down and be prepared to use marketing dollars to support promotional prices [20]. The processors can invest in technology that makes the crops more efficient to produce, processors can not only rely on technology but use trade promotion dollars to reduce the prices at retail and finally retailers must be willing to pass on the promotional money that was designated to reduce the retail price and therefore the risk [21].

As previously mentioned, social media can play a huge role in supporting new products. Recommendations from family and friends are the third most important factor to encourage trial. A recommendation by a friend or family member would prompt two-thirds of shoppers to buy a new food product. This underlines the value of word of mouth to brands when launching new products [22]. There is no question that this media is difficult as it is new, and many older companies are not comfortable with this media. Additionally, remains challenging, since it is difficult to measure the impact. The online snack delivery brand Graze, for example, has offered discounts to customers when their friends/family sign up [23]. Other brands have taken advantage of digital platforms to encourage recommendations. For example, Birds Eye set up a pop-up restaurant in London in the spring of 2014, which let people pay by taking a picture of their meal and posting it to Instagram. Similarly, when Special K launched its Cracker Crisps, it set up a pop-up shop that allowed people to pay for the crisps with tweets.

### 4. Results

From the research, we defined a general framework that considers the trend of a sector, time, complexity, and degree of uncertainty as the variability underlying the forecasting choices. The forecast time depends on the static or dynamic nature of the sector being analyzed. Mature industries with rather stable dynamics tend to be slow to change and therefore allow forecasts over longer time frames. On the contrary,

<table>
<thead>
<tr>
<th>+10%</th>
<th>+16%</th>
<th>+23%</th>
<th>+17%</th>
<th>+22%</th>
<th>+15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>Meat</td>
<td>Dairy products</td>
<td>Fish</td>
<td>Sugar</td>
<td>Ethanol</td>
</tr>
</tbody>
</table>

Table 3. Agricultural production outlook.
the sectors most exposed to innovations have faster dynamics of change which allow forecasts over shorter time frames. The degree of complexity depends on the number of variables to consider. The greater the number of relevant variables, the greater the complexity of forecasting the trend of the sector. Finally, the degree of uncertainty depends on the level of knowledge of the relevant variables. The greater the knowledge of the relevant variables, the lower the degree of uncertainty in forecasting the trend of the sector (Figure 1).

To apply the model identified to the study of future trends in the tomato sector, a medium-long time period is considered, taking into account the maturity of the agri-food sector, to limit complexity, innovation, sustainability and internationalization and to reduce the degree of uncertainty, each of them is operationalized into two macro-categories. This model must take into consideration a series of main agri-food trends such as technological and non-technological innovation, the environment and sustainability, the individual and corporate choices for internationalization and entry into new markets (Figure 2).

In the production and processing industry, we must focus on the joint activity of technological and non-technological innovation. Technological innovation capable of determining substantial improvements in the quality of the product or of the production process must increasingly be accompanied by innovation non-technological relating to organization and marketing activities. The competitiveness of the sector must, in fact, be based on the constant research and implementation of products to respond to new needs, the introduction of new processes that consider the growing digitization of the economy and new organizational forms and marketing actions capable of significantly improving the national or international adoption of the manufactured products [19].

The primary objective of the agri-food processing industry is to offer good, healthy, and safe food at affordable prices for everyone. To this end, companies in the sector must be engaged in product and process innovations aimed at creating healthier products suitable for different needs and lifestyles. The know-how starts from an adequate selection of the best raw materials available and is carried out through production processes born from ancient gastronomic traditions [20]. The agricultural and agri-food sector are in the ideal conditions to fully exploit the potential offered by information and communication technology to individual companies and to the production chains in which they are inserted, both as regards specific activities (such as research and development), both as regards support activities (such as technology transfer). In parallel with product or process innovations, companies also implement marketing innovations aimed at helping the consumer make choices based on
detailed information on products, raw materials and conservation methods. These innovations must above all concern packaging which plays a key role in guaranteeing food quality and safety, protecting product integrity during transport, distribution and consumption, conveying brand values and also providing nutritional and service information essential for the consumer [24]. The work of consumer information and communication must be accompanied by real innovation on the market to guarantee new solutions suitable for different lifestyles and targets. The improvement of the nutritional characteristics of food products is achieved through a modification of their composition, as far as technologically possible and accepted by the consumer and by trying to maintain the organoleptic characteristics of the product (flavor, texture and shelf life). Most agri-food companies that intend to compete in the global market choose the development of innovations in design and the adoption of new solutions in the field of wrapping and packaging that enhance the new products as a strategy for diversifying and improving the production offer [25]. The growth strategy of many companies is based on organizational innovations which provide for the strengthening of the distribution network in the markets in which they already operate or the entry into new markets by setting up their own sales networks abroad [26]. Further innovations concern the organization of the network of raw material suppliers. In order to be able to create products to be introduced on the global market, the Italian food industry is not self-sufficient for the raw materials of some product chains. In these types of matters, it is necessary to implement innovations of an organizational nature aimed at optimizing relations with foreign suppliers through integrated management systems which provide for participation in the activities upstream of the supply chain.
Companies in the agri-food sector should direct their activities towards the development on a global scale of production and consumption business models capable of making Italian companies capable of meeting the present and future needs of the world population while respecting the environment and communities territorial. From this point of view, the objective of companies extends from offering quality products to doing so with respect for the environment and future generations. The sustainable development of agri-food companies must consider the possibility of extending as much as possible the policies for the reuse of waste by-products, in the production of bioenergy, in the cosmetic and pharmaceutical industry and in the production of fertilizers. Significant progress must also be made in terms of more efficient use of energy and water in production processes along the entire food chain.

The issue of sustainability must be accompanied by that of health and food safety. The lifestyle of people worldwide has undergone profound changes in a relatively short period of time. In fact, in the last decade, social and economic changes due to globalization have had a strong impact on the organization and functioning of our society, leading to pervasive and consistent changes in eating habits and behaviors. In the meantime, a real demographic revolution has taken place which has led to a substantial increase in life expectancy. This change in eating habits and lifestyles has resulted in a greater orientation of the consumer towards food products with health benefits and of better quality. This has led to a natural segmentation of the market which must lead companies to consider the needs of new market niches that respond to the needs of the elderly, vegans, sportsmen, etc.

Environmental issues related to the agricultural sector are influencing the way farmers and businesses in the sector operate in agricultural production through the adoption of more sustainable and environmentally friendly cultivation techniques, better management of water resources, the use of renewable energy sources. The extensive use of chemicals and pesticides in agriculture has polluted rivers, lakes and other water resources and adversely affected the health of agricultural workers. The conversion of forests to agricultural land has a significant impact on biodiversity and the destruction of wildlife and its habitats.

The international growth strategies of agri-food companies can be aimed at defending existing markets or at entering new markets and can be implemented in different ways depending on the objectives that the company sets itself to achieve. From this point of view, it is necessary to distinguish the determinants underlying the internationalization choices from the methods of implementation of these strategies. In the first case, it is necessary to identify which factors drive towards the choice of a given market, which opportunities are present in it or which reasons make it impossible to exploit the same opportunities in the domestic market. In the second case, however, it is necessary to focus on the decision-making processes of companies, on the reasons for choosing one method rather than another and on the main resources that make a given internationalization path possible. Traditionally, internationalization processes in the agri-food sector have involved large companies. In recent decades, however, many small and medium-sized enterprises (SMEs) have carried out their economic activities outside national borders, becoming international players. SMEs face more challenges than large multinationals to compete successfully globally. The main barriers to the internationalization of SMEs are, in fact, the scarcity of working capital to finance exports, the difficulty in identifying foreign business opportunities, the limited information to analyse the markets, the inability to contact with potential clients, the difficulty in obtaining certain foreign representation, the lack of time of managers who mainly deal with internationalization, the inadequate amount
of personnel not trained in internationalization. These problems can be traced to a general lack of time and managerial skills to internationalize, financial means and knowledge of foreign markets. The success of an internationalization operation requires the prior definition of a clear strategy and the acquisition of a series of skills, abilities and resources. The greater number of constraints and the substantial differences in the available resources and organizational structures of SMEs compared to large multinationals highlight a series of limitations in using the literature of the latter to explain the choices of the former.

5. Conclusion

Relationships between microstructure, process, product characteristics and technological innovation can protect the quality and origin of products. Innovations are not enough if they are not accompanied by a regulatory environment conducive to business development. Policy-makers could play a leading role in deploying this innovative approach. In developing countries, the challenge is to use mostly internal resources to develop inexpensive technologies and enrich food formulations. In developed countries, the need is to balance scientific innovation with cultural changes. Harmonization with the regulatory framework and homogeneous implementation of land-based regulations are key concepts to ensure the proper development of efficient agro-food policies. Think first of all about the issues of security, rationalization of controls and the embargo of bureaucracy. But also, to the sustainability of food production and the need for common rules on supply conditions in crucial international commodity markets for the development of certain products.
References


