
REVIEW ARTICLE

INNOVATION TRANSFER AND RURAL SMES**CANNARELLA C., PICCIONI, V.****ABSTRACT**

The role innovation can play to make enterprises more dynamic and competitive is surely well known. For rural small and medium enterprises (SMEs) this can become a critical issue because they often need financial and technical incentives and support from public and private research institutions in order to make innovation accessible to them. Yet bridging research and productive dimensions is not always an easy task. The cooperation between researchers and rural entrepreneurs can become a rather demoralizing experience for both parties due to the action of a large number of inadequacies caused not only by financial, technical or organizational factors but also by cultural diversities and different approaches. This paper proposes some considerations matured by the authors while cooperating with some rural SMEs of agro-industrial and agro-business sectors in Central Italy to implement actions of innovation and know how transfer. The experiences reported have been made within the framework of article 15 of the Ministerial Decree (Ministry of University and Research) n. 593/2000 which allows temporary deployment of personnel from research institutions in SMEs. In this paper the authors outline some methodological guidelines developed and adopted to analyze and meet the innovation demand from SMEs involved in innovation transfer processes.

KEY WORDS: innovation, rural development, innovation transfer, management, rural SMEs

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DETAILED ABSTRACT

This paper outlines some methodological guidelines developed and adopted to analyze and meet the innovation demand from SMEs involved in innovation transfer processes. The paper is divided into different analytical steps. The first main step of this discussion involves an analysis about those factors and mechanisms capable to determine success or failure of the introduction of innovation itself. This step is composed of two sub-questions: a) nature and characteristics of innovation (what) and b) characteristics of innovation transfer (whether and how). With regards to the sub-question a) (nature and characteristics of innovation) innovations are classified according to their different nature and features: a description of an innovative cycle is also provided in this section. On the base of these elements, modes and times in which an innovative cycle is managed is described showing also those related extremely different results in the firm's/farm's approach to innovation according an analytical scheme. With regards to the sub-question b) (characteristics of innovation transfer) three complementary analytical levels are involved in this analysis: b.1) the characteristics of the innovation transfer source; b.2) the characteristics of the innovation transfer receiver and b.3) the relations between them. The combined action of these three problematic levels can produce a complex mix of negative/positive conditions really influencing the fate of the process of innovation transfer itself: a number of some frequent specific inefficiencies arising from empirical observation are described in this section. The second main step involves the description of the model adopted to manage a process of innovation transfer towards SMEs. This step is composed of two sub-questions: a) innovation and the enterprise's "constitution" and b) innovation and the "culture of innovation". In point a) (innovation and the enterprise's "constitution") the characteristics of the process adopted to draw a preliminary scheme of a firm's/farm's characteristics is provided together with the description of some analytical tools adopted to generate data and information. In point b) (innovation and the "culture of innovation") three key-variables capable to influence and determine the culture of innovation are highlighted. Information about the firm's constitution and innovation culture are then organized into two indicators: innovative potential and market position: the combination of these variables with those provided by the response to innovative cycles are implemented to identify four main categories showing different innovative potential and market position degree. On the base of the related results, two different general management approaches are outlined: these approaches should provide some useful contributions to concretely manage and cope with different attitudes towards innovation in order to grant to the processes of innovation transfer and cooperation between research centers and SMEs adequate potential and effective success margins.

INTRODUCTION

Small and medium enterprises (SMEs) of agricultural, agro-industrial and agro-business sectors operating in rural areas look at "innovation" with very differentiated attitudes: needs and pushes to adopt changes in a consolidated scenario (and the consequent reactions to adaptation processes) can highly vary in space and time. In these recent years, the direct and indirect effects of globalization represented for these rural sectors the main pushes to innovate caused by the reduction and progressive elimination of many geographical and legal traditional barriers [21,22]. Globalization forces (and the search of new relations in the trade of agricultural products between developing and developed countries) are fuelling in fact the current debate aiming at a re-thinking in many basic pillars of the Common Agricultural Policy (CAP) of the European Union (EU) in particular with regards to the injection of more consistent openness to world market with a parallel reduction and elimination of market protection policies. This erosion in the direct and indirect protection for agriculture and for those rural productions with high "traditional" content is convincing more and more farms and rural firms to think in terms of efficiency and productivity, to search for new skills and know how to achieve competitiveness and exploit potential opportunities and benefits globalization can imply (for instance those related to the promotion and trade of specific products and services despite of isolation and distance from crucial market networks). [4,11,40]

For the rural sector as a whole, changes in characteristics, composition and, above all, connections between supply and demand are stimulating different reactions among the operators of the sector itself. Some entrepreneurs are exploiting the system's potentials experimenting, for example, with new types of short market circuits (overcoming distributors and intermediate agents) thanks to the possibilities offered by Internet and the electronic commerce (The relations between Internet and rural enterprises are likely to be extremely complex under many points of view which cannot be analyzed in detail here. It should be carefully evaluated if these investments can be justified and how consistent and coherent the related outcomes can be. *E.commerce*, *e.business* and Internet create often only illusions: in addition, who cannot afford further investments in this field to adequately promote his products and

services remains "hidden" and isolated in this huge network.). Nonetheless these enterprises are facing a progressive massive challenge related to the effects of continuing market adjustments, concentration pushes, increasing competition among local, national and international suppliers in the same sector. Consolidated and inherited production and management methods, communication patterns and strategic synergies (defined to cope with concentration pushes and to provide solutions to a fragmented supply with no specific quality and image) tend to become obsolete in a very short time.

Marginal areas can show even more severe problems for the reduction (negative flows) of resources they usually suffer. These regions are in weak and debilitated conditions to cope with the effects of concentration policies: their local savings are adsorbed by urban centers, young and professional skills are attracted by the opportunities offered in cities or abroad, local output is not processed at local level, etc. These flows deprive territories of resources and the involved enterprises show a reduced capability to generate and preserve added value at local level: therefore local capacities need improving substantially through an *ad hoc* resource and skills management (by public and private subjects) [14,43]. These conditions are at the base of an evolving scenario composed, at company level, by a number of rural firms and farms potentially interested in incremental improvement processes to their existing products/services. It implies radical innovations to which some enterprises seem unable to change their strategies despite recognising the need to modify their thinking. Scientific partnering, transferring "tangible" and "intangible" products of innovation (technologies, skills, experiences, methods, etc.) can become a key-factor for these components of rural entrepreneurship providing essential contributions to the recovery, consolidation and expansion of economic activities [5,23,38,47].

The critical question of the entire issue is whether and how innovation, in terms of advanced equipment, practices, management tools, organizational structures and cultural changes, defined in research centers and experimented in testing firms, can be cloned and applied in a wider social and economic context. This question has to be considered as an essential component of "development" as a global issue [2,12,48]; often concrete obstacles for a widespread presence of a constructive environment

for an innovation convergence in these enterprises result from traditional approaches linked to ossified academic, folkloristic and bureaucratic visions. These approaches tend, in fact, to identify a limited diffusion of innovation with a lack of technologies, rather than a lack of an “innovation culture”, to be solved thanks to descending standardized policies. The complex network of internal and external relations at the base of the development of rural areas is evaluated with the same undifferentiated vertical and administrative procedures applied for decades in agriculture with a progressive extinction of initiative and personal commitment. All this does not contribute to increasing the interest in innovation investments, making these firms unable to see and retain an improvement in returns. This is the reason why innovations are paradoxically necessary to deal with innovation and make it convincing also considering the progressively reduced availability in financial resources due to the European Union’s (EU) enlargement eastwards with the inclusion of even more disadvantaged territories. This makes a complete reliance on public subsidies to grant a firm’s (and farm’s) survival a not practicable option in the short run. On the contrary it is essential to undertake a better, correct and “transparent” use and management of the available resources, both at public and at private level, in order to make innovation (and development itself) efficient and effective through investments capable to produce, even with regards to innovation transfer, real and concrete benefits to firms, farms and the rural territories involved [49,52].

SUCCESS AND FAILURE OF INNOVATION

The question whether and how innovation can be cloned and applied in a wider context is strictly connected to the understanding of those factors and mechanisms capable to determine success or failure of the introduction of innovation itself. It means that the above question has to be split into two sub-questions: a) nature and characteristics of innovation (what) and b) characteristics of innovation transfer (whether and how).

1) *Innovation (what)* is always linked to the idea of “change”: this question is critically connected to the fact that innovation doesn’t grow in a “ground zero” condition, but in a tissue formed by already existent resources, practices and approaches. Each concrete innovation process lies on former innovative

processes: each innovation process thus creates the pre-conditions for the following one. In this way, the characteristics of the context in which an innovation, defined as a new combination of existing factors, occurs are so deeply modified to alter the entire process in forms totally different from those it would have shown if developed only thanks to its own conditions [46]. Innovations can show very different nature according to their features for example [18] “need spotting” innovations (providing answers for known problems), “solution spotting” innovations (finding a new way of using an existing piece of practices/techniques), “mental inventions” (dreamed up ideas with little reference to outside world) or “random events” (situations from which innovation arises from something they were not looking for). The empirical evidence provides several cases about these innovations and the simultaneous actions of different types of innovations capable to activate innovative cycles. For example, a cooperative specialized in organic farming faced concrete difficulties in finding in the market high quality certified seeds to be adequately adopted for the organic practices in the specific local context where this cooperative operates. For this reason, it has been decided, on the base of a pre-operating study, to invest firstly in research and training, thanks also to scientific partnerships with local research institutions, in order to identify those local vocational species and qualities of seeds capable to meet the farm’s needs and secondly in appropriate new equipment in order to concretely produce, select and package these seeds necessary for a certified organic farming. With the introduction of this need spotting innovation, this cooperative not only is presently capable to completely satisfy its own certified organic seeds’ demand, but it has quickly acquired a strong position in the market as supplier of high quality seeds for many other organic farms (thus concretely contributing to increase the farms profitability and to repaid the investments made). This machinery was also appropriately modified in order to better fulfil the farm’s needs and scale (solution spotting innovation). Also random events can provide interesting innovations. For example, the cooperative cited above adopts a modified machinery (solution spotting innovation) to carry on the harvest operations. Conventional harvester in fact select automatically wheat grains from infesting seeds releasing the latter immediately in field during the harvesting operations. The machinery has been

modified in order to avoid that infesting seeds, selected from wheat in a separated container, are released in field for eliminating the use of chemical herbicides. This sub-product was initially considered as a waste: then it has been found out that these infesting plants represent an excellent fodder for sheep. For this reason, these “wastes” have been adopted to seed grasslands now used for sheep pasturing for the production of meat in certified organic regime (innovation from a random event).

Whether a new seed or a modified harvester, whether a new business niche or a new use of already existing resources, the core question is the variable value innovation provides to business and to farmers. At a first step, these innovations attracted in fact investments and showed a wide range of opportunities giving to this farm a leading position in the local market. At a second step, these innovations progressively lost their “experimental” character: they surely became more reliable and easy to use but also a routine event and more exposed to competitors’ imitation. This is confirm how these cyclical innovative processes are linked to complex systems composed of a large number of material and immaterial factors and elements which can be incorporated in two consequent lives as described in **Figure 1** [41]. It is important to note that a process of change rarely involves an isolated innovation but rather groups of innovations (innovation clusters) and innovative actions operating on different intervention levels at the same time: for this reason these processes activate an innovative cycle characterized also by contagion and influences among firm sectors.

The process described in Figure 1 can be thus referred to a standard innovative cycle which shows completely its “natural” phases. Of course, each innovative cycle, even if composed of one innovation, will show its own specific life with a variable expression and width of the phases described in this model. An innovative cycle is composed of a first period A (installation period) which starts with an activation moment and ends with an “explosion” moment. During this period A innovation irrupts into the firm in exploration, experimentation, planning and first exploitation phases with the first eventual economic benefits of innovation. During this phase innovation is “young”: it tends to be biased in small expert teams and shows its highest economic potential because, being concentrated in a limited groups of experts, it is

characterized by complex processes and systems whose information bases are quickly and timely shared within these teams. To the high economic potentials correspond a parallel high risk potential because innovation is still young: something “new” is always linked to uncertain factors which cannot be fully analyzed and evaluated and its introduction can generate unexpected results. The following period B (deployment period) starts with an adjustment phase and ends with a maturity phase. This period is characterized by synergies among firm sectors with increasing innovation maturity which progressively loses its innovative character. This period B is a routine and standardization phase during which processes have to be simplified in order to be generally shared: innovation shows a limited economic potential with a parallel decrease in risk and uncertainty. Between these two periods, a particularly critical phase can be highlighted: during a period C (turning point) operative choices are, in fact, adopted and decisions to move from A to B.

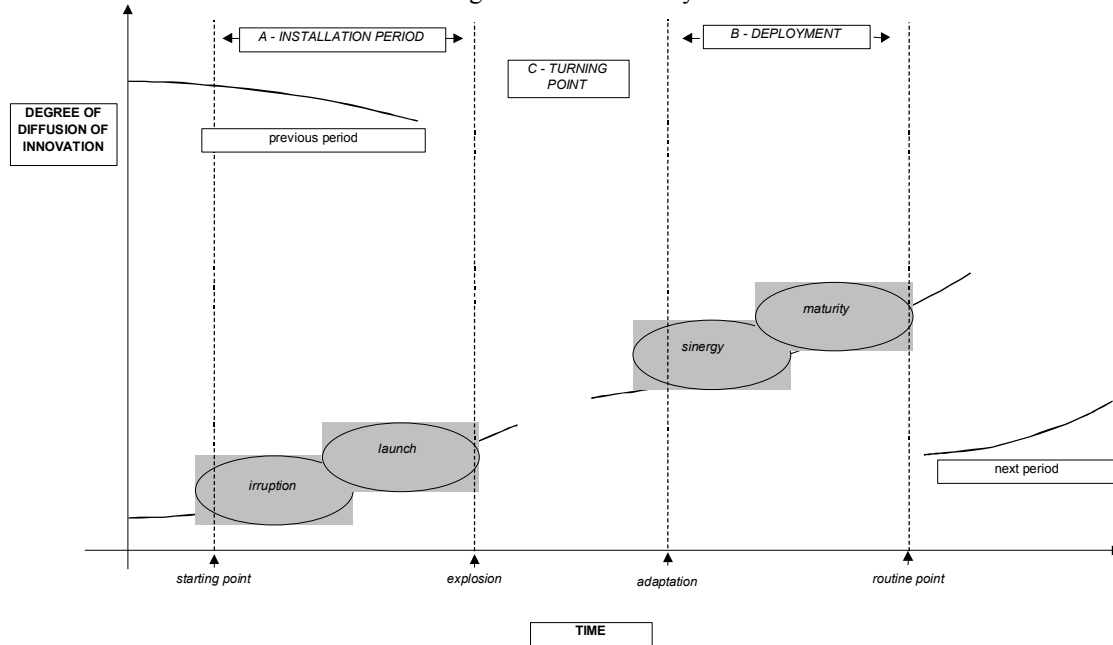
Modes and times in which these two lives are managed, create extremely different results in the firm’s approach to innovation according to the following scheme:

- i. ***firms which do not enter period A activating only period B***: this is an approach essentially based on imitation copying from others’ experience and from innovative firms. This case implies fewer risks: profits can be generated mainly by the absence of R&D costs but these firms enter the market late, through paths already explored and exploited by others. A typical example is provided by a small farm machinery producer in a rural area who imitates and adapts the multinational’s models to local conditions.
- ii. ***Firms which enter period A with extremely short B and C periods***. These pioneer firms are highly based on innovation which can potentially generate great economic benefits, but they have to deal with high risk. These firms must be extremely flexible because adjustment time is extremely short. There are many examples of this approach among rural firms involved in the sector of functional packaging of fresh products at farm level or firms specialized in IT services for rural enterprises and farms.

Firms which enter A and B periods are usually dynamic enterprises whose dynamic attitude is however linked to the time length of the involved periods. Typical examples of these enterprises are the multi-use farms systematically dedicated to multi-

faced and multiple agricultural activities (organic farming, crop production, animal husbandry for meat and dairy, aquaculture, environmental initiatives, educational schemes, research partnerships, etc.).

Figure 1: Innovative cycle



A particular attention should be paid to period C. The acquisition of potential economic benefits from innovation in period B depends not only on the length of this period but also on the time length and characteristics of period C. If decisions and operative choices are made in a too long time, the above mentioned potential of period B will progressively decrease. On the contrary a too short period C could activate adaptation problems: in this case the impact of innovation on human resources could drive to potential fierce oppositions to innovation, sabotage and luddism. This period C is thus strictly related to the firm's flexibility degree of human resources. This flexibility has to be carefully evaluated in order to grant adequate success margins to the innovative process adopted. Innovation in fact does not enter a static reality but rather a living context. A firm could have experienced a former innovative cycle (with its own characteristics) being ready to begin a new one or, on the contrary, adopt an opposite choice without entering an innovative cycle for a large number of reasons: a conservative attitude and doubts toward that type of innovation, the presence of subsidies, risks and costs considered too high, the firm

operating in a distorted economic scenario - due to political corruption and bribes [45] - pushing entrepreneurs to consider the introduction of innovations useless, etc. With regards to this, Schumpeter argues that "(the economic problem of production) should be distinguished from a purely technical problem. Between these two aspects there is an antithesis which in the economic life can be frequently found in the personal contrasts in a firm between technical and commercial managers. With regards to this, it could be noted that changes in production processes are often suggested by one side and rejected by the other side; for example an engineer suggesting a new process rejected by the commercial director because being considered not profitable". Schumpeter argues also that both technical and economic aspects of production are based on a concept of "utility": this conflict is generated by different natures and meanings of this "utility". "... technology is directed to elaborate production methods for requested goods. Economic reality does not push these methods to their logical conclusion and in a technologically perfect way, but it submits their realization to an economic point of

view. The ideal technical framework, which does not take into consideration economic relations, is thus modified . Economic logic prevails on the technological one. For this reason it is possible to see in the everyday life, worn ropes rather than steel cables, poor rather than excellent animals, the most primitive hand work rather than perfect machines, a coarse economy based on coins rather than cheques and so on. Best economically and technically perfect combinations are thus not necessary and often distinct and not simply due to ignorance or indolence but because technologically inferior methods can be better adapted to given conditions ”. (J. A. Schumpeter 1946 translated from the italian version).

As mentioned above, innovations operate at different levels being not only synonym of new technologies. At the company level, it has to be noticed that eventual changes could involve a wider spectrum of intervention areas as follows:

- a technological level (innovations in processes and products)
- an economic level (new methods to reduce costs, wastes, defects and to increase profits)
- a financial level (new methods and opportunities to access to credit, to obtain subsidies, public, EU and private contributions, opportunities to make investments in financial markets, etc.)
- a management level (rationalization and optimization of decision making, evaluation of alternatives and choices, improvements in human resources management and evaluation, etc.)

Each intervention level shows its own peculiar characteristics with different priority degree highly varying in time and from firm to firm. Despite this high variability, it is possible to note that basic problematic issues and conditions are essentially the same. For all these levels the basic question is again how to inject new skills, within a realistic framework, related to workers’ and managers’ mentalities and behaviors operating in a “consolidated” environment.

2) *Innovation transfer (whether and how)* shows three complementary analytical levels based on a) the characteristics of the innovation transfer source; b) the characteristics of the innovation transfer receiver and c) the relations between them. The combined action of these three problematic levels can produce a complex mix of negative/positive conditions really influencing the fate of the process of innovation transfer itself.

With regards to point a) it should be noted that the possibilities to create a scientific partnering are

essentially connected to a problem-solving approach eventually available within research institutions and centers involved. It implies a crucial paradigm shift involving a concrete softening in scientists’ and researchers’ attitudes about “getting their hands dirty”, spending their time and spreading their own intellectual properties into the market-place. This paradigm shift needs to be supported not only by investments and funds (from private and public sources) but also by appropriate human resources with specific skills to adequately undertake and manage innovation transfer processes [15,32,35,51].

Point b) is essentially related to the question about “interest for innovation” which is at the base of an innovation demand. This factor can highly vary in different forms and intensity from firm to firm and within the same firm. To these different interests and forms correspond (and are translated into) differentiated innovation needs [8,9,20,44]. In general terms, rural SMEs, for their small scale structure, have no personnel or teams specifically devoted to Research and Development (R&D): interest for innovation is usually limited to one or more individuals who can be named “pioneers”. These individuals in general, but not necessarily, are the firm’s (or farm’s) owners or however cover directive position through which they can stimulate the introduction of innovation. These pioneers not always face an easy task: not rarely (mainly if they are not the firm’s owners) they have to cope with a feeling of opposition and resistance even toward simple imitation processes and are pushed to marginal positions. Yet without these figures it is not possible to undertake an innovative process or activate channels of transfer from the sources of innovation generation. The failure and success of an innovation transfer process thus depends on the identification of these pioneers and on a deeper and correct quantification and evaluation of innovative demands and needs.

With regards to point c) it could be argued that the relations between innovation source and innovation receiver can be influenced by a problematic mix related to one or more inadequacies which can determine and ossify concrete gaps [3,19,24,26,28,29,42]. These inadequacies can be summarised as follows:

a) inadequacies deriving from the nature of institutions generating innovation: they can include:

▪ inadequacies in terms of **distance** – this means a physical distance between institutions and rural firms. Added to physical distance is the psychological distance arising from the fact that researchers, administrators and bureaucrats often know very little about the rural socio-economic environment. Many aspects of this context are not immediately evident and considered low profile issues: administrators and researchers tend to be not interested in them.

▪ inadequacies in terms of **time** – research institutions and agencies have their own “time”; in many cases research activities and procedures last several years, whereas needs for entrepreneurs can be generally short-term.

▪ **inadequacies in interests and in defining the intervention objective – For many researchers, objectives and results may be divorced from a global vision of the area in which these firms operate: frequently the objective is too circumscribed, limited and partial, rather than a part of a territorial strategy;**

▪ inadequacies in terms of **approach** – A researcher and an entrepreneur often show a completely different approach when coping with problems and implications related to innovation;

▪ inadequacies in terms of **communication**: research institutions and agencies tend to use two different languages. The former language is mainly based on juridical and legal terms while the latter is tailored for specific intervention areas (agriculture, health, environment, scientific research, etc.). The result of this coexistence of languages is frequently translated into very complex documents which create severe communication problems between institutions and individuals and among institutions. This condition can also be the consequence of an unclear language frequently adopted in State law and regulations to which research institutions have to refer. These documents are rarely written paying attention to the final users, being created to be mainly coherent to bureaucratic languages.

b) Inadequacies in terms of practices; the lack of adequate knowledge on rural context results in actions that sometimes conflict with farms’ and rural firms’ needs.

c) Inadequacies associated with financial problems: in general, very few financial resources are earmarked actions directed to aid rural development as operative context for these farms/firms. Many intervention measures that may be

useful to support an innovation culture in rural areas are often the product of actions directed for other purposes for example sector actions, especially in agriculture, energy, environment, etc.

The complexity of the multi-sector and multi-level system resulting from the action of these factors pushes toward the definition of a specific operational method and model capable to deal with the above mentioned issues and provide adequate “problem solving” approaches to the following basic questions:

▪ How to evaluate a firm’s/farm’s attitude and capability to acquire competitiveness due to innovation injection?

▪ How to evaluate a firm’s/farm’s predisposition to achieve this task?

▪ How to evaluate the eventual gaps between this predisposition and an estimated degree of competitiveness degree to grant, in a mid term, growth and development of a firm/farm?

Possible answers to these questions are thus connected to the possibility: a) to identify a pioneer (or a group of pioneers) within the firm; b) to outline a firm’s configuration in order to provide an identification, quantification and classification of innovation needs, according to a priority order (innovation demand); c) to identify potential innovation intervention levels; d) to define strategies and methods to undertake these innovations and the related innovation transfer process; e) to remove eventual obstacles and solve difficulties in the exchange process.

THE OPERATIONAL MODEL ADOPTED: GENERAL PRINCIPLES

An evaluation of innovation demand from a firm interested in processes of transfer firstly has to be based on the identification and quantification of endogenous and exogenous factors (within both transfer partners) capable of influencing and determining the above described inadequacies. The following macro problem areas encompass and summarize the main operational topics interested in these processes of innovation transfer.

Innovation and the enterprise’s “constitution”

The identification of innovation needs should be firstly based on a preliminary analytical process directed to the description of the framework in which the innovation transfer had to be implemented

[6,25,36,53]. This preliminary process (**Figure 2**) is essentially focused on the evaluation of a) existing elements; b) practices; c) organizational systems based on these practices and d) reference values in order to create a first set of data and information about: 1) production/processing volume; 2) existence of technical problems and their usual solutions; 3) trade strategies and prices adopted; 4) expectations; 5) priorities; 6) level of staff commitment.

The correct problem formulation and the organization of both numerical data and verbal considerations useful for the generation of knowledge indicators (and the management of the entire process) have been achieved adopting the following analytical tools [39]:

- KJ diagrams (**Figure 3/a**)
- Relation diagrams (**Figure 3/b**)
- “tree” diagrams (**Figure 3/c**)
- PERT (Program Evaluation and Review Technique) diagrams (**Figure 3/d**)

Knowledge indicators can describe the static situation providing traces and snapshots on specific aspects of the firm’s life. These indicators are thus unable to outline the framework of possible transfer actions because they cannot highlight causes and issues linked to innovations and their transfer; they cannot provide operational indications for the solution of problematic conditions either. The evaluation of possible causes and eventual solutions can be achieved in the following planning phase highlighting, in the same time, some crucial elements which can influence (positively or negatively) cooperation and know how transfer between operators and researchers such as: common potentials and problems, better definition of the enterprise’s identity, identification of ignored resources, identification of critical contact points, etc.

This phase, with the inclusion of the action of causes and effects, can lead to the definition of the dynamic situation in production with particular regards to volumes, real quality levels, motivations, expectations and mentality of workers and managers thus contributing to outlining a “provisional” intervention strategy. Even if dynamic, the scenario (which has to be checked and re-tested) defined so far does not clarify the firms’ innovation needs yet because many crucial elements for the definition of the firm attitude toward innovations have not been

identified. At this stage it is possible to identify the transfer receiver profile through the reaction of the enterprise’s “constitution” identifying eventual critical points where innovation can concretely act. An enterprise’s “constitution” is generally defined through the following elements [1,30,31]:

- firm’s values and priorities
- characteristics of firm culture
- the prevailing mentalities
- the characteristics of the main decisional and management processes
- techniques and methods used by the staff
- the “climate” or perceptions and feelings of the staff about relations, organizational mechanisms and staff management

The definition of this constitution, highlighting attitudes and the context of possible reactions toward innovation, can provide essential contributions to understanding if innovation is (or is not) seen as *a tool mainly influencing individuals’ mentality* rather than norms or equipment which have to be implemented only to reduce costs and defects, increase profits and productivity or improve staff motivation.

Innovation and the “culture of innovation”

The introduction of innovations does not increase sales and profits *per sé*: innovation can act as a key-factor, thus determining benefits and successes for a firm, only if supported by a flexible mentality, continuing improvements, creativity and spirit of initiative [27,37]. This statement should be considered as the basic principle of the “culture of innovation” and if this notion is insufficiently shared within a firm, any attempt to adopt advanced technologies, new management or production methods could be a very expensive (in economic and non-economic terms) and often ineffective option because fundamentally *extemporaneous*.

Within this scenario, the complex relations between innovation and the culture of innovation available in a firm/farm play a fundamental role. Three key-variables can be placed at the base of a culture of innovation:

- *Time of adjustment*. Every change creates problems: the culture of innovation is linked to a reactivity degree and the adjustment capabilities in coping with (and solve) those problems unavoidably related to the process of innovation introduction. In general, advantages and benefits from the

implementation of innovations tend to decrease when adjustment time increases. If a firm shows an adequate culture of innovation, the adjustment time will be generally short thus receiving higher benefits and gains from the process of change. On the contrary, if a firm shows scarce reactivity with too long time in coping and solving these problems, potential advantages will be reduced and the bases and the credibility of the innovative process itself will be eroded.

- *Sensibility to problems.* The culture of innovation highly depends on how a firm reacts and deals with problems. It can show high sensibility to problems when they are considered as operative impulses or incentives with high sense of responsibility: these problems are identified and analyzed during the planning phases with the adoption of a *preventive* approach. On the contrary, hiding, ignoring,

underestimating problems or throwing responsibility and faults on each other denounce a low sensibility: problems are usually faced *in extremis* with emergency remedies.

- *Involvement.* The culture of innovation depends on how managers and workers are involved within the innovative process. The more human resources involved, the higher the effectiveness of innovative actions. In particular for SMEs this condition has to be achieved also overcoming those invisible borders among the sectors of the firm. Workers in all firm sectors have to be informed and involved even if the innovative actions do not (apparently) concern them directly in order to stimulate however an interest and a reaction attitude toward innovation and contribute to the creation of a “mentality of innovation” in the whole firm.

Figure 2: Steps in the operative process

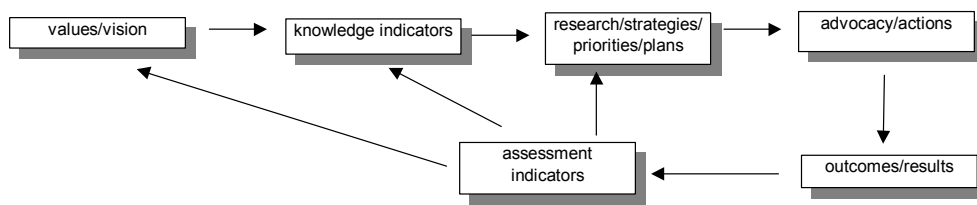


Figure 3a: A KJ diagram

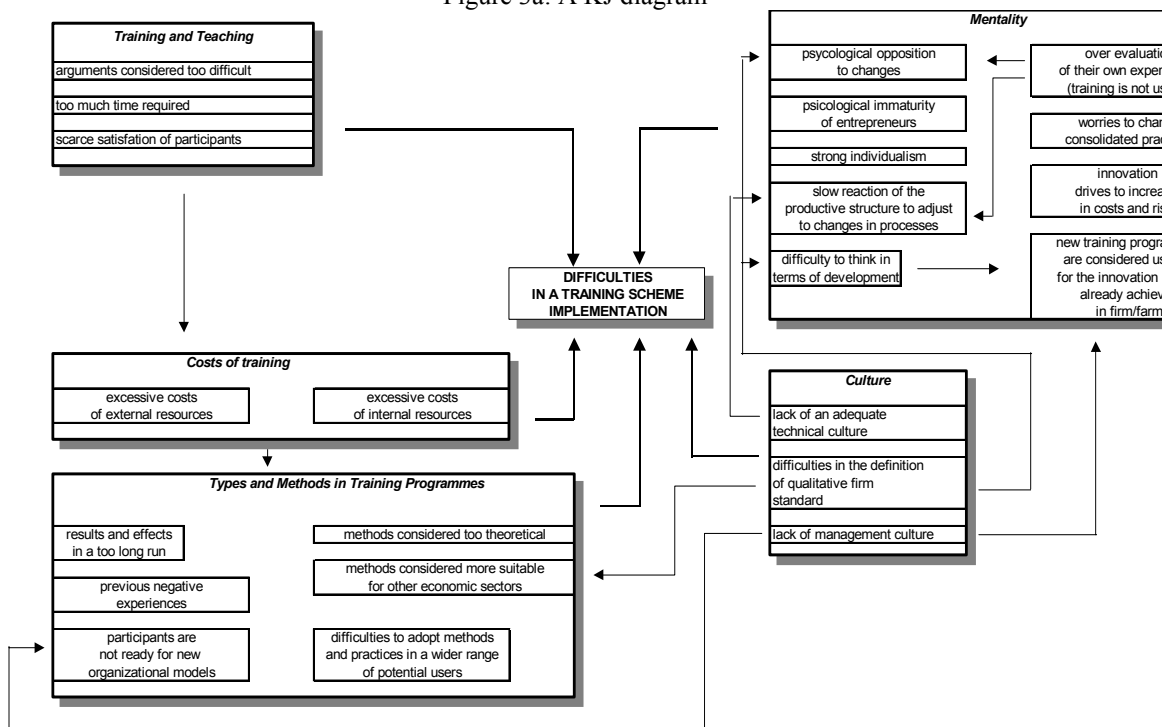


Figure 3b: A relation diagram

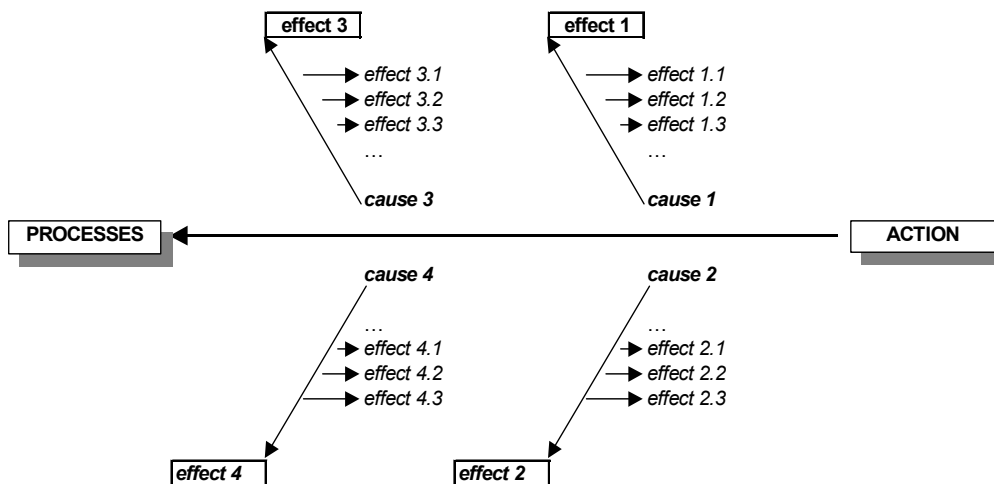


Figure 3c: A “tree” diagram

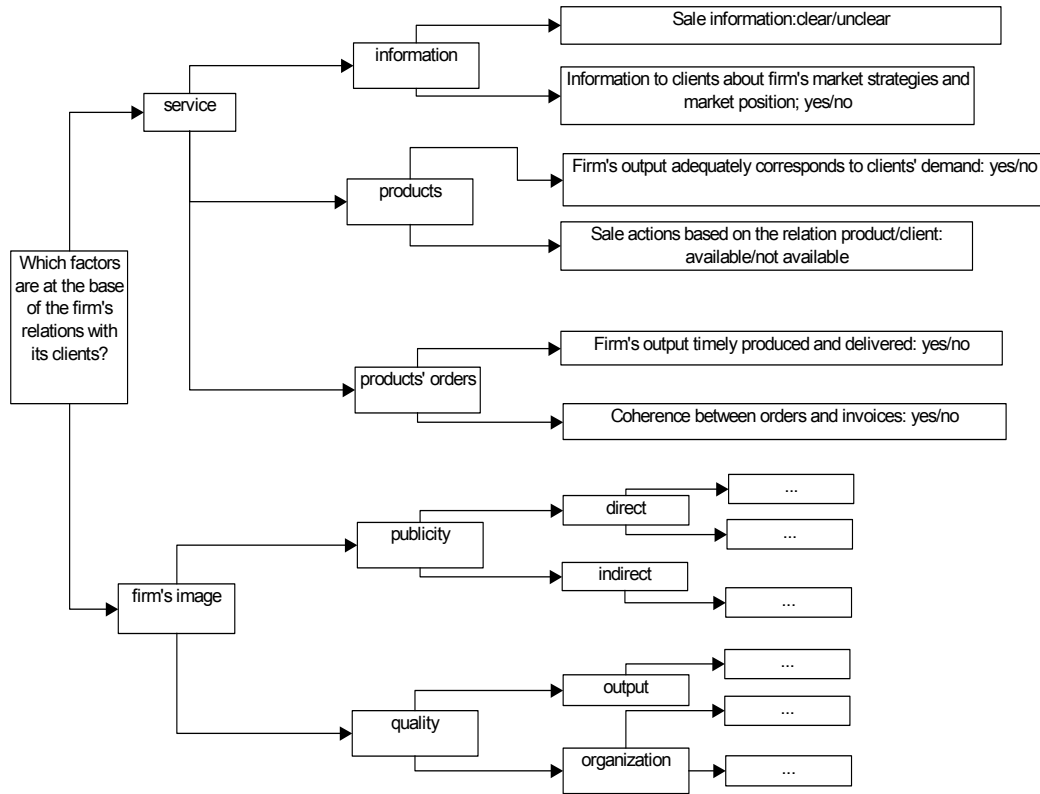
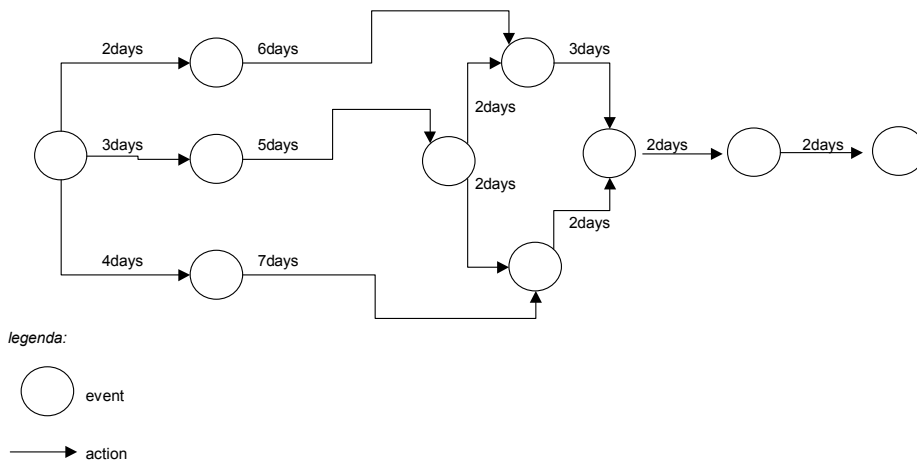


Figure 3d: A PERT diagram



Information about the firm's constitution and innovation culture can be organized into two indicators: innovative potential and market position (**Figure 4**). Innovative potential can be described by the critical elements of the culture of innovation (time of adjustment, sensibility to problems, involvement), technologies, techniques and practices adopted, etc. Strength and weakness of a firm's market position can be related to some parameters such as product or service prices, product or service quality and its substitution degree, the firm's position, promotion, public relations, power. Combining these variables with those provided by the response to innovative cycles it is possible to identify four main categories showing different innovative potential and market position degree:

- *Area 1 Firms with high innovative potential and strong market position.* This is a situation of excellence. These firms can be potentially very interested in innovation transfer for example to achieve a diversification in their output, to constantly improve management efficiency or to boost productivity.
- *Area 2 Firms with a strong market position but weak innovative potential.* These firms often show mistrust toward innovation with too long time adjustment, scarce involvement of human resources, scarce sensibility to problems losing the benefits from innovation adoption. This condition can result from several causes. As mentioned above, a firm's strength depends on economic (prices, quality, substitution degree, position, promotion) and extra-economic factors (public relations, power). Some considerations about the relations between technical and economic forces within a firm have been already made (see note 2). These firms are likely to face, however, an erosion in their competitive degree in the medium run pushing them from area 2 to area 3. It implies difficult transfer processes but the overcoming of these difficulties depends mainly: a) on the pioneers' capability to interrupt the vicious circles based on conservative attitudes and b) on the capabilities of transfer managers to adopt innovation transfer processes capable of generating short term problem solving results. If so, there are potential opportunities for these firms to move from area 2 to area 1. If extra-economic factors prevail over the economic ones in determining the firm's strength, the mistrust toward innovation finds completely different

causes and motivations. In this case, these firms operate in a distorted scenario when for example political connections prevail over product quality: these connections could provide also a privileged access to subsidies and other public support. In these conditions (from *know how* to *know who*), any innovation transfer process will face obstacles and oppositions: improvements in adjustment time, in sensibility to problems or in staff involvement will not be seen as priority tasks by the management and the firm's leadership because this firm is "competing" on the base of completely different parameters (to which innovation transfer can have very little effect).

- *Area 3 Firms with a weak innovative potential and weak market position.* In this case, innovation (and innovation transfer) will find obstacles because considered only as "costs". The reason for this condition could lie on the considerations made above. The conservative firm is based on the owner's long experience, sometimes also inherited, who instinctively knows what to do to obtain his/her usual gains. He/she respects, as better as he/she can, this experience and tends to adopt very gradual changes only on the bases of the circumstances. Innovation is thus identified with an unknown risk: in these firms there are few (and often marginal) pioneers. In this case, the opportunity to inject innovation are linked to the adoption of extremely gradual processes: small steps with prudent (but highly convincing) actions involving cheap investments.

- *Area 4 Firms with high innovative potential and weak market position.* These firms are in general very interested in innovation and innovation transfer because they tend to strengthen their market position. As already mentioned, if this weakness depends on extra-economic factors, the innovative potential is frustrated by distortions in the operative environment in which privileged contacts prevail on market efficiency; in this case, these firms could shift to area 3 because leadership and pioneers see their efforts to inject innovation constantly frustrated.

In general, these categories can encompass firms potentially interested in innovation transfer. Yet types of innovations and transfer methods can greatly vary from area to area. Also considering eventual distortions in the operative environment, it should be possible to make some general conclusions as follows (**Figure 5**):

Figure 4: Innovation potential and market strength

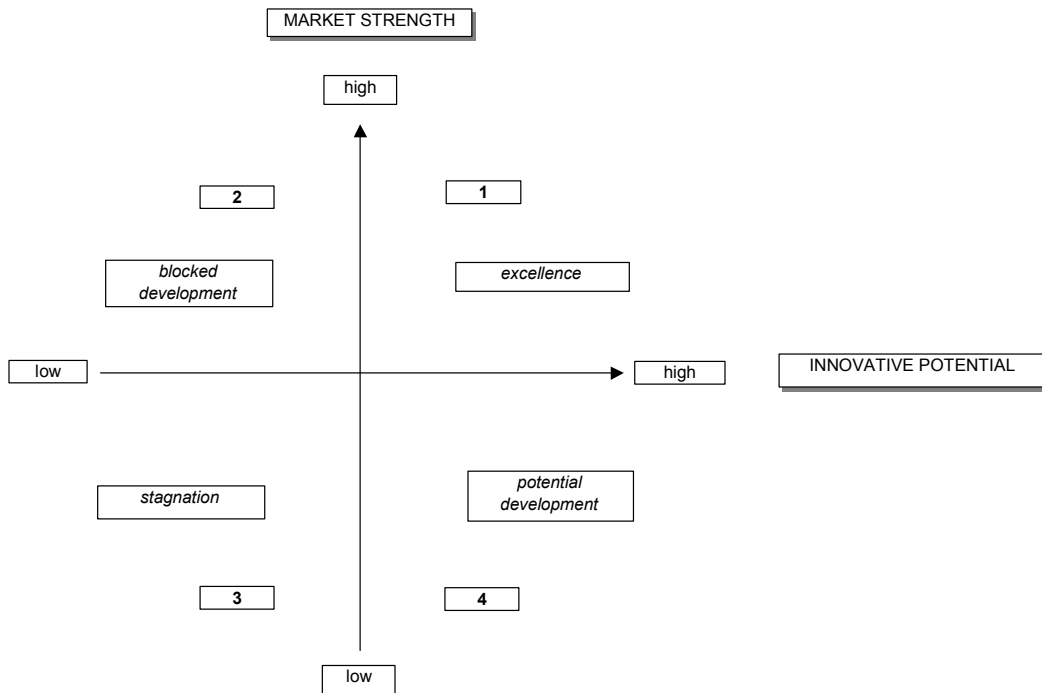
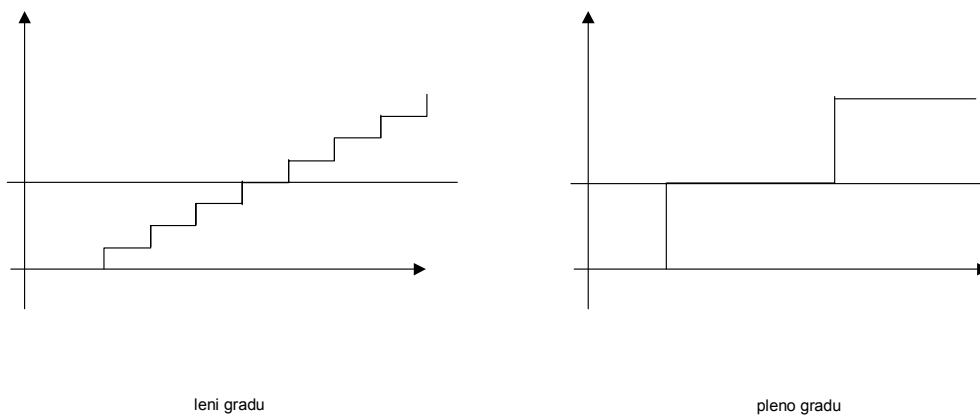


Figure 5: Leni and Pleno Gradu approaches



▪ in case of high innovative potential, a *pleno gradu* approach (from Latin “with great steps”) could be adopted. This approach is based on great innovative breakthroughs involving great amount of investments and high risk. In this case, very specialized transfer actions, high skilled human resources and advanced financial schemes are

requested. This kind of approach is usually led by small teams of specialists and does not need high strategic commitment because transfer processes find a positive ground due to the presence of an elevated innovative potential. A *pleno gradu* approach is mainly linked to technological transfer with a very fast adoption of new methods, practices, equipment,

processes with a parallel destruction of the former operative context. Being a rather shocking approach it requires very flexible and skilled human capital: with regards to Figure 1, this approach is likely to create innovative cycles based on high curves and narrow time periods;

- in case of weak innovative potential a *leni gradu* approach (from Latin “with small steps”) could provide useful contributions to introduce innovation through gradual steps and a wider staff involvement. This approach is mainly directed to small improvements in the use of existing resources and conventional know how. This strategy requires less investments compared to the *pleno gradu* approach

but results, even if relevant, will be less “revolutionary” and shocking because this strategy is mainly directed to human resources and mentalities in order to stimulate the development of an innovative potential thanks to a long path of small steps, sometimes even apparently inconsistent, within all the firm’s levels. For this reason, commitment has to be particularly high because of a generally non positive environment for transfer: a widespread mistrust has to be faced with few carefully selected actions capable of granting adequate success margins. With regard to Figure 1, this approach will involve innovative cycles based on generally flat curves and rather long time periods.

The main differences between these approaches are resumed in the following table:

	Leni Gradu	Pleno Gradu
<i>Investments, required degree</i>	Low	High
<i>Efforts, required degree</i>	High	Low
<i>Human resources involvement</i>	High	Low
<i>Priorities</i>	Commitment and efforts	Results and profits
<i>Focus</i>	Culture and mentality	Technology

CONCLUDING COMMENTS

The critical role of innovation and its implication and effects to increase a firm’s competitiveness are well known [10,13,16,33,50]. Rural entrepreneurs not always tend to see at innovation as an investment but rather an issue in immediate relation to a gains/losses balance and to a modification of the context in which they usually operate. Innovation can therefore become a reply to changed conditions and thus an instrument of that change itself: it implies a timely adaptation process even if a complex system of inadequacies can deeply influence transfer’s types and modalities. The adaptation processes generated by innovation and by innovation transfer can create a number of difficulties: even in the case of simple and inexpensive innovations (ad example simple protocols useful to obtain and organize information about the implications and consequences of a modified operative context) an innovation transfer could face severe obstacles, difficulties and a lack of a timely reaction.

In case of firms showing low innovative potential, a transfer process capable of producing effective results in the short run (involving “need spotting” and “solution spotting” innovations) has to be preferred; this process shouldn’t be restricted to

limited intervention areas but it should have global implication stimulating imitative actions and the diffusion of innovation clusters. These conditions are essential for the stimulation of an innovation culture in all firm sectors. Even if a firm showing similar characteristics intends to undertake big innovative breakthroughs (for example just to imitate a competitor), supporting this choice could be a very destructive suggestion. This option will provoke easily predictable big financial costs: but the worst side effects of the failure of an innovative process are not immediately evident and quantifiable. It is extremely difficult in fact to quantify (and repair) the consequences, not only on a firm’s/farm’s fate but also on the people involved and the territory where they operate, of mistrust and frustration toward innovation for the erosion and weakening in credibility of the eventually existing culture of innovation and initiative. It is the case, for example, of the adoption of an ISO9002 regulation scheme in a winery, actually producing excellent wines, but not “culturally” ready for this type of actions: soon this scheme has been seen by the staff as an expansive and useless loop which creates only impediments and time losses thus severely contributing to this initiative’s failure. Now in this context innovative entrepreneurial initiatives remain quite sporadic and

episodic random events not systematically adopted for the significant mistrust and rigidities in management and in personnel.

This is to confirm that the adoption and implementation of specific innovations require sound cultural bases in order to make them real and realistic strategic factors for competitiveness and growth. The elements at the base of this culture represent therefore the framework to which innovative technologies, methods, practices, etc. can effectively refer thus positively reverting some typical stereotypes toward innovation such as:

- Innovation is not a priority. The real priorities for a firm are costs and deliveries.
- The firm's strategy is mainly focused on competitors rather than on clients.
- High incidence of a static attitude (i. e. resistance to any change) in firm's costs.
- Innovation is synonym only of "new technologies": it is a problem involving only productive processes thus excluding any other sector.

The effects of these stereotypes on a rural firm's strategy are usually translated in the idea that innovation is a "financial" cost. Yet a deeper analysis can highlight that types and sizes of the obstacles impeding the diffusion of innovation within a firm can be of very different nature. Scarce financial resources or difficulties in the access to credit can severely hit any effort toward innovation. So far, so obvious. Yet a lack of a culture of innovation (in private as well as in public subjects) can hamper any development and recovery process even when *ad hoc*

investments (at local, national and international level) are potentially available for agricultural and rural enterprises making this investment deployment definitively ineffective and determining an over-invested but still outdated productive tissue [34]. Those obstacles to innovation, being a multilevel process of change, related to principles and visions rooted in both rural entrepreneurs' and in R&D organizations', agencies' and institutions' mentalities, cannot be therefore ignored or underestimated [7,17]. A deep analysis on material/non material resources and on human capital, together with the identification of actual and potential forces capable of positively affecting the productive and the social tissues, is a critical pre-condition in order to make investments for innovation effective and efficient. In this scenario, innovation can concretely act as a turning point for a static and repetitive status generating profits, a better resource allocation, a diffusion of initiative attitudes, etc. A trend toward a static condition has to be considered as a potential source of opposition to a change process. According to an economic, technological, management and psychological point of view, routine always represents an easier path when compared to unknown consequences of innovation. Aggressive actions to a) break down static trends biasing resources in investments for innovation and b) stimulate induction and imitation (innovation clusters) could concretely contribute to generate impulses of investment waves which will tend to exhaust at the beginning of a next concentration of innovation clusters.

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ADDRESS OF AUTHORS

Carmelo Cannarella: c.cannarella@dcas.cnr.it; **Valeria Piccioni:** v.piccioni@dcas.cnr.it

National Research Council of Italy (CNR)
Scientific and Technological Activities Dept. (DAST)