# Innovation and the role of Social capital in nursery industry: The case of Sicilian micropropagation companies

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**Abstract**

*The advent of technological innovation does not constitute a process confined to a particular territory or to a specific economic system, but represents a shared opportunity, cutting across all regions, sectors, and activities, that is destined to grow to meet the expectations of the modern consumer in terms of food safety, wholesomeness, quality, certification, etc. It is in this context that the work places itself, exploring the role played by social capital in the diffusion of micropropagation in agriculture, an innovation able to shift productive chains upstream, particularly in the activities of the nursery industry. The paper demonstrates the influence of numerous relational variables on the success of this activity.*

**Keywords** Horticultural nursery industry; formal and informal relational networks; market; qualitative analysis

## 1. Introduction

The adoption of innovations in agriculture is closely tied to the role and to the figure of the entrepreneur, activator of development and precursor of adaptive strategies, and to the overall specific resources available at a local level for the generation of particular types of enterprises and for their growth (Bakhshi *et al.*, 2016). The existing agricultural, economic, and agribusiness literature reveals that the adoption of innovations is often determined at a local level by the existence of resources such as the capacity for co-operation and trust (Jarrett, 1985; Feder and Umali, 1993; Liu, 2013), the presence of rich external tangible and intangible economies (Dinar *et al.*, 2007; Klerkx *et al.*, 2010), and the network of relations that link individual and collective subjects that can fuel cooperation and trust, and the production of external economies (Lambrecht *et al.*, 2015; Nevies and Osorio, 2012; Hsiao *et al.*, 2016). All of these multidimensional resources are universally recognised as expressions of "social capital", and together contribute to the creation of value and to the increased possibility of adapting the agri-food enterprise to highly competitive markets (on which it has a limited control of prices) by improving productive efficiency. In fact, it happens that such enterprises are forced to seek and adopt innovations in order to increase their productivity and, consequently, their profits, but this process is made more difficult in the context of scarce social capital and absorptive capacity, which in turn are related to the size of the enterprise, the type of enterprise, the make-up of the workforce, their level of training, and the life cy-

cle phase of the enterprise (Klerks *et al.*, 2012; Micheels and Nolan, 2016). Thus, the adoption of innovations may assume many forms, depending on the strategy of the entrepreneur and of the enterprise's core business (Abu Bakar, and Ahmad, 2010; Nossal and Lim, 2011), as can be observed in the modern nursery sector in an important region in Italy, which is increasingly concerned with the technique of micropropagation in order to ensure the production of base material for transplantation in the appropriate quality and quantity, and for the activation of intensive and specialised cultivation systems in the vegetable, flower, and fruit sectors. In vitro propagation allows for the realisation of a range of opportunities, such as: the production of a high number of plants of selected quality (clones) in a shorter time, in a limited space, and with considerable cost reductions compared to traditional techniques; the control of infectious agents bringing greater commercial opportunities with lower customs control, quarantine, and inspections; the overcoming of fertility problems and the recovery of biodiversity; the redemption of nursery production from seasonal trends and rigid crop cycles in the field, and/or the implementation of cold storage, in order to obtain a production that responds to the demands of the market. It is in this context that the study has been developed, whose objective is to offer an interpretative contribution that aims to clarify certain aspects of the process of diffusion of micropropagation and to measure the role and importance of specific elements of social capital that have an influence on the adoption of innovations in the nursery industry.

## 2. Conceptual framework

According to the theoretical literature, the entrepreneur who takes a positive approach to the adoption of innovations is one who looks for a new combination of resources, operates in a context of uncertainty, and acts in a timely manner (ahead of the competition). According to this view, innovation is incorporated into new enterprises entering the market alongside the existing ones, activating a process of economic development able to determine a qualitative change in the economy (Schumpeter, 1912). Innovation and competition represent, therefore, the soul of a dynamic process that simultaneously generates a "creative destruction" and a "creative accumulation" (Schumpeter, 1942), all the way from the creation and realisation of new products, the introduction of new production methods, the restructuring of the enterprise, to the identification of new markets and sources of supply. These processes take place "routinely" in agrarian enterprises, because in their evolutionary process they are generally subject to the use of new varieties, new machinery and technologies, new agricultural practices, new modes of organisation, and new forms of connection with the markets for the procurement of productive means and services and for the placement of products (Pannell *et al.*, 2006; Micheels and Nolan, 2016). In this scenario, factors that are taking on increasing importance are the size of the enterprise, the variety of resources available in the system, the changes in technology, the barriers to entry, the capacity for "team" working, etc. Overall, large corporations tend to invest more resources, but the qualitatively superior innovations end up being realised by small enterprises (Cohen and Klepper, 1996). These innovative processes accrue not only within the confines of the enterprise, but more and more through the formal and informal relationships that enterprises develop between themselves, and suppliers, customers, and structures of training and of research (Trigilia, 2001). Thus, in the contemporary economy, the social and relational dimen-

sions of innovation tend to become more important than that of the enterprise and, therefore, social capital becomes a concomitant factor of the development (Triglia, 2004, and 2008) and of the enterprise's roots in the territory (Ghoshal and Nahapiet, 2009; OECD, 2013). The systematic analysis of social capital dates back to Bourdieu (1980), Adler and Kwon (2002), and Arrengle *et al.* (2007), and highlights the relations between individuals and organisations that facilitate action and create value. They are the creation and reproduction of enduring social and economic relationships, able in time to procure material and symbolic profits (Cartocci, 2000; Ahmad and Mushraf, 2011). In fact, various empirical studies demonstrate that social capital has a positive effect on the performance of agricultural enterprises (Molina and Martinez, 2010; Van Rijn *et al.*, 2012; Dowd *et al.*, 2014).

Social capital is, therefore, a multi-dimensional and intangible phenomenon that is difficult to measure but is, nevertheless, economically very significant. In the literature it is possible to find diverse contributions concentrated on its relative measurement (Garofalo and Sabatini, 2008; Sabatini, 2009a, 2009b; Siegler, 2014) through the use of sets of variables such as: 1) "networks of familial relationships"; 2) "good neighbourly relations" or "networks of informal relationships"; 3) "associationism"; 4) "trust" and 5) the "social environment".

In the first case, reference is made to the family, the sphere in which relationships of trust and reciprocity are developed; the family then becomes an integral part of the social and institutional fabric in which economic activity is rooted. Assuming relevance for familial social capital is the spatial proximity of the extended family, the frequency and type of relations, and the sense of satisfaction with the quality of these interactions (Arreagle *et al*., 2007). In the second case, reference is made to the relational dimension of the life of the entrepreneurs and to all those connections that can represent "bridges" (known as *"bridging social capital")* to encourage the circulation of information and the building of confidence between different socio-economic environments. In the third case, social capital is considered both in terms of belonging to a form of voluntary cooperation or organisation, which can promote social interaction and the development of fiduciary bonds, and in terms of "corporate" social capital (e.g. Trade Associations), which can enable, also in an informal manner (White, 1981), improved access to a range of capital goods and services, contact with partners, suppliers, consultants, and public officials that is useful to entrepreneurial activities, suggestions regarding new techniques of production or of organisation and management of the enterprise, the recruitment of specialist labour, and the achievement and maintenance of stable niches in the market. In the fourth case, on the other hand, social capital is seen as a *"set of characteristics of the social structure, networks, name and trust that encourage collective action and the pursuit of shared goals"* (Putnam, 1993; Mutti, 2003). In literature, forms of trust are thus referred to as "horizontal" (between similar social categories) and "vertical" (between subjects in different socio-economic positions), involving public administration entities, institutions, the banking system, etc. In the fifth case, finally, reference is made to the social environment and to trust in relation to the quality of the rural and natural environment, the economic and social cohesion, the efficiency and quality of public services, the availability of infrastructure, and the relational climate characterising the place of work and the ability to develop effective teamwork (Foti *et al.*, 2013; Timpanaro *et al.*, 2013).

## 3. Materials and methods

In total 120 nursery enterprises were surveyed, predominantly located in Sicily, a region that holds 7% of the nations' nurseries (over 1,100 units) and 5% of the surface area (over 1,700 hectares). The selection of these enterprises was made by taking into account the productive sector, the propensity for the introduction of innovations, the connections with enterprises in the same sector, the degree of utilisation of the base material obtained through techniques of micropropagation, and the presence or absence of a laboratory of in vitro culture. The propensity to innovation has been determined on the basis of indicators related to the increase of the range of products/services over the last three years, the access to new markets, and the level of spending on research and development (ISTAT, 2015).

In fact, of the 120 companies surveyed, as many as 45 have set up a micropropagation laboratory, while the remainder are connected in varying degree by commercial and/or professional technical relationships with them. The survey was carried out through *face-to-face* interviews, utilising an *ad hoc* questionnaire, conducted between May and July 2015.

Because the research has set itself the objective of studying the relations between the adoption of innovations in agriculture and the influence of social capital in this process, the innovation was measured through the presence or absence of a micropropagation laboratory within the enterprise, although all the nurseries considered make use of this technique by connecting themselves with other enterprises holding such a structure on an *ad hoc* basis. For the social capital, only a few variables have been considered for each group selected in the literature. In particular, some aspects were detected of "familial social capital" (such as the generational change, and financial aid from the family), "organisational social capital" (considering the quality of the forms of association, the opportunities created for the enterprise's core business, and the procurement of means and services of production or for marketing activities), "social capital trust" (such as the quality of services of the public administration, of the banking and credit system, and of the social climate existing within the enterprise), and, finally, the "informal friendship networks" (with reference to relationships with enterprises in the same and other sectors). The above variables, qualitative and quantitative, have been measured in some cases in a discrete or continuous manner, while in other cases a scale of semantic differential to 5 degrees was used. In this way, the entrepreneurs interviewed expressed a score with a neutral value if 0, or with a +/- sign for judgments on social capital to represent a worsening or an improvement compared to the situation of the past or that expected for the future. Once the data were collected, in order to be comparable, since they were collected with different scales, they were subjected to statistical standardisation.

The analysis of the value of social capital has been carried out with a multiple linear regression, of the type:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ \ldots \ + \beta_k X_k + \varepsilon$$

where $Y$ = innovation adopted by the enterprise, through recourse to the activity of micropropagation; $X$ = diverse components of the social capital considered.

The model proposes to explain the influence of the considered variables on the organisational activities and of the market on the enterprise, and therefore, indirectly to

measure the weight of the social capital on these activities. As a criterion of adjustment, the statistical procedure carried out with SPSS has used that of "minimising the sum of wasted squares" between the effective values of the variable Y and the values predicted according to the estimate (Timpanaro *et al.*, 2015a).

## 4. Results and discussion

### *4.1. Organisational characteristics of the enterprises*

Overall, the enterprises surveyed manifest a particular dynamism, expressed in the average age of the entrepreneurs (with 34% under 40 years of age), in the high level of professional qualification (62.5% hold a high school diploma or university degree), and in the advent of the ownership and direction of the enterprise (in 61% of cases, the take over occurs within the family), in line with the character of this kind of intensive and highly capitalised activity, in which the organisational aspect and the skills and abilities of entrepreneurs play a significant role in addressing the different technical, economic, financial, and market aspects (tab. 1). In regards to the latter, the introduction of in vitro propagation has occurred in recent times (in 56% of cases, between 2010 and 2012), although it involves 37% of the surveyed sample. The apparent restricted dissemination of the micropropagation technique among the enterperises surveyed must be put in relation, on one hand, with the technical and economic problems that this activity presents, as well as the availability and quality of the human capital which operate in the production areas and, on the other, with the widespread presence of young entrepreneurial energy, with high levels of training and, therefore, a propensity to change and to the introduction of innovations.

The enterprises are predominantly engaged in the production of species of fruit and flowers (each with 35%) and, to a lesser extent, in other sectors (medicinal species with 17%, and fronds with 11%). The dimensional index considered was that of turnover, particularly significant for the wide prevalence of enterprises (in 50% of cases, the range is between 100,000 and 400,000 Euros), even if there are some enterprises that stand out compared to the average (over 400,000 Euros in more than 12% of the cases). The placement of the productions, however, is exceptionally close, taking into account that more than two thirds of the sample (exactly 72%) do not cross the boundaries of the regional market, and half of these limit their sales possibilities to within the same municipality in which the productive activity is realised. To this figure, a quite modest counterweight is exerted by those companies whose productions reach European Union markets (only 5% of the enterprises). A possible interpretation of the observations can be made on the basis of the distribution channels followed by these companies, evidently long since they are represented by an excessive presence of commercial intermediaries (approximately 39%), while only a quarter of the sample places the product directly with the end user.

On a strategic level, these enterprises seem to have well defined both their *company mission* and its sector of activity (69% are specialised in one specific nursery sector), with the objective of maintaining and/or defending their current market share (around 66% of the sample). Particularly significant, moreover, is the desire on the part of a number of the enterprises to differentiate their own product portfolio (a little more than 31%), both to expand the range of services and products offered (about 28%), and to

***Table 1.*** *Characteristics of the entrepreneur and the business strategies of enterprises in the sample of nurseries who use micropropagation of horticultural species (2015) (*)*

| Indications | Value % | Indications | Value % |
|---|---|---|---|
| ***Anagraphical age, %*** | | ***Nursery production, %*** | |
| - up to 39 years | 34.4 | - Species of frond | 11.1 |
| - from 40 to 55 years | 46.8 | - Species of fruit | 35.2 |
| - over 55 years | 18.8 | - Species of flower | 35.2 |
| | | - Medicinal species | 16.7 |
| ***Gender, %*** | | - Other | 1.8 |
| - male | 87.5 | | |
| - female | 12.5 | ***Value of production, %*** | |
| | | - Up to 100,000 Euros | 37.5 |
| ***Title of study, %*** | | - From 100,000 to 400,000 Euros | 50.0 |
| - Primary school | 6.2 | - Over 400,000 Euros | 12.5 |
| - Middle school | 31.3 | | |
| - High school | 46.9 | | |
| - Degree | 15.6 | ***Objectives of the strategic planning, %*** | |
| | | Maintain/defend the current market share | 65.6 |
| ***Year of introduction of micropropagation, %*** | | Expand the range of products and services offered | 28.1 |
| - before 2010 | 18.7 | Access to new markets | 59.4 |
| - from 2010 to 2012 | 56.3 | Increase activity abroad and reduce that in Italy | 3.1 |
| - after 2012 | 25.0 | Increase activity in Italy and reduce that abroad | – |
| | | Bring previously outsourced activities within the enterprise | 3.1 |
| ***Sector of activity, %*** | | Re-size the activity | 6.3 |
| - specialisation in only one sector | 68.7 | Activate/enhance partnerships with other firms | 31.3 |
| - differentiation of the product portfolio | 31.3 | Other | 3.1 |

*(*) Author's elaboration.*

gain access to new markets (59%). All of this allows the enterprise to continually evaluate the economic viability of its product portfolio and to differentiate their prospects of success, always bearing in mind that the scenario in which the market moves is dynamic (as a result of technological innovations, the economic situation, etc.), and that the demands of the customer/consumer are continually changing. From this perspective, even the search for opportunities of collaboration with other companies (31%) can be read in terms of their desire to intercept the preferences of the consumer, directing the activities

of the enterprise towards satisfying the customer *(consumer marketing),* in order to develop its market share and to increase profits.

### *4.2. Innovation and social capital for the enterprises analysed*

In the case of the enterprises surveyed (tab. 2), the propensity to the introduction of innovations is high (approximately 69% of the sample), as is demonstrated also by the level of contributions allocated to such innovations from the enterprise's turnover (50% of the enterprises invested an average of 6-12% of their annual turnover). In the process

***Table 2.*** *Orientation to innovations and their relative type in the sample of nurseries who use micropropagation of horticultural species (2015) (*)*

| Indications | Value % | Indications | Value % |
|---|---|---|---|
| ***Openness to innovation, %*** | | ***Organisational innovations, %*** | |
| - yes | 68.8 | - In management | 28.0 |
| - no | 31.2 | - In the organisation of work | 52.0 |
| | | - In external relations | 20.0 |
| ***Spending on innovations (% of turnover)*** | | | |
| - up to 5% | 31.8 | ***Marketing innovations, %*** | |
| - from 6% to 12% | 50.0 | - Product improvement | 40.6 |
| - over 13% | 18.2 | - Innovations in packaging / presentation | 9.4 |
| | | - New media/advertising techniques | 15.6 |
| | | - New sales solutions | 18.8 |
| | | - New pricing policies | 15.6 |
| ***Innovations of product or of service introduced, %*** | | | |
| - As a result of internal research and development | 39.6 | ***Reasons for the non-recourse to innovations, %*** | |
| - Acquisition of research and development services | 60.4 | - Lack of financial resources | 37.5 |
| | | - High cost of innovations | 29.1 |
| ***Innovations of process introduced, %*** | | - Lack of qualified personnel | 4.2 |
| - New production processes | 60.0 | - Lack of information on the technology | 4.2 |
| - New logistics | 20.0 | - Lack of market information | 4.2 |
| - New activities of production support | 20.0 | - Difficulty in identifying partners for cooperation in innovation | 4.2 |
| | | - Markets dominated by consolidated companies | 16.6 |

*(*) Author's elaboration.*

***Table 3.*** *Financial aspects of the sample of nurseries who use micropropagation of horticultural species (2015) (*)*

| Indications | Value % | Indications | Value % |
|---|---|---|---|
| ***Sources*** | | ***Degree of indebtedness*** | |
| - Self-financing | 28.9 | - less than 25% | 29.0 |
| - Bank loans in the short term (up to 12 months) | 13.2 | - from 25% to 50% | 64.5 |
| - Bank loans in the medium to long term (over 12 months) | 27.6 | - over 50% | 6.5 |
| - Personal loans | 17.1 | | |
| - Commercial credit | 10.5 | ***Institute of credit applications*** | |
| - Public financing | 2.7 | - Real guarantees | 28.4 |
| | | - Personal guarantees | 28.4 |
| ***Degree of dependence*** | | - Information on the budget | 25.9 |
| - Nil | 3.1 | - Project investment | 6.2 |
| - Low | 31.3 | - Trace of the solvency of debt | 11.1 |
| - Medium | 37.5 | | |
| - High | 28.1 | ***Purpose for which public funding is required*** | |
| | | - Business Start-up | 23.5 |
| ***Motivations*** | | - Supporting innovation | 47.1 |
| - Productive investments | 38.3 | - Machinery, installations, equipment, hardware | 29.4 |
| - The need for liquidity for ordinary activities | 61.7 | | |

*(*) Author's elaborations.*

of adopting innovations of the product and its development, they resort to the acquisition of services on the market (in 60% of cases), even if there are a considerable proportion of enterprises that internalise this function (about 40%). In this case, the research activity is focussed on the production according to a *problem-solving* logic (Timpanaro *et al.*, 2015b).

Significant for micropropagation is the recourse to innovation of process, related, above all, to the activities of production (60%) and to those of support (20%), as well as that of logistical organisation, useful both in upstream and downstream activities. Figuring heavily amongst organisational innovations are those relating to the organisation of work (52%), while a key marketing innovation is related to product improvement (in 41% of cases), made in order to adapt the offer of plantlets (micropropagated species and varieties) to the demands of the market. In any case, the adoption of such innovations is, to varying degrees, dependant on certain factors outside the enterprise, such as, in particular, the availability of new technologies *(technological push)* and the market conditions *(demand pull),* and to other factors within the enterprise, such as an innovative and marketing-oriented culture (Yli-Renko *et al.*, 2001), and the development of a product portfolio that comprises both hybrid species derived from genetic selection and

***Table 4.*** *Social capital activated in the sample of nurseries who use micropropagation of horticultural species (2015) (*)*

| Indications | Value % | Indications | Value % |
|---|---|---|---|
| ***Indicators of familial social capital*** | | ***Indicators of social capital of "trust"*** | |
| Advent of generational change | 60.9 | Political-institutional system | 8.9 |
| Family members employed in enterprise | 36.9 | Bureaucratic-administrative system | 16.3 |
| Family help in financing and loans | 68.3 | Bank and credit system | |
| Practical family assistance (e.g. unpaid work) | 52.7 | Positive judgment on the quality of the infrastructure | 12.4 |
| Family help in the presentation of partners, suppliers, consultants, etc. | 24.6 | Positive judgment on the quality of social cohesion | 16.7 |
| | | Positive judgment on the internal climate of the firm | 45.7 |
| ***Indicators of social capital of voluntary organisations*** | | | |
| ***Activity realised*** | | | |
| Principal core business | 50.0 | ***Indicators of informal networks of friends and acquaintances*** | |
| Research, development, innovation, design | 5.0 | ***Type of activity realised*** | |
| Information technology | 2.5 | Commission (acquisition of goods and services) | 23.2 |
| Procurement | 15.0 | Subcontract (sale of goods and services) | 16.2 |
| Distribution, transport, and storage | 12.5 | Network contracts and other agreements | 4.7 |
| Marketing, sales and after-sales services | 10.0 | Non-formal agreement | 41.9 |
| Legal and/or financial services | 2.5 | Other | 14.0 |
| Other | 2.5 | | |
| | | ***Subjects*** | |
| ***Subjects*** | | Firm from the same sector | 53.7 |
| Trade association | 65.4 | Firm from another sector | 22.2 |
| Business association | 16.4 | University/Research centre | 7.4 |
| Other | 18.2 | Public Administration | 13.0 |
| | | Other | 3.7 |

*(*) Author's elaboration.*

improvement, and from the local biodiversity. With reference, finally, to the 31% of companies which declared that they did not adopt innovations, a not inconsiderable role is played by financial difficulties of the enterprise (in over 37% of the sample), the costs related to their implementation (29%), and the role played by the leading firms in the sectors to which the enterprise belongs (with 17% suffering from the presence of dominant firms).

A complete picture on the nursery enterprise that resorts to micropropagation cannot disregard the financial aspects involved (tab. 3). From the survey carried out, one element that clearly emerges is the high degree of recourse to self-financing (in about 29% of enterprises), alongside access to external sources of financing represented by both short-term (13%) and medium to long-term (28%) loans, and by commercial credit (10%). In this context, the information on access to credit facilitated by public funding is alarming (observed only in approximately 3% of the sample). Overall, the degree of declared dependency is medium (37%) to high (28%), as the degree of debt (in 65% of the companies it lies between 25% and 50%) is, often, due to demands for liquidity necessary to cope with ordinary activities (62%). In the scope of strategies to access financing, a considerable role is played by the system of guarantees (respectively approximately 29% for each variable).

In this context, the analysis of the relational aspect of the enterprise assumes a particular significance (tab. 4). It happens, in fact, that in the prevalence of the entrepreneurs surveyed the agreements between enterprises are concluded in a non-formal manner (42% of cases), often for commissioned activities (23% of cases) and the subcontracting (16% of the total) of goods and services. Although without an apparent desire for self-organisation (Nardone *et al*, 2010), it is evident that within this productive fabric a strong horizontal relationship exists between the various components present in the same territory (54% declare having relationships with enterprises in the same sector), while relationships with universities, such as centres of excellence of production, of research, and of developing innovations, appear to be limited (in little more than 7%). As to the types of activity for which interpersonal relations are established, the connections between enterprises appear to be formed predominantly for aspects related to production (50%), procurement (15%), distribution, transport, and storage (over 12%), and for marketing, sales, and after-sales services (10%). Ultimately, therefore, it is possible to detect a different level of territorial integration and interdependence according to the type and to the degree of specialisation of the enterprise.

### *4.3. Results of the correlation model for the analysis of social capital*

Overall, the model explains 93% of the variability of Y, namely the enterprise's capacity for innovation through recourse to micropropagation (tab. 5).

The ANOVA analysis shows, moreover, that the fraction of variance explained by the model is statistically significant, while the analysis of the coefficients illustrates how familial social capital has a significant influence on the process of adopting innovations (both in the case of taking over ownership of the enterprise and in the financial support provided by the family), as well as some components of the aspects related to the organisation (opportunities for the enterprise's core business), to the component of trust (for co-participation in the process of adopting innovations on the part of all the enterprise's resources), and to friendship networks (for relations with other enterprises oper-

***Table 5.*** *Model of linear regression estimated for the analysis of relations between the adoption of micropropagation and the social capital recorded in the nursery enterprise (2015)*

| **Model Summary** | | | | | | |
|---|---|---|---|---|---|---|
| Model | R | R-squared[b] | R-squared adjusted | Standard deviation error from the estimate | | |
| 1 | 0.967[a] | 0.934 | 0.900 | 0.462 | | |
| **Anova[a]** | | | | | | |
| Model | | Sum of the squares | df | A of the squares | F | Sig. |
| 1 | Regression | 63,523 | 11 | 5,775 | 27,085 | 0.000[c] |
| | Residue | 4,477 | 21 | 0.213 | | |
| | Total | 68,000[d] | 32 | | | |
| *a. Dependent variable: MICRO_Lab* | | | | | | |
| **Coefficients[a,b]** | | | | | | |
| Model | | Coefficients non standardised | | Coefficients standardised | t | Sig. |
| | | B | Standard deviation error | Beta | | |
| 1 | SUB-Prop | 0.179 | 0.208 | 0.201 | 0.860 | 0.000 |
| | Help_FIN_FAM | 0.488 | 0.200 | 0.443 | 2,434 | 0.002 |
| | Quality_For_ASSOC | -0.067 | 0.064 | -0.131 | -1,041 | 0.031 |
| | Opport_Core_BUSI | 0.198 | 0.199 | 0.170 | 0.997 | 0.000 |
| | Opport_Mark_Supply | -0.235 | 0.223 | -0.264 | -1,056 | 0.030 |
| | Opport_MK | 0.009 | 0.205 | 0.010 | 0.042 | 0.097 |
| | Quality_Ser_P_AMM | 0.030 | 0.055 | 0.067 | 0.539 | 0.060 |
| | Quality_Sis_BAN_CRE | 0.040 | 0.054 | 0.083 | 0.736 | 0.047 |
| | Quality_Clim_AZIE | 0.077 | 0.063 | 0.115 | 1,227 | 0.002 |
| | Rapport_Imp_Same_Sector | 0.242 | 0.228 | 0.208 | 1,062 | 0.003 |
| | Rapport_Imp_Other_Sector | 0.152 | 0.254 | 0.177 | 0.598 | 0.056 |
| *a. Dependent variable: MICRO_Lab* | | | | | | |
| *b. Linear regression that passes for the original* | | | | | | |

ating in the same sector), as is clearly shown in Fig. 1. At the moment, the enterprises spontaneously establish strong horizontal links based on economic dimension, and build networking relationships for their target market within the territory, but suffer from an excessively close connection with a market of placement for their product (Hughes et al, 2014). The network relationships themselves can be a possible promotional model for innovations related to micropropagation, adequately addressing technical, economic, organisational, and training aspects, and the quality of human resources responsible for these functions and connected commercial issues. The literature reveals the influence of

these aspects of social capital in the development of innovations of process and of product, especially in the case of young technology-based enterprises (Yli-Renko et al., 2001). Not only that, but the enterprises are able to more effectively overcome times of crisis due to better connections with the market. Thus, the influence of familial social capital for the purpose of the creation of value for the enterprise and for the development of the other components of social capital is amply demonstrated (Arrengle et al., 2007). It appears necessary to secure the intervention of public institutions and the research community, which play an active role of mediation in terms of fostering dialogue within the system of enterprise (necessary given their territorial concentration), because the acquisition of knowledge is essential in the process of growth, and because the creation of an environment conducive to the circulation of competence, information, and knowledge can concretely determine the leap forward of the entire system, which is based on the direct relationship between production and the possession of technology. The remaining variables together show a statistically less significant influence on micropropagation. There exists, in any case, a potential demand for innovation in a horticultural nursery productive system that is, to varying degrees, dependent on the importation of propagation material from other areas that brings problems of acclimatisation of the imported plants, increase in the length of production cycles, limitation of cultivable species, and elevation of costs of production.

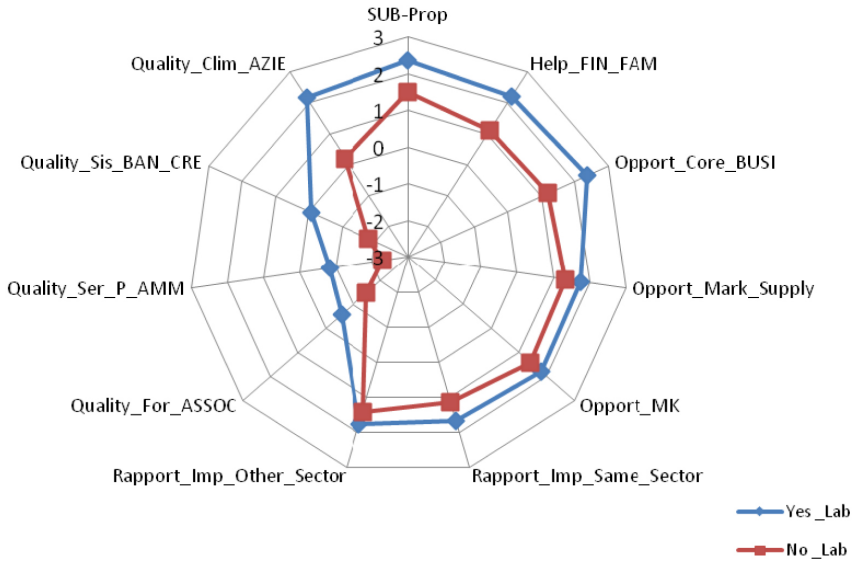


***Figura 1.*** *Average weight of the different components of social capital recorded in the nurseries with and without micropropagation laboratories*

## 5. Concluding Remarks

Despite some issues that remain open, *in vitro* culture has become one of the most widespread technologies of the nursery and of the advanced and modern horticultural enterprise. The techniques applied are of considerable significance today for the quality

of results obtained in the laboratory, in terms of the exemption from pathogens and the homogeneity of the agronomic behaviour. Therefore, in conclusion, the competitiveness of this system compared to conventional methods of multiplication is mainly linked to the possibility of producing plants cloned in high enough numbers in order to reduce unit costs and achieve the necessary economies of scale. In fact, despite the market potential of micropropagation, the individual cost of production of in vitro plants adversely affects its use, as the plants are often not competitive with those produced using traditional propagation techniques of grafting or growing from cuttings. The "labour" element has a significant effect on these costs, due to the numerous transfers of cultures necessary for the establishment of the individual plantlet, and to the significant losses of material in the various phases of micropropagation. The strong incidence of labour on the costs of production has, among other things, favoured products from Eastern Europe and Asia, well known for the use of cheap labour. Therefore, the prospects for diffusion are favourable, as long as research, technical assistance, and public and private partnership (from the EU through to the Regions, universities, and the business system), together build an organic system for the creation of an environment conducive to the spread of this type of innovation. In essence, it seems useful to focus on those aspects of social capital already exploited in whole or part by each individual enterprise and territorial nursery productive system, and on the absorptive capacity of innovation (Micheels and Nolan, 2016). The future developments of the research will be aimed at defining an adequate technical and economic dimension for laboratories of multiplication and their relative organisation.

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**Funding Information**

This study was carried out thanks to the financial support of the Assessorato Risorse Agricole e Alimentari, Regione Sicilia "Progetto Sementiero Regionale – Analisi economiche" (Giuseppe Timpanaro, scientific coordinator).