

Sustainability and Innovation Against the Techno-Corporate Gap: Evidence and Perspectives from the Italian-Romanian Partnership

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Abstract. This work aims to investigate the status quaestionis of the *techno-corporate gap* in Romania and the potential prospects for early reduction. In this context it was possible to provide a specific contribution on this subject as further proof of the potential criticalities currently afflicting the *modus operandi* of small local Romanian firms. The evidence from Romanian small farms helps to understand how only through the technological reconversion and new business models, together with strategic partnerships, SMEs will be able to stand up to the multinationals and foreign companies.

1. Introduction

There are almost 5 million peasants in the countryside and the outskirts of Romanian cities. With almost 50% of all European farmers and 13.3 million hectares devoted to agriculture, Romania is one of the largest agricultural resources in Europe [1-3]. Peasants and small-scale farming, however, seem to be more a hindrance to the economic strategies of the few large companies than a resource for the country. In the last decade, almost 2 million hectares have been sold to large local and foreign investors and converted into monoculture plots. In this regard, the political parties argued that everything would be fine but that to be competitive in the market the agricultural “yield” would have to be increased [4]. This scenario inevitably raises some fundamental questions.

What are the reasons why agriculture now accounts for 5% of GDP compared with 15% more than 20 years ago?

What are the reasons why local companies couldn't – or have not been able – to exploit this surplus to turn it into a strategic economic value?

Are there other than political reasons for this development? And again, what is, or could be, the role of foreign companies in this economic scenario?

According to a recent census in 2020 there were 23,000 Italian companies active in Romania. They operate in almost all economic sectors and according to recent estimates Italian investments in Romania exceeded 9 billion euros [5]. Agriculture is certainly one of the many sectors in which these companies are particularly apt. In fact, Italy is the leading investor in agricultural land in Romania.

Today, in fact, Italy and Romania form a model of highly integrated economic systems, through value chains that support growth in both countries. This explains the great balance of trade too. Italy is the second destination market for Romanian exports and the second supplier of Romania, which represents the 13th destination market where Italy mainly exports metal products, textiles, machinery, electrical appliances, means of transport and chemicals. Specifically, in the first half of 2021 Italian exports to Romania were 4.8 billion euros and imports 4.1 billion euros [6].

As we will see in the rest of this work, it is therefore appropriate to evaluate the creation of specific partnerships for the sustainable growth of local businesses and the development of the territory.

To do this, we are convinced that the optimal solution is to move towards a decisive innovative upgrade of local production systems, given that the level of innovation in the agricultural sector worldwide is now very high [7-9], together with the adoption of precise collaboration strategies. It is believed that this “joint action” may be the only effective solution to reduce what has been identified as a *techno-corporate gap* [10] of local firms in the agri-food sector.

In order to demonstrate this thesis, it was considered appropriate to proceed with the following analytical framework: the first part will outline the key aspects of the agricultural sector in Romania.

This will be followed by a study of the motivations that have led Italian companies to invest in the Romanian lands and agri-food sector. This issue has been further explored through questionnaires addressed to Italian companies in order to try to understand some crucial aspects of entrepreneurial initiatives in the agricultural field which constitute a fundamental link for the understanding of the role of *agritech* and the conditions of the agricultural market in Romania.

Next, the principle of the *techno-corporate gap* and the related criticalities found in Romania are described. This aspect is important to analyze the specific technical problems of Romanian firms related to the agricultural sector by directly referring to the studies carried out by the Ministerul Agriculturii și Dezvoltării Rurale [11]. The last part of the work includes the example that the Italian evolution in the agri-food sector can offer for a better approach of local Romanian companies towards *agritech*. It should be noted that the Italian example has been used since, as already argued, Italian investments in Romanian agriculture are the largest in number. Finally, a final paragraph proposes to outline some strategic perspectives aimed at reducing the *techno-corporate gap* in agriculture in Romania.

1.1 The status quaestionis of the agricultural sector in Romania

Agriculture is a strategic and vital sector not only for the Romanian economy but also for Romanian society. Nearly one fifth (19%) of Romanians are employed in agricultural related activities, compared to 4.1% EU member average [1]. Romania’s 3.4 million agricultural landowners account for one-third of total agricultural landowners in the EU.

The average Romanian landholding, however, is 3.7 hectares, considerable smaller than the European Union average of 15 hectares [1]. Romania is the European country with the highest percentage of farmland controlled by foreign companies. More specifically, about 35% is divided between European and non-European investors [2]. Since 2014 a new era of liberalization has been launched [12] which has contributed massively to this process. In addition, NGOs working in the territory pointed out that the effectiveness of the moratorium previously applied was limited to cases where the legal form was a foreign natural person. Therefore, it was enough to set up a domestic company to buy thousands of hectares. In this context, the big investors with Romanian nationality should not be forgotten [2].

Large amounts of resources have been invested to buy tens of thousands of hectares at a time in addition to what the Transnational Institute reveals to be a real *land grabbing* [13]. The liberalization of land – among other things – in accordance with the EU accession agreements, the incentives of the Common Agricultural Policy (CAP) and a new national law (No. 17/2014), which regulates the purchase and sale of land, would have given potential buyers, certainly local but above all foreign, a much greater bargaining power than sellers [2].

This landscape has inevitably led to the emergence of new protagonists: multinationals, banks, pension funds, insurance companies, together with land deal brokers, that is, the new promoters of transactions that often lack transparency. In addition to this dramatic aspect, there are two other equally important aspects. The first is related to what was said above and expresses the concentration of crops for the mere purpose of business. Despite its fertile soil, in fact, foreign companies mainly grow corn, wheat, rapeseed and sunflowers. They are the cheapest crops and are destined for a dense network of intermediaries [3].

Another important aspect for understanding the *status quaestionis* is the division of land into a myriad of plots [14]. “Unification” is an indispensable process for those who want to do conventional agriculture: today Romania is still divided into millions of strips of land, often without cadastral

registration [14]. A fragmentation inherited from the transitional period between the fall of the regime and the installation of the new government which divided the agricultural land into many small plots equally allocated to the farmers of the former state cooperatives. This is a choice that, if on the one hand it has allowed everyone to have a piece of land for self-sufficiency, on the other hand it has helped to keep agriculture an almost rural, subsistence activity [3].

Amalgamation, however, is not an easy practice. The bureaucratic aspects of collecting documentation take a long time and until 2007 Romania never had a real land registry. But this has not stopped the land market: landowners with less than one hectare continue to decline while large farms with tens of thousands of hectares have increased.

These include the Dutch giant Rabobank [15] and Lukoil, together with its affiliates [16]. The two giants would work the land to produce grain. One possible reason is the emerging bread market in China [3]. The volume of business it represents is very large, therefore, in order to meet demand, it is necessary to purchase ever new land in order to produce sufficient quantities of wheat. This constantly rising trend has consequently increased the offer price of the land which, while certainly not much remains for a medium-sized foreign investor, is however out of reach for most Romanian farmers.

As early as 2013, Judith Bouniol denounced the practice of concentrating land in Romania in the hands of a very few. The French expert claimed that at that time 6% of the land was owned by multinationals, equivalent to approximately 800,000 hectares of arable land [17]. Just think of Agricost, which alone boasts a property of about 57,000 hectares of land and more than a thousand workers [18].

The risk is that the strategic management of agricultural resources – and not only – will remain under the oligopoly of a few companies. The desire of the new generations to move to the cities and the desire of the older generations to sell the land they own is only increasing this trend of concentration under the control of a few large investors. Bouniol [17] argues that it is difficult to talk about land grabbing as there are no coercive practices to induce smallholders to sell their land, and more often offers are welcomed. The apparent legality of this phenomenon, however, is guided by a *velvet glove that masks the aggressiveness of an iron fist* [17] for the potential repercussions it may have in the medium to long term. Against this process there seem to have been no particular measures at national regulatory level while we can speak of a subsidy from the EU. From 2000 to 2006, Romania received 150 million euros in grants for modernization projects of agricultural structures; however, they have almost mainly flowed into large-scale projects [3]. In 2012, Europe fully covered the cost of renting the land, favoring agri-business oriented companies with public money. Not to mention how the resources were distributed: out of 500 companies, 1% received half of the available funds; the remaining 99% went to the other half [3]. Almost all the contributions for the European Agricultural Fund for Rural Development (2.9 billion), furthermore, were paid to those companies capable of putting on the table an amount equal to that requested: this means that small farmers, who often do not have loans are disbursed by banks due to lack of guarantees, they have not benefited from any development aid [3].

1.2 Italian direct investments in the agricultural sector in Romania

In order to try to better understand the situation of the agricultural sector in Romania, in addition to the analysis of the literature, the primary and secondary sources, it was considered appropriate to outline the objectives and strategies of the companies that more than others have rooted themselves in the Romanian agricultural market. Italy is the fourth country by volume of investments in the Romanian territory, equal to about 9%, and the first in number.

The main sectors of Italian interest are infrastructure, renewable energy, advanced manufacturing, technology, and health but above all the agri-food sector. In the recent Economic Forum organized by Confindustria Romania it emerged that Italian direct investments in Romania have a value of over 9 billion euros [5]. According to ICE, the Italian farms registered in 2016 are 1361, equivalent to 6% of active enterprises [19], and they cultivate about 25% of the Romanian agricultural land, equivalent to over 200 thousand hectares. The main crops are only corn, wheat, rapeseed and sunflowers. In some areas, companies of Italian origin represent 50% of the foreign presence. As regards the areas of concentration of Italian companies in Romania, about a quarter are based in Bucharest and in the neighboring district of Ilfov. The second province in terms of number of companies is Timis, followed

by Arad, Bihor and Cluj Napoca (the capital of Transylvania where many foreign companies able to combine research and industrial development are located) [6].

In the district of Timis, for example, the capital Timisoara is known as the “eighth province of the Veneto” since there are many farmers from the Italian region of Veneto. In Timis there are in fact 135 Italian companies which are owned by 30 thousand hectares.

What are thus the real reasons that induced this wave of economic migration, especially in the agri-food sector? In order to try to shed light on this rather thorny aspect given the economic and social interests involved, moreover in a context of ever-emerging corporate sustainability, it was considered appropriate to create questionnaires to be submitted to Italian companies that moved from Italy or arose directly in Romania under the conduct of Italians. To carry out the sampling, three distinct groups of companies were identified, selected by turnover range and number of employees (Table 1).

Table 1. Structure of the analyzed sample

Year of establishment	Companies' Group	Number of Employees	Annual Turnover € (year 2021)	Subject Interviewed
From 2000 to 2019	1	≤ 3	up to 100,000	Sole entrepreneur
	2	≤ 5	between 100,000 and 500,000	Manager
	3	≤ 10	between 500,000 and 1,000,000	Manager

The questions submitted to the entrepreneur (mainly in the case of small businesses) or to the manager were focused on various aspects, however, all united by the principle of investment and the achievement of technological innovation by the company (table 2).

These two aspects are in fact essential to understand the link with the *techno-corporate gap*, which will be analyzed later, and as further proof that the investments of foreigners – in this case Italians – are determined or facilitated by specific criticalities expressed by the local firms operating in the agricultural sector.

Therefore, in addition to understanding the specific reality that distinguishes the analyzed company, the questionnaires allowed to investigate the level of technological innovation that characterizes the processes, how much is invested in technological innovation and whether particular barriers were found (in financial, organizational or managerial terms). Particular attention was then placed on the relational level with the reference territory in terms of relationships with suppliers, customers, commercial partners and even competitors.

This aspect is fundamental because, through the study of the *techno-corporate gap*, we want to support the hypothesis that (as an alternative to digital transformation in an individual key) it is mainly through new technical collaboration solutions, strategic partnerships or business networks that small local businesses will be able to win the challenge with agricultural multinationals.

According to the data collected from interviews addressed to n. 30 Italian companies established in Romania between 2000 and 2019, the last year considered before the pandemic, the reasons for the opening of Italian companies in Romania are mainly attributable to four factors: first of all, the low land prices, follow the tax burden, the cost of labor and soil fertility.

Table 2. Framework of the questionnaire

Argument		Description	
Area of specialization in agribusiness		Describe the specific section in which the company operates in the field of agribusiness	
Innovation management		Describe the importance that innovation has for the company	
		Describe the most important technological solutions adopted in the processes	
Barriers against innovation		Describe the main barriers encountered while adopting innovation (financial, organizational, managerial)	
Management of relationships		Understanding of the collaborations put in place by the company in the area (relationships with suppliers, customers, business partners; competitors)	
OPERATING motivations of the delocalization	Describe the influence exerted by the factors in terms of	PRODUCT	<i>resources (land quality)</i>
			<i>specific technologies</i>
		ORGANIZATION	<i>quality of labor</i>
STRATEGICAL motivations of the delocalization	Describe the influence exerted by the factors in terms of	COSTS	<i>labour costs</i>
			<i>land prices</i>
			<i>tax pressure</i>
		COMPETITION	<i>competitors' pressure</i>
		LOGISTICS	<i>distribution opportunities</i>

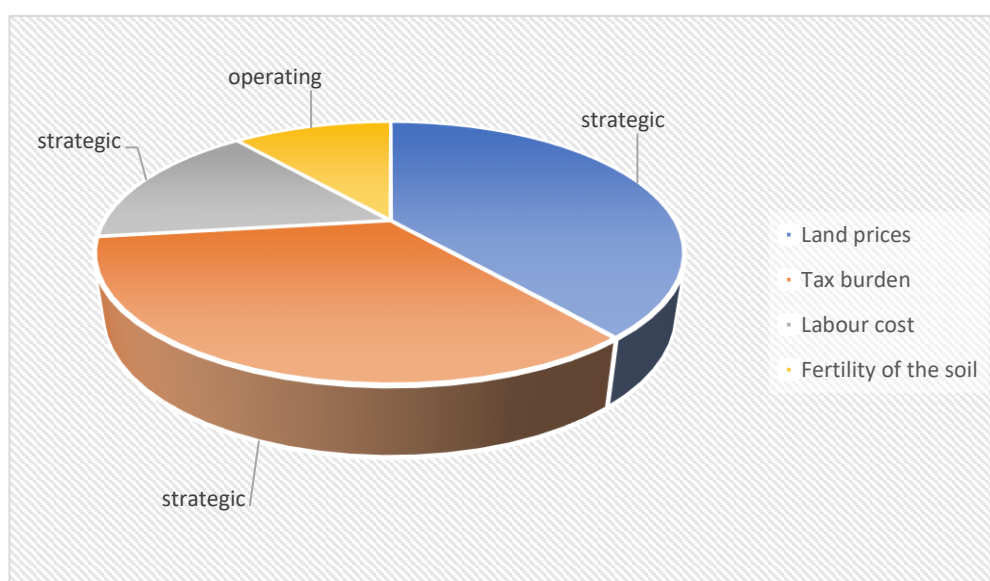


Figure 1. Reasons for Italian investments in the agricultural sector in Romania

As can be seen from the Figure 1, these are mainly strategic reasons aimed at achieving an increase in the chances of success of the entrepreneurial initiative and not at obtaining products with specific

technical characteristics or due to local resource requirements. These data provide a further key to understanding as companies move to where they know they can exert an economic influence.

The Italian companies interviewed are technologically well equipped, some for an immediate technological investment while others for a constant upgrade over time, but still at the same level as the technological equipment in Italy. This further evidence underlines how the investments made in Romania were not dictated by a desire to escape from a now technologically advanced reality.

As regards the system of relations with other companies in the area, the interviews revealed that over 70% of Italian companies are willing to open up to forms of collaboration through the creation of networks aimed at strengthening the supply chain system and to broaden the panorama of target markets to be served.

2. Techno-Corporate Gap and Agritech in Romania

2.1 *The challenges of the Techno-Corporate Gap*

Referring the reader to our specific work entitled “Managing Corporate Innovation. Determinants, Critical Issues and Success Factors”, published by Springer [10] for any in-depth study of the topic, we find it interesting to highlight the key features of what we have called the *techno-corporate gap*.

Could we ever think that Italy, one of the founding countries of the European Union but above all a destination symbol of good living, is today one of the European countries with a very high rate of *techno-corporate gap*?

According to a 2018 study [20], traditional companies, i.e. those that do not use 4.0 technologies nor have future interventions planned, correspond to 86.9% of the total.

The Center-North confirms itself as the main promoter of investments in innovation, while the South shows a very low propensity to change. As part of the transformation towards Industry 4.0, a greater propensity for process innovation is also considered, together with product innovation connected to a decisive research and development activity. From this point of view, large companies express a much higher potential and show a propensity to invest in both production and data technologies, while small companies (micro-small) prefer the specific use of data technologies [20].

If we consider the investments in a more general way, it emerges that the discriminating element among the different profiles is not to be found in the presence of a mere renewal of the physical capital, but rather in the willingness to act on the human capital together with the investment in technologies. In fact, in order to satisfy their needs, companies resort mainly to human capital training (43.6%) and to the acquisition of external services (37.7%).

Analyzing this aspect also from the point of view of size, some substantial differences emerge, since the larger enterprises resort mainly to staff training and new hires, while micro and small enterprises, in addition to training, resort to a relatively greater extent to the purchase of services and external collaborations [20]. While on the one hand such a policy may seem appropriate by virtue of a considered make-or-buy principle, it is worth stressing how much this situation can actually push towards a constant subjugation of micro-small companies to the wishes of service providers.

Apart from specific sectors, the Italian business context therefore shows a situation of enormous diffidence towards the use of technologies to support processes and products.

These data, which can be considered extremely dramatic if contextualized in an international economic system already largely centered on technological development, in our opinion clarify the presence of a limited “company logic” [21] which in Italy is still largely linked to traditionalist preconceptions. In spite of ourselves, this view is not only the expression of a *techno-corporate gap*, but as a whole it contributes to exalting an even more worrying technological gap with other European countries, as expressed by the indicators of the Global Innovation Index [22].

The analysis carried out [10] allowed to demonstrate that renewal objective of companies but especially the strategy inherent in such processes on which the success of the investments themselves depends are related to corporate governance issues.

By reasoning in systemic terms [23, 24] this assumption is expressed by the following relation: Innovation → Technology → Management → Corporate Governance.

This concatenation is intended to underline how the ability to achieve innovation is closely linked to and depends on the technological skills of the company's scientific team; in turn, the know-how of a company is bound to the managerial choices in terms of development of a new product, research of new and specific technical skills to better face the market competition or more generally for the needs of company reengineering. However, the management is conditioned by the eternal debate on the creation of value for shareholders [25-30] or in small companies by the convictions of the founding owners (still linked to an artisan culture) and is largely conditioned by them.

Governance establishes medium-long term objectives (in this specific case, the investment in innovation), but it is also constantly influenced by external dynamics that can be cultural (customs and traditions of the territory in which the company operates or the competence of the shareholders themselves and of the top managers), social (massive influence of stakeholders such as the mass media or political forces that discourage certain types of development) and even market (development of private equity initiatives, support of the banking system, high competition).

Therefore, even if indirectly, the change in the governance structure and the perspectives connected to it can concretely act on the result in terms of innovation: recognizing the need to look for new managers specialized in innovation (innovation coach), approving new investments in the scientific sector, welcoming in its capital new partners to undertake new business initiatives and thus mitigate the risks etc.

By using the "control theory" [31] in terms of innovation creation it is possible to identify different levels and levers that the company can use [10]. The *techno-corporate gap* is thus understood as the margin due to the ability of firms to create innovation and can be reduced thanks to countless strategic choices taken by governance, adopted individually or in combination:

- maintaining a high control governance structure capable of producing innovation technology internally (having experienced managers, internal R&D areas, with own or borrowed capital);
- search for new partners who will contribute capital by way of equity or contribute assets aimed at achieving new technology (logic of shared enterprise - open governance structure);
- development of strategic partnerships aimed at joining forces exclusively for joint development projects (typically found in the creation of joint ventures);
- membership of enterprise networks;
- drafting of technical agreements in order to be able to develop the technology internally without necessarily making investments.

In the light of the strategic solutions adopted, a series of causal diagrams [32, 33] will take shape, which will positively or negatively influence the achievement of an adequate level of innovation. As mentioned earlier, however, it is up to the system thinker or manager to be able to best identify the boundaries of the system being examined.

2.2 Evidence of Techno-Corporate Gap in Romania

According to the analysis of the Global Innovation Index 2021 [22], in the world ranking Romania is positioned in 48th place with a score of 35.6 (the best in class is Switzerland / 65.5). 31 economies are performing below expectations on innovation. In the high-income group, three are European Union economies - Greece, Lithuania and Romania [22: 25].

As showed in table 3, the areas in which Romania has many weaknesses are numerous. For the purposes of our analysis, the aspects related to access and use of ICT skills, now an essential requirement in the 4.0 era, are highlighted in particular, the volume of credit to the private sector, especially that aimed at micro-enterprises.

The limited volume of joint venture agreements and strategic alliances, furthermore, is particularly important, today more than ever essential to win global competition and dictated by large companies operating in the agricultural and agri-food business sector.

2.3 Criticalities in the agritech sector in Romania

Romania has the fifth agricultural area used in the European Union, however, according to authoritative sources, the equipment has now become obsolete.

Table 3. Fields and weaknesses emerged from Global Innovation Index 2021 - Romania

Source: author's adaptation from [22]

Fields	Weaknesses	Score	Rank
Human Capital & Research	Global corporate R&D investors	0,0	41
ICTs	ICTs access	73,4	51
ICTs	ICTs use	68,9	50
Credit	Domestic credit to private sector	24,7	106
Credit	Microfinance gross loans	0,0	73
Investment	Venture capital investors, deals	0,0	74
Investment	Venture capital recipients, deals	0,0	76
Knowledge workers	Knowledge-intensive employment	24,0	65
Innovation linkages	Joint venture/strategic alliance deals	0,0	93

This particular aspect was first of all analyzed in the Romanian National Rural Development Program 2014-2020 [11] which argues “Romanian agriculture has an insufficient level of endowment with machinery / equipment, physically / morally used with a negative impact on productivity. Many farmers, including those in the mountains, have production systems based on outdated mechanization, poor quality and inadequate buildings / storage facilities. Tangible assets are not adapted to production conditions, especially during peak periods. Many farms have difficulty adopting new technologies due to insufficient financial resources and limited access to finance. Small and medium-sized farms need support to realize their potential and become competitive. They need investments in modernization and construction of facilities, equipment, machines, post-harvest and conditioning spaces, sorting systems, calibration, means of production, etc.”[11: 131](author's translation).

Romanian Ministry of Agriculture and Rural Development continues, arguing that “There is a need to prioritize agricultural sub-sectors with declining herds, especially cattle and pigs, because RO is traditionally a meat consumer, and the potential for economic growth can be exploited in these sectors, but also in the poultry sector, where production faces increasing competitiveness. The crops sector has a yield below its agricultural potential. Large farms have a significant deficit related to the application of the latest techniques and technologies that allow a competitive development with low impact on the environment. By addressing these needs, farms will improve cost-effectiveness and labor productivity, diversify incomes and standards - including environmental protection, hygiene, animal welfare.

Addressing the needs of livestock farms to improve access to adequate manure management facilities and equipment will enable them to improve standards and reduce GHG emissions. Farms will be encouraged to use technologies for good soil / water management, will be adapted to the effects of climate change in the context of declining trends in vegetable crops and major fluctuations for certain species. There will be a better orientation towards high-performance irrigation systems that contribute to water efficiency, endowments / equipment that lead to reduced energy consumption and equipment for the production / use of renewable energy on farms[11: 132](author's translation).

Many farms obviously have difficulty in adopting new technologies due to insufficient financial resources and limited access to finance, while large companies need to restructure their business model through a full technological conversion.

These data are further confirmed by Agerpres (Romanian Press National Agency), which claims that over 73% of the tractors and combine harvesters fleet in Romanian agriculture has exceeded its lifespan and the technical equipment of agricultural machinery has a direct influence on the trend of the producers' market [34]. The sources (already sufficient in terms of importance) were more recently accredited in the conference held in July 2021 in Italy during which various Romanian political forces, promoting the collaboration between Italy and Romania, discussed the topic of agribusiness. From the forum, the profound need again emerged to transform an agricultural economy still largely based on traditional techniques into an advanced system by means of which raw materials are more integrated

with production [4]. The conference also revealed how desirable cooperation with Italy is in order to transfer the technologies of machinery, food processing, crops and livestock [4].

The agricultural mechanization market in Italy is well developed also because the agri-food sector is one of the leading players in the Italian economy; moreover, there is a very important cooperative reality.

Precisely for these reasons, given that the agricultural sector also plays a strategic importance in Romania, it is possible to draw inspiration from the Italian evolution by trying to establish further points for potential collaborations. Firstly, to help Romanian farmers in internal cooperation, given that Italy is the seat of large agricultural cooperatives, and secondly in the mechanization of processes. Italy in fact buys about 30,000 new tractors a year while Romania buys only 3,000 [4]. It is furthermore emblematic that Romanian cereal productions are largely exported, together with live cattle, to the countries of the Arabian Gulf [4]. *Agritech*, therefore, appears to be one of the critical and extremely topical points in Romania. According to some sources [35] investment companies are observing a plenty of *agritech* startups related to autonomous machinery, sensors, satellite monitoring solutions, intelligent irrigation, and the technology-driven business is the key in agribusiness sector.

In Romania, however, small farm holdings can be a challenge for tech startup initiatives. Internet connectivity, time, funds, a limited and aging workforce, and an effort to train in specialized farming are factors that are holding back the digitalization of this sector [35].

In such a context, in fact, there are still a lot of farmers who don't understand what the benefits are for them until they see the first demo and then they realize how technology can increase their productivity.

2.4 Smart agriculture in Italy: an example of development

To better understand the relationship between Italy and Romania, which sees an in-depth system of investments in the agricultural sector, and possibly propose similar solutions to solve the *techno-corporate gap* in the agri-food sector in Romania, it is also essential to outline the economic and technological condition which characterizes the "Italian" model.

The health emergency has slowed down the Agriculture 4.0 market in Italy. However, according to data from the Digital Innovation Observatory of the School of Management of the Politecnico di Milano together with the RISE Laboratory (Research & Innovation for Smart Enterprises) of the University of Brescia, the market has restarted reaching a value of 540 million euros in 2020 (approximately 4% of the global market) and recording a growth of 20% compared to the previous year, in line with the pre-pandemic trend [36]. In this perspective, spending is driven by precision agriculture solutions such as monitoring and control systems for vehicles and equipment and connected machinery. There are 538 Agriculture 4.0 solutions available for the agricultural sector in Italy (over 100 more than in 2019), which mainly use data analytics systems, processing platforms or software and the Internet of Things, and are applied in the cultivation phases, sowing and harvesting of products in various sectors, among which fruit and vegetables, wine and cereals stand out. The PoliMI Digital Innovation Observatory continues arguing that as many as 60% of farms use at least one digital solution, and 38% employ two or more, but only 3-4% of the agricultural area is cultivated with 4.0 tools, a sign that the market has yet to express a large part of its potential [36].

The agri-food sector was able to pass the test of the pandemic, also and above all because foodstuffs could not be drastically blocked as in other sectors. However, the agri-food sector has shown itself to be dynamic and open to innovation, well aware of the benefits that the application of digital technologies can bring in terms of efficiency, competitiveness and sustainability of the supply chain.

The Italian Agriculture 4.0 market is driven by manufacturers of agricultural and auxiliary machinery, responsible for 73% of turnover, followed by suppliers of IT solutions and advanced technologies (especially the Internet of Things) with a 17% share. The solutions that attract the most investments are those for the monitoring and control of agricultural vehicles and equipment (36% of the market) and related machinery (30%). 13% of expenditure is concentrated in management software, systems for remote monitoring of crops and land cover 8%, 5% is represented by decision support systems, 4% by solutions for crop mapping and land, 2% from robots for field activities. Of the 538 4.0 solutions dedicated to open field cultivation, 79% are designed to help farms in the cultivation phase, 45% during sowing, 35% in harvesting and 16% in the planning phase. The technologies on which the

solutions focus are mainly data analytics (73%), platforms and processing software (68%) and the Internet of Things (54%, + 4%), followed by the latest generation devices (46%), mobility and geolocation (38%), vehicles and connected equipment (25%), cloud (19%, + 10%) and artificial intelligence & machine learning (12%). Most of these tools are used in remote land mapping and monitoring (41%), in the analysis of environmental and land factors (33%), in the monitoring of machinery and equipment (23%) and in water management (19%) [36].

It should be noted, however, that not only farms have benefited from technological systems and are increasingly evolving towards digital applications.

Food processing companies are also open to innovation and experimentation with 4.0 solutions, even if they are still often linked to basic technologies.

87% of the 135 companies analyzed by the Observatory apply or experiment with at least one digital technology, mainly in distribution and production processes, among which supplier and warehouse management software (75%) and portable devices (57%) stand out. However, there is no shortage of realities that focus on more innovative technologies: above all data analytics (19% apply them, 9% experiment them), cloud (18% and 10%), IoT (16% and 10%), advanced automation (13% and 3%) and blockchain (2% and 6%). Companies use digital solutions mainly to make production processes more efficient (52%), reduce the distance with the consumer (47%) and improve logistic management and traceability (45%). 85% of the sample intends to invest in 4.0 tools within the next three years, especially in mobile solutions (54%), management software for suppliers and warehouse (43%), data analytics (33%) and blockchain (18%) [36].

This combination is fundamental as the achievement of performance in terms of services or products can only take place if the entire supply chain is permeated by hi-tech systems.

As analyzed in previous works [7, 37] a quality finished product and customer satisfaction will increasingly be due to efficiency in the entire agri-food supply chain. This will increasingly define the need for strategic sector alliances aimed at creating innovative control systems from the beginning to the table.

3. New perspectives for agribusiness in Romania

As it happened and still it happens in numerous cases in Italy, in Romania today the potential benefits that companies can reap from an investment in technological innovation today clash with a social reality far from fully understanding the possibilities available on the market. The spread of these technologies is still far from international standards. The internal obstacles to diffusion lie primarily in the fact that there are not consistent investments in *agritech*.

This problem, however, is the direct result of a misconception of the firm and the owner of the company who doesn't understand the potential of an investment in technological innovation. The cultural barrier to innovation is the most frightening problem that has to be faced in order to overcome the so-called "traditional" business system. The number of companies in Romania that have planned or started business reengineering processes in an innovative way is infinitely lower than that of traditional companies. This conception not only does not allow companies to make new investments in technological innovation, but it also makes the very small companies more and more distant from the market reality that is rapidly changing today. The distance from the "smart" technological conception and mentality, therefore, not only makes traditional business realities uncompetitive, but also irremediably defines their economic defeat in the medium to long term as technology evolves exponentially and it will be increasingly difficult to understand and adapt to new standards.

The obvious consequence will be that the large companies will be the only ones to invest in cutting-edge technologies and to exploit highly qualified and specialized human resources in the hi-tech agri-food sector, thus deciding more and more the fate of the very small farms that work upstream and which will have to offer products in abundant numbers but at very low prices to survive.

Achieving a revolution in a smart key (figure 2) means first of all acting on the knowledge of our companies so that they can understand the strengths of a development 4.0. Moreover, it means understanding the potential of human resources with specific technical skills that can manage the new 4.0 technology without having to resort to external consulting, thus burdening the company with additional costs.

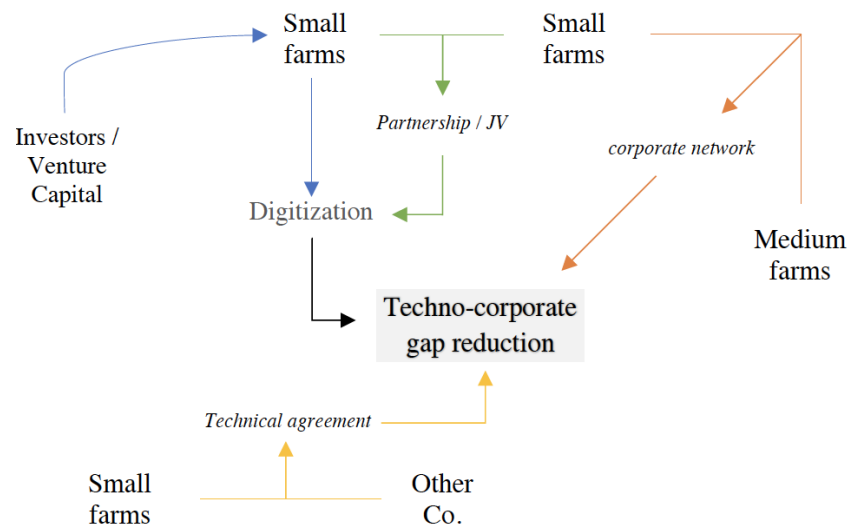


Figure 2. Essential causal diagram for the techno-corporate gap reduction

In order to achieve this objective, it is essential that the following goals are achieved:

- ad hoc training courses for specialized technicians;
- university courses to educate the new generations;
- the incentive to develop spin-offs;
- the interaction between companies and university research centres in a logic of open innovation [38, 39];
- the use of innovation managers (temporary managers, innovation coaches) to stimulate companies' investments and to allow companies in the “start-up”
- phase to become “scale ups” thanks to new business models;
- an opening up of the concept of doing business towards a “shared company logic” [7, 21].

This means that the supply chain must have an extremely high degree of cohesion between the actors.

In the absence of this change, the large companies that already control large portions of land will increasingly monopolize the system, defining supply criteria and imposing their own economic terms.

The companies, thus, must learn to open up to new forms of collaboration so as not to be excluded from new technological solutions and the potential they express.

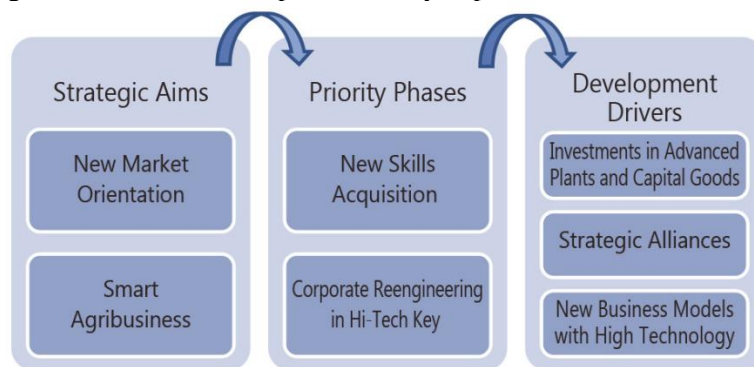


Figure 3. Map of the key points for a dynamic development

The “company logic” [21] must be rediscovered according to a principle of “sustainable sharing” that can provide the tools for new corporate governance solutions or push companies in the agri-food sector to seek new strategic partnerships [7].

Wanting to draw conclusions from this analysis, which certainly expresses a prelude to subsequent studies, it is considered useful to underline how much it has become imperative for companies in the agri-food sector to define new important strategic objectives (figure 3) for technological development.

In our opinion, this new orientation requires substantial processes of corporate reengineering of the entire food chain so that it can be carried out efficiently and effectively for the companies involved but especially for the end consumer.

It is therefore imperative to give priority to the contribution that technology on the market today can make to the companies involved in terms of reducing costs and the time needed to carry out processes and obtain goods.

Today, despite the fact that the food sector is extremely important for the Romanian economy, it has not yet been permeated by a strong diffusion of ICT technology, unlike other economic sectors or public infrastructures.

This revolution must therefore proceed at the same time as the smart revolution in the environmental sector that is emerging on the horizon [40].

In order to achieve this evolution, companies can leverage on some important drivers that consist both in investing in plants as well as in technologically advanced capital goods and in strategic alliances that allow to optimize the connections provided by the digital reality.

These drivers will provide the most appropriate tools to develop new business models that will make the firms themselves more competitive in the market.

Conclusions

“Audentesfortunaiuvat”. This motto, which was already very important for the Latins, has been deliberately emphasized from an economic point of view, since all too often companies rely exclusively on cold analyses of financial performance, without however considering that in the business world those who dare generally win.

To be clearer, in the business wins who is able to understand the changes or the entrepreneur who has a “vision” of the society in which he lives and future prospects considering that, regardless of the values more or less high ROI, there will always be a margin of risk in any form of investment and at every stage of its implementation.

So, entrepreneurs have to be daring and often have to be guided by their instincts.

Today it is imperative to understand new technologies but above all to understand that if large companies in every sector invest in them, it is not possible to refrain from carefully evaluating every potential benefit. The alternative is decline. There are still many open questions that can be considered on the subject of agribusiness in an innovative way and will certainly be developed through concrete cases in subsequent publications.

However, we would like to underline that at the base of the great changes in the economic field there are always “visions” and strategies that often refer to intuitions.

This is therefore a warning to the categories of entrepreneurs who often abandon themselves to the terror that business risk generally spreads and who hinder the development of their company for fear of taking new steps towards what they do not know.

But history teaches us that intuitions guide us towards great discoveries and winning initiatives.

These are the insights of the great men who, not by chance, later become great entrepreneurs and guide the trends of our future.

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