3 Novelty as Redefinition of Farm Boundaries

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Introduction

During the past few years a range of new factors have emerged that are beginning to reshape agriculture, making it more responsive to new social needs and priorities. These factors are modifying the institutional context in which farms operate. They may be summarised as follows:

- the introduction of the concept of sustainability into economic activities;
- the limits of returns to scale in agricultural enterprises, due to natural resource constraints which lead to an increase in costs;
- the need to maintain high labour incomes in developed countries, for reasons of social equity

Together these factors result, in post-industrial countries, in a crisis in the paradigm of mass production and the technological regimes connected with it. The New European Agriculture, that is unfolding as a response to this crisis (van der Ploeg *et al.* 2002), aims at guaranteeing multifunctional production processes that combine productivity with environmental sustainability, and secure the reproduction of natural and cultural resources. This has to be achieved within an international context in which trade liberalisation and reductions of subsidies dominate the agenda. Technological progress that aims to increase agricultural productivity no longer provides acceptable, or even useful answers, from an economic, political, or environmental viewpoint.

Thus, a quiet revolution is occurring in agriculture that entails two closely connected trends:

- The rediscovery of the possibility to differentiate agricultural products on the basis of their tangible and intangible characteristics, made possible by growing consumer interest in a wider range of qualitative specifications regarding food products;
- The growing attention paid to resources that are used in agricultural production and particularly to those resulting joint products that are not amenable to market exchange as they cannot be reproduced

outside of farming except at high production and transaction costs. Examples include biodiversity, local 'know-how' and traditions, soil fertility, and the protection of landscapes, soils and watersheds.

These trends emphasise the need for a new economic model for agriculture that, in turn, needs a new institutional and technological regime capable of addressing a range of issues that are of importance to European society, particularly those of employment, environment, and consumer confidence.

This model corresponds closely to that of flexible specialisation (Piore and Sabel 1984), which is based on the rediscovery of (1) the distribution of production processes over more than one unit, (2) the artisanal nature of production processes and (3) the utilisation of human skills and specific knowledge. In this model the expertise of the individual operators (farmers, food processors) plays a key role, allowing them the possibility to reassert choice and authority over the scale and orientation of their enterprises.

Neo-institutionalism and the paradigm of flexible specialisation

Two elements can be identified as contributing to the success of artisanal farming styles. The first consists of reducing or minimising the need for external inputs and minimising the costs (including transaction costs) of inputs that cannot be replaced. The second is that of diversifying farm activities, or finding a way to increase the value of the artisanal component of farm produce.

In the first case this leads to a multi-product farm (Teece 1982), where the on-farm labour, skills and know-how become central resources used to (re) produce resources that would otherwise have to be purchased. In the second case we have a process of product differentiation, competitively *repositioning* the farm's produce.

In economic terms these farms are pursuing economies of scope[1] (Panzar and Willing 1982). They do so through two distinct strategies:

- the reduction of production costs, through utilising the same factor in several production processes (specifically those factors where the farmer controls the property rights, i.e. land and labour);
- external economies[2] arising from synergies that are created within a single territory, or through a network of operators (economic and/or institutional) which permit the product to be valorised, often through the use of formal quality specifications, which tie the product to a specific geographical area or production process (Brunori and Rossi, 2000).

In the first case the economies of scope are achieved within the farm, through a reorganisation towards multiple production. The lower the cost

of organising and co-ordinating the factors of production and governing the production processes connected with them, the more efficient the enterprises become. For example, in family-run farms, the costs of governing labour resources can be extremely low due to mechanisms of reciprocity that exist within families.

In the second case the economies of scope depend on the institutional context and its capacity to create convergence between different interests and thereby reduce the governance costs associated with the bargaining processes. The existence of local systems, characterised by production processes that are strongly embedded within local culture and ecology allow farms to achieve economies of scope, without an increase in the uncertainty associated with market exchange mechanisms.

The nature (and potential) of economies of scope can best be understood through the concept of transaction costs (Teece 1980). If all transactions were without costs, it would make little or no difference to firms whether factors of production were purchased on the market or produced internally. However, the costs associated with transactions are often significant, particularly when the factors of production are very specific, and this can influence a firm's preference as to whether to buy in or produce internally.

The centrality of transaction costs to understanding economic decision making was developed by Williamson (1981; 1996). He defined transactions as modes of realising exchange that are characterised by:

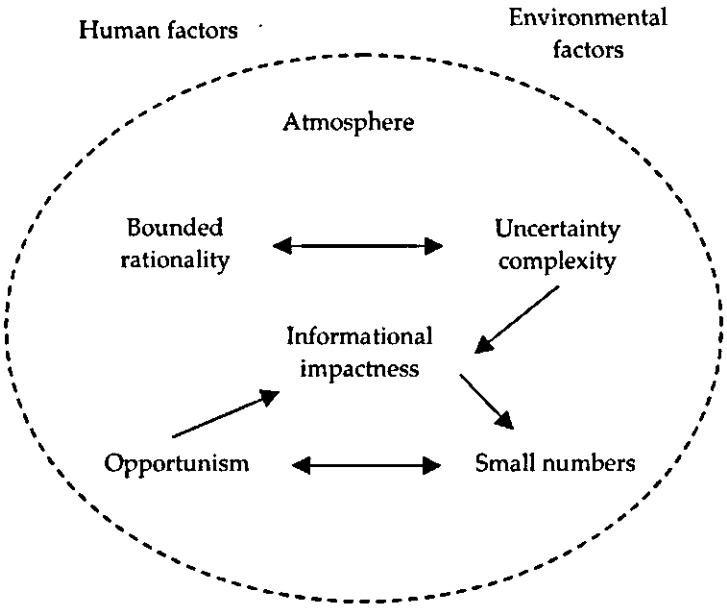
- the object of the exchange;
- the parties to the exchange;
- the set of rules and actions, called the governance structure, that make the exchange possible by connecting the economic and organisational aspects with contractual obligations.

This analysis can be further developed by regarding transactions as consisting of hard (or immutable) features and soft ones. The hard features consist of the object of and parties to (or subjects of) the exchange, whereas the soft part describes the ways in which the transaction is carried out. The theory of transaction costs differs from traditional analysis of exchange as it moves the focus of analysis from the hard to the soft part. Williamson's transaction cost theory examines the causes of transaction costs and the choice that exists between making a transaction on the market or within a firm. This is known as the Williamson criterion or rule (Williamson 1975; 1985).

Figure 1 shows the context in which such choices are made. The context includes both human factors (the preferences and limitations of individual actors) as well as environmental ones. Opportunistic behaviour (or the anticipation of it), bounded rationality, uncertainty, complexity and limited market size all play an important role in determining the extent to

which full information (a necessary precondition for the functioning of a perfect market) will be available. In different market situations these interacting influences will play different roles in determining this.

Figure 1 Human and environmental factors responsible for transaction costs



Williamson sought to address the relative importance of the factors that influence the choice between market transactions and internal ones. In so doing he developed the concept of the *specificity of resources* required to carry out transactions (Williamson 1981). Specific resources are those that are incorporated within firms and include land, buildings, machinery tools and knowledge. In general, transactions that require a high level of resource-specificity will involve higher transaction costs. Thus, a producer with a very specific asset base and/or product range is likely to have only a limited market. A buyer with specific demands for product criteria is likely to find only a few suppliers. The greater the reliance of either party on specific resources, the more they will prefer to adopt long-term contracts as opposed to bargaining on the open market. The specificity of the resources required to realise transactions is related to location, human resources and physical assets. The first of these is connected with the lower costs involved in entering into transactions with a locally based seller or buyer. The second relates to the need to learn certain productive processes, acquire skills and/or develop teamwork. Finally, the third concerns the set of idiosyncratic physical investments, which may be related to future as well as current transactions (e.g. promotional expenses).

In neo-institutional theory, the firm is conceived of as an organisation where actors are characterised by a limited rationality and acts under conditions of uncertainty and with an opportunistic behaviour. Within this theory the objective of the firm is to reduce this uncertainty, through developing contractual relationships that will enable better organisation of the different functions of the firm in order to enhance profitability.

Thus, according to neo-institutional theory, the firm is a governance structure that organises production factors and market exchange mechanisms that constitute its 'functional space'. This functional space consists not only of the classical production and market spaces, but also includes a third category of relations called support space (Ratti 1998). This is defined as the group of relationships that are situated outside the market.[3]

The entrepreneur's choices are made within the constraints of limited (bounded) rationality, as described by Simon (1957) who identifies limited rationality as behaviour that is rational in intent but only partly so in reality, as there are limits on human knowledge, foresight technical skills and time.

Thus in the real world limited rationality and uncertainty[4] make it practically impossible to arrive at complete contracts. Indeed, the very process of analysing an almost infinite number of choices and combinations of choices would in itself lead to unrealistically high contractual costs, making it uneconomical to enter into such contracts. This is compounded by uncertainty, about future changes, in the context and in the behaviour of other traders. On the basis of this hypothesis Tirole (1988) conceptually redefines the firm as a long-term organisational structure that incorporates production factors and exchange activities between actors exercising their property rights through incomplete contracts. Because of the incomplete nature of the contracts subsequent renegotiations are necessary. In consequence, the contractual positions of the actors may shift, thus increasing the uncertainty surrounding the outcome of future negotiations.

Over time firms seek to reduce uncertainty through reducing the transaction costs connected with contractual incompleteness. These mechanisms differ and are highly dependent on the institutional context in which the firm operates. Reputation, authority, loyalty and work ethics may all play a role here. A high level of trust between citizens and between citizens and institutions can drastically reduce transaction costs. The evident lack of such trust in many modern societies creates the need for increasingly complex and costly controls that may even make it impossible to carry out some types of production and exchange activities (North 1984; 1990).

The process of innovation also plays an influential role within these incomplete negotiations:

- on the one hand, innovations contribute to the uncertainty and incompleteness of negotiations as it is difficult to anticipate developments that may occur after the negotiations are concluded (Grossman and Hart 1986);
- on the other hand, the contractual incompleteness may act as a deterrent to innovation, as it may lead to a position of disadvantage in future renegotiations.

The process of innovation is characterised by a high level of specific and tacit knowledge and by the ability to make appropriate use of the results of learning processes. According to Dosi (1990), the innovative process comes about as a result of interactions between firms, who recognise the opportunity to achieve technical progress and market advantage. This process is endogenous to the firm that is constantly innovating.
According to Teece (1982), transaction costs also explain why firms internalise processes of innovation. Apart from the specificity of knowledge required to do any job, the incremental nature of innovation, and the strategic importance of developing the capacity to learn, make it impractical to contract innovation out to the market, without incurring high transaction costs. As a result of internalising the process of innovation, firms are also able to re-deploy and re-use specific material assets.

In agriculture resources are generally highly specific. Each area has specific characteristics of soil, relief, climate and vegetation as well as management process that have evolved in order to best manage the local natural resource base. This process of contextualisation has in turn entailed and required the development of specific knowledge about the use and management of territorially specific factors. In areas where natural resources have a strong specificity, or where local traditions influence (either formally or informally) specific production processes, farms have tended to pursue economies of scope, as the pursuit of economies of scale would entail excessive transaction costs. One result of this has been the progressive marginalisation of such areas. The innovations of the dominant technological and institutional regime, focused almost exclusively on the specialisation of production and increasing economies of scale, have been of little interest to farmers wishing to develop their farms along other pathways.[5]
At the same time, transaction costs are generally very high due to the biological nature of the production process and its dependence on environmentally specific and variable factors (such as climate). Agriculture is also characterised by conditions of uncertainty connected with the institutional context (market and technologies of social preferences).

There are a number of strategies open to farmers seeking to minimise transaction costs. They can:

- internalise research and development activities within the farm itself, leading to a particular and individualistic pattern of resource use and to a particular farm development trajectory
- collectively internalise these activities through membership of formal organisations (co-operatives, etc.) which assume the role of the firm in pursuing innovation. In this case the organisations take on the role of the firm in the production of innovations. This is clearly illustrated by Benvenuti (1982a) who describes the processes of incorporation and institutionalisation[6] generated by the *Technological – Administrative Task Environment (TATE).*[7]
- internalise innovation within a local production system. In this case the circulation of information and the existence of reciprocal relationships (or, at least, relationships that are not based exclusively on financial considerations), allow for the transfer of, even strongly contextualised, knowledge from one farm to another without incurring excessive transaction costs (Dei Ottati 1995).

These different mechanisms for innovation (which may be adopted in combination as well as individually) partly explain the origins and development of different farming styles[8] (van der Ploeg 1990a; 1990b; 1994). The concept of farming styles has been used to describe the rich heterogeneity of approaches to farming that can be found to exist within any given region, operating within an apparently uniform and inflexible techno-institutional regime. Such descriptions show how farmers are able to carve out 'protected spaces' and make technological and organisational choices within such a regime. Today the relevance of some of these choices is becoming of more general interest as the resultant agricultural production processes appear more in harmony with criteria for environmental and social sustainability.

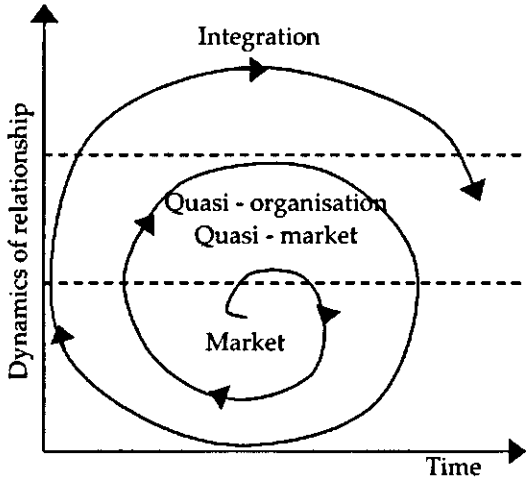
Innovation in agriculture as an endogenous process

Innovation may be described as the process that makes it possible to realise new competitive advantages through new forms of production, new products, or new methods of organisation. It is not simply a choice about what to produce or what technique to employ, but rather a 'process' that has a temporal dimension and takes place within a specific environment in which there are pre-existing constraints and opportunities.

A distinction needs to be made between the *continual* nature of innovation processes within a firm and the *discontinuous* nature of the diffusion of (successful) innovations. Firms innovate continuously; they experiment or imitate what other firms (even in very distant places and times) have

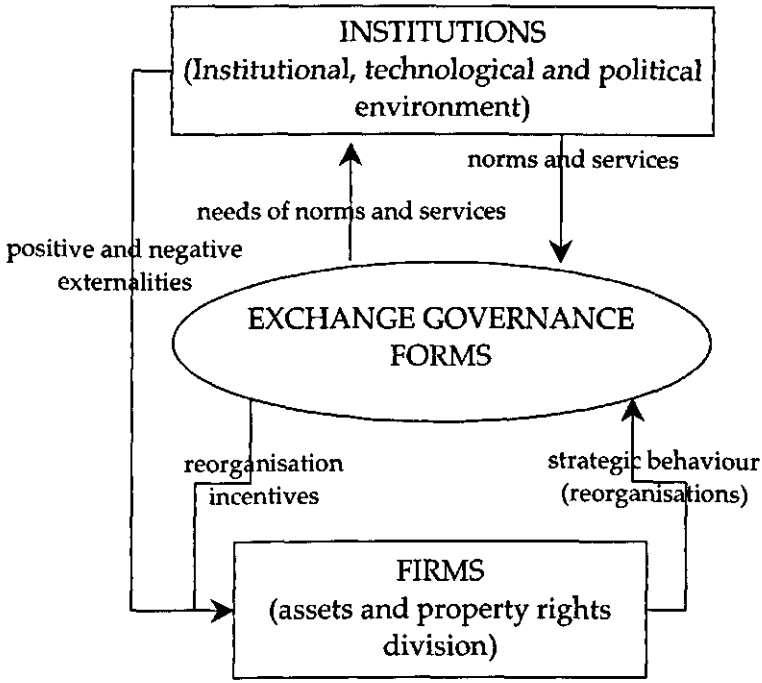
done. Not all these innovations prove to be 'efficient' or successful. Sometimes they fail for reasons internal to the firm. At other times they fail because of external reasons. Some innovations simply do not meet the objectives that underlay their adaptation, which may often include making better use of redundant or under-utilised resources in a new technological set-up. In such cases the entrepreneur is likely to abandon the innovation before restructuring his or her organisational set-up. Innovations always lead to a change in the organisation of the firm. This translates into continuous changes in resource use, in the exercise of property rights over such resources and in the relations between the firm and its institutional context. The firm is continuously repositioning itself, a process that Saccomandi (1998) defines as the organisational innovation cycle (see Figure 2).

Figure 2 Organisational innovation cycle



The methods through which such adaptations come about, and the speed with which they occur differ from one firm to another. They can be immediate, with the adaptation leading to the creation of new (or abandonment of old) organisational forms, which lead to changes in the entire structure of the firm. Equally they may be gradual adaptations that do not immediately lead to organisational changes in the firm. In either case, the patterns and methods of resource use (the production functions) are modified. New resources may need to be introduced, others augmented and others may become redundant. This process of adaptation illustrates a more fundamental characteristic of the firm being rooted in a dynamic organisational context, in which it is constantly redefining its boundaries and its relations.

Figure 3 *Redefinition of the exchange governance forms*



The representation made by neo-classical theory of the market as the most efficient method of exchange is thrown into doubt by empirical evidence of the existence of alternative forms of exchange that, in specific institutional contexts, prove to be more efficient than the market. Neo-institutional theory explains the existence and success of these forms of exchange through the concept of the cost of using markets. As discussed in the previous section, these costs are related to a number of factors: the impossibility of achieving conditions of perfect information; the behaviour of economic agents with limited rationality, and the specificity of the object(s) of trade.

The choice between recourse to the market or the internalisation of the exchange within an organisation (i.e. Williamson's '*make or buy*' choice), depends on the resources (assets) available to the organisation and the distribution of the property rights over those resources. Institutional, technological and political factors all influence the very definition of a resource, its specificity, and the distribution of the property rights over it. In other words, the cost of using a market and the costs involved in reorganising a firm vary according to these exogenous factors. As a result firms are involved in a continual reassessment of the most efficient form

of governance (see Figure 3). This is not solely limited to a choice between the market and the organisation, but can encompass a range of hybrid forms of quasi-organisation and quasi-market options (Saccomandi 1998). In such options the exchange relations are not only regulated by the price but also by other variables that include the characteristics of the products and the existence of social rules of behaviour that reduce the costs of market use.

The dynamics of these changes vary, because of differences in the speed with which the external institutional contexts change and the speed with which the preferences of individuals seeking to safeguard the assets over which they have property rights evolve. The modernisation of agriculture has diminished the importance of the assets over which individual farmers exercise property rights (i.e. land, local knowledge and labour). At the same time it has increased the importance of those assets, both tangible and intangible, over which other parties control the property rights (i.e. seeds, machines, chemical products and administrative and market services). This has led to the organisational dominance of the institutional and technological environment over the farm. Choice of the forms of governance of exchange to be employed has passed from the farm to those industries that produce technological inputs and process agricultural outputs. This has imposed a reorganisation upon farms that has aligned them more closely to development models that give primacy to specialisation and achieving economies of scale. For individual farms the costs of conforming to these rigid organisational structures has often been very high. Equally these development models have failed to meet broader social objectives, such as protecting family farms, rural employment or maintaining a diverse and attractive countryside.

We can consider the farm as an organisational unit, whose initial status with regard to the governance of exchanges and control over assets is related to the functional space of the farm (that is its unique agro-ecological and socio-economic characteristics). When the innovative process leads to a repositioning of the farm *vis-à-vis* its Technological Administrative Task Environment (TATE) we can speak of a 'break innovation': a radical repositioning of the framework in which a farm operates. This might create a completely new governance structure and therefore represents a fundamental change in the relational pattern between the farm and its TATE. This might be exemplified by a change from a simple sales contract to a fuller integration with a processor or distributor. Such a systematic organisational innovation can often lead to the emergence of new power relations between the actors concerned.

On the other hand, when the innovative process leads to a co-operative form of adaptation between the farm and its TATE, this is more of an incremental innovation. This process may also lead to a change in the power relations[9] within the TATE.

When a farm abandons the TATE constructed by the dominant technological regime, it enters the field of novelty production. Many of these novelties closely correspond to the new and emerging forms of agriculture. While the farmers themselves may feel that they are moving into uncharted territory and lacking adequate support, they are in fact part of a much broader movement. It is therefore extremely useful and important to create a protected space around them that makes it possible to move beyond the niche dimension in which such novelties are usually confined.

The process of exclusion of farms from incremental innovative processes within the dominant technological regime has led to the creation of micro-TATES that provide a protected space for novelties. These micro-TATES create an environment in which the chance of survival of these farms (previously considered to be marginal) is enhanced. Thus, some novelties have emerged, in response to earlier failure of the dominant technological regime to engage with and enlist rural areas or farming styles that were considered marginal and which never shared the regulatory ethos of the dominant regime. For this reason, these novelties have their own history and development course, which has entailed both 'break' and 'incremental' innovations. The innovation process therefore can lead either to the construction of a new relational network or to the strengthening of the existing one.

The neo-Austrian school (Amendola 1972; Amendola and Gaffard 1988) considers the innovative process as an interactive one between the farm and its environment, which provides opportunities for the creation or development of new resources. Seen this way, the innovation process consists of a period of learning and a period of structuring new processes, which together lead to new production options. The process of innovation therefore depends on the existence of systematic relationships between the farm and the market (its reference environment).

The mechanisms through which information, formal and contextualised knowledge are generated are decisive factors in this innovation process. They offset the constraints posed by the limited rationality of the economic agents and reduce the insecurity associated with the innovative process. The capacity of the farmer to involve other economic actors in the process of elaborating innovative solutions is a key factor in this process of combining formal (exogenous) knowledge with contextual (endogenous) knowledge. These other economic actors may include firms within the same sector, firms in other stages of the product chain or consumers. Such alliances serve to reduce uncertainty (as they bring in actors with other areas of expertise). Through working with other actors the firm (farm) is no longer acting in isolation and its innovations are informed by the requirements and expectations of others (and vice versa). Therefore, the creativity of the firm is developed by factors that extend

beyond the economic logic of reducing production and transaction costs and come to include the strategic dimension of entrepreneurial activity, personal inclinations, and socio-institutional context. This gives firms a different perspective when making choices between innovating or adopting an innovation developed by others. If we consider the firm in terms of a system, we can interpret innovation as an event that alters the balance of the system, which later returns to a new state of equilibrium. This new equilibrium may be reached through changing the structural elements of the system and their inter-relations or it can involve maintaining the boundary of the system itself or changing it.

Innovative processes take place in a situation of uncertainty, caused by the limited rationality of economic agents, who operate within a given procedural logic of choice and on the basis of those opportunities that they know about. Recognition of this aspect of the innovation processes raises several issues of both a theoretical and practical nature. Technical progress cannot be considered as a factor that is totally exogenous to the production process (i.e. generated in institutions such as universities). Rather it is the result of an interactive process between the firm, already operating according to a certain production technique, and the scientific and technological regime(s) with which it relates.

The diversity in the processes of innovation, and routes towards it, depends on three aspects:

- In the first place, economic agents do not start from a common footing with regard to the choices and evaluation of opportunities that they are able to make. These choices depend on their expertise, which in turn is derived from their history and learning experiences, from the other agents with whom they interact, and the context in which they operate. This means that at any given time the potential (or 'virtual') opportunities are much broader than their degree of economic exploitation (Dosi *et al.* 1988a).
- A second aspect is connected with differences in 'expected utility' that the economic agents have of a specific production process or function. This will be closely connected to the different strategies they employ. A specific process or function may have a different role or potential within different firms (farms). This expected utility is likely to be determined by observations of what is happening in the surrounding environment; for example (in the case of imitative behaviour) the results obtained by other firms.
- A final aspect is connected with information. Here it is important to distinguish between the availability of information and the capacity to elaborate and use this information.

Firms innovate and experiment continuously, guided by the idea that it is possible to create or discover opportunities to improve their performance.

Their understanding of an improvement is in turn guided by their own (self) regulatory structure and guiding principles.

The 'virtual' type of opportunity stems from two observations: Asymmetries in information do not allow agents to know, or experiment with, all the possible alternatives provided by technology. From an economic standpoint this translates into the assumption of limited rationality of the economic agent, which does not allow him to evaluate the possibilities of economic exploitation of all the various opportunities. Even where there is perfect information, this is not sufficient to trigger an innovative process. The capacity to elaborate an innovation is also a constraining factor in this process. In addition to this, actors also have very different levels of expertise. This may be due to their history, their relationships with other actors, the context in which they operate, and many other factors (Dosi 1990).

These elements can explain the existence of different performances, even amongst firms within the same sector and in the same territory. The possibility of exploiting virtual opportunities thus depends mostly on the capacity of the agents themselves, and is connected with their learning routes. These, in turn, depend on their experiences, in the various functional contexts of the firm, on extra-economic relations, and on the mechanisms for regulating them[10]. This refers to the cumulative and specific nature of the innovative process and to the specificity of technological knowledge within any given firm (Pavitt 1987).

Real opportunities are defined by the ease with which economic agents can innovate. Initially this involves identifying and selecting new or existing technologies (often from a large pool of potential ones) that are most appropriate to their technological and organisational structure. Later it involves incorporating them within the firm, in a manner that will guarantee the continued success of the companies' activity. The realisation of such opportunities depends, in large part, on the firm's capacity. It is also strongly influenced by the institutional context, in which the firm exists and its capacity to determine the development routes of an adopted technology and to create a protected space around it that will facilitate its adoption and diffusion[11] (Malerba 1988; Malerba and Orsenigo 1990; Rip 1995; Rip *et al.* 1998).

In the case of a farm, it is unlikely that the innovation process will remain confined to a single process, phase or entrepreneurial function. Rather we are more likely to be faced with complex innovative processes that may ultimately lead to a redefinition of the very boundaries of the firm/farm. This will occur through a succession of continuous adjustments that are driven by the need to find solutions to the constraints that emerge once the initial project has been embarked upon. This is related to the systemic nature of agricultural activity, in which the modification of an input often

leads to different product characteristics or, *vice versa*, the introduction of a new product leads to a reorganisation of the use of the production factors.

The innovative process in agriculture may thus be viewed as a continuous interaction between the internal context of the farm and its Technical - Administrative Task Environment (TATE). However, this external environment is not as rigid or monolithic as earlier descriptions imply. The possibility of access to information, now vastly expanded through modern communication technologies, the increase in the number of farm entrepreneurs with roots outside of farming and the growing importance of consumers in the construction of quality definitions of products have all contributed to a proliferation of micro-TATEs, within which farmers can develop their project ideas, always taking into account the endogenous resources they have available.

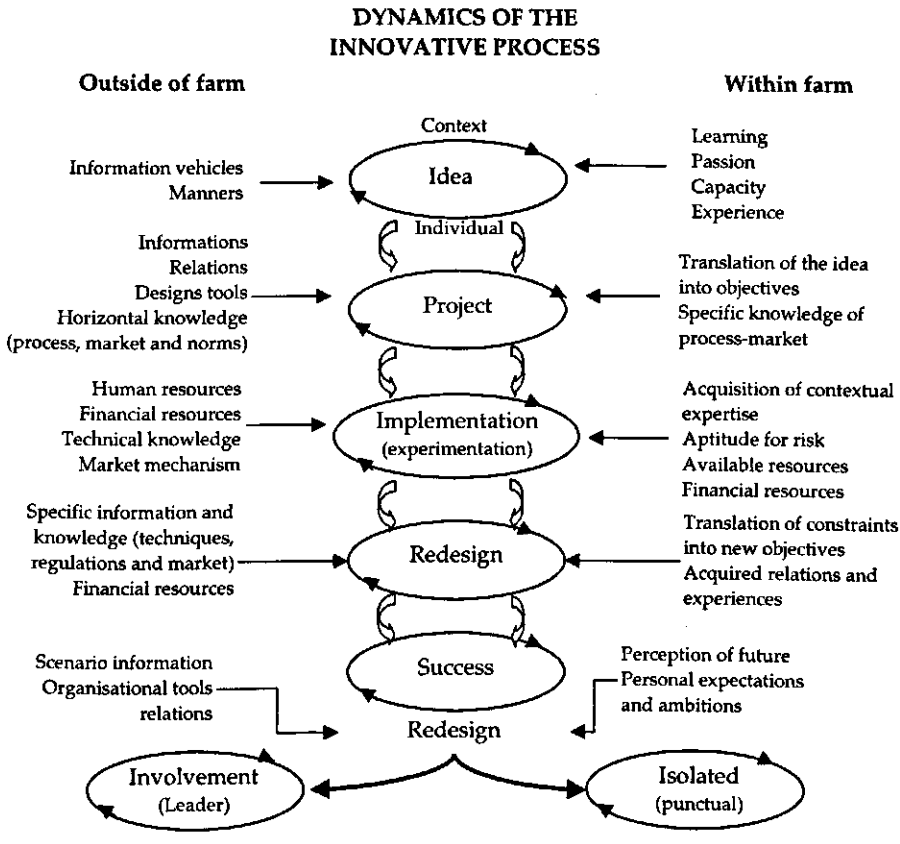
These interactions between the farm's internal and external contexts are illustrated in Figure 4. These shows how these interactions help shape the innovative process, its potential for success and the time that this is likely to require.

The interaction between the farmer and the socio-economic and institutional environment also plays a decisive role in the adoption of innovations throughout an area or region. Even when other actors recognise the value of an innovation, it is not always adopted. Thus the role of the institutions, that provide services and incentives (and sometimes disincentives), is very important in determining the uptake of a 'successful' innovation and developing its potential as a possible tool for triggering broader development processes in the area.

Paradoxically, innovations are often only acknowledged as such when the actual innovative process has ended: at the moment when the farm, that has generated new tangible and intangible resources, and created a new relational structure based on these resources, implements strategies for defending the investments made during the innovative process. These investments may be 'intangible', taking the form of specific and contextualised knowledge about production processes and markets, a re-organisation of labour, or new inter- and intra-company relationships whose purpose is to develop a form of governance that minimises the transaction costs associated with the farms' market exchanges.

This stage of defending an innovation does not represent the end of the innovative process, but continues as an ongoing, gradual redesign, now mainly aimed at safeguarding the investments that have been made (which now form part of the farm's specific resources). At this point farmers may also seek to create organisational arrangements with other farmers (or other actors in the supply chain) to safeguard their innovation.

Figure 4 Interaction between environment and farm in the innovation process



The redefinition of the firm's boundaries: the success of the novelty

Innovations within farms always occur within the context of the farms' short and long-term management strategies. Even when the innovation is limited to the introduction of a single machine or a new technology in one single process stage, this will, in the short or long term, lead to a reorganisation of the farm's resources and, therefore, of its organisational structure.

Earlier, we defined 'break innovations' as those that bring about an organisational change. These occur when a farm internalises or externalises several phases of the production process or several production functions and they are accompanied by changes in farm transaction and governance costs. Sometimes these changes are immediate and lead to changes in the reference context of the farm, i.e. they lead to a new position within the innovation cycle.

One key effect of the dominant technological regime has been to progressively incorporate farms within the market. Thus, the re-introduction of production processes and firm functions, back into the farm, may therefore be considered a novelty, since it runs against the current of the dominant technological regime. The reintroduction into the farm of processing and marketing activities is a form of vertical integration, which is becoming more frequently adopted as a response to increases in market uncertainties and diminishing returns from commodity markets.

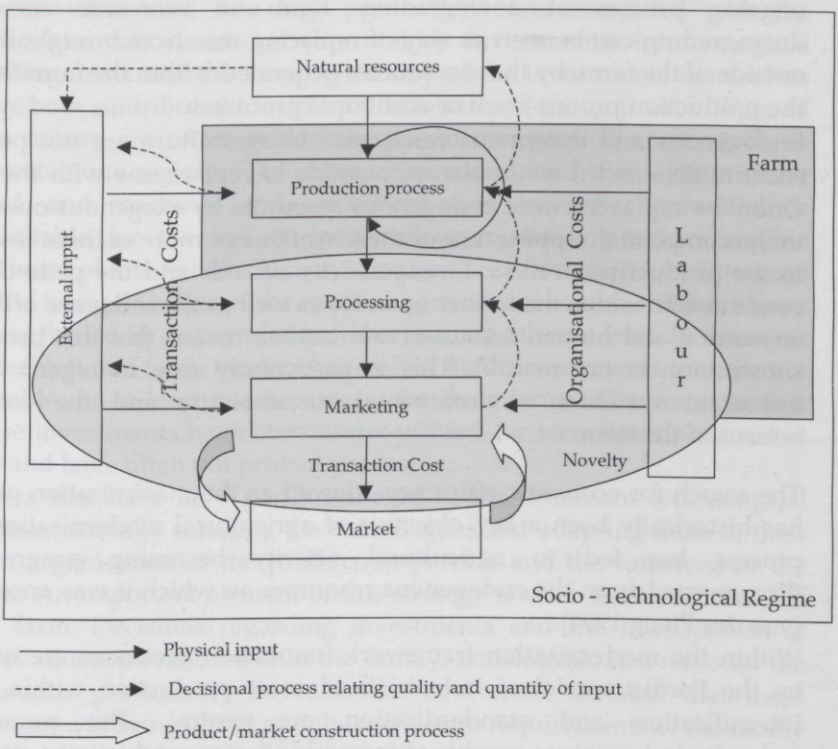
One interesting aspect of this process is that the internalisation of these functions is connected to a modification of production techniques, which must be adapted to the (more) artisanal nature of production. This can often lead the farmer to re-acquire an interest in, and knowledge of, the relationships between cultivation techniques and the qualitative characteristics of his products. Examples of this can be found from studies of animal husbandry and organic agriculture. Thus, for example, the opening of a local or on-farm butchery may entail the reintroduction of fresh forage into the feed of the livestock (displacing ensiled fodder) in order to improve the organoleptic characteristics and preservability of the meat. Or, on-farm processing of pecorino cheese will require paying attention to, and gaining knowledge of, the types of grazing areas that give this particular cheese its unique characteristics. Such changes often result in environmental benefits as well. In the first case, the abandonment of practices entailed in producing ensiled fodder (particularly maize) can lead to a reduction in soil erosion and pollution of groundwater. In the second case traditional types of grazing areas that were progressively being abandoned are reinstated and safeguarded (Biondi 1999; Biondi and Taffetani 1989).

From an economic standpoint, such vertical integration implies a decrease in the market transaction costs for inputs, which is accompanied by an increase in the farm's governance costs. These costs can be minimised through the creation of economies of scope in the joint use of farm labour and other resources. The existence, within the family or the local system, of specific knowledge, required for the (re)-introduction of the new production processes, thus becomes a decisive factor in the process of organisational innovation, since it considerably reduces the transaction costs connected with developing this resource. Because of the specificity of this knowledge the costs of acquiring it through other means would be extremely high.

All the activities connected with the reorganisation of a farm involve transaction costs, which are sometimes referred to as 'transition costs' (Pagano 1993). Such an organisational change leads to a change of the reference markets for both inputs and the sale of products (see Figure 5). The magnitude of these transition costs therefore depends on the

existence and structure of markets that differ from those in which the farm previously operated, and which had determined its organisational structure (the choice between 'make or buy'). The transition costs also depend on the history of the firm itself and its development pathway.
The time required for such a transition from one organisational form to another depends on a number of factors. These include: the type of innovation, the flexibility of the farm in the use of the resources that will be made redundant, and the inertia imposed by investments[12] associated with a firm's modus operandi. For example the presence of a strong local co-operative organisation would represent an element of inertia to the vertical integration of a family farm.

Figure 5 Organisational innovation



Within the dominant regime in agriculture, technological innovations that aim to increase resource-productivity often seek to replace the 'limiting resource'[13] by artefacts manufactured in the agro-industrial sector[14]. By contrast, novelties often represent a way of organising endogenous resources so as to circumvent the constraints implied by the limiting resource, using strategies for diversification and/or the generation of – internal and external – synergies. These strategies emphasise the

economies of scope which, as we have seen, can facilitate a reduction in production costs and an increase in output value.

The very definition of marginality derives from the inability of the farms to respond to technological innovations with increases in productivity comparable to the top areas/farms. The limited effectiveness of these technological innovations, however, was often disguised through raising the level of opportunity – that is, by creating easy access to these innovations through a system of public support (contributions to investments) and technical assistance.

In all rural areas the development trajectories of agricultural activity are embedded in and, hence, dependent upon specific socio-economic and environmental contexts. Currently, many farmers, especially those in 'marginal areas', are structuring their development trajectory as an ongoing process of downgrading. From an economic standpoint downgrading can be seen as way of replacing resources brought in from outside of the farm, by those resources generated within the farm through the production process itself or additional processes.

Endogenous and exogenous resources[15] in agriculture are not perfectly substitutable and it is not always possible to replace one with the other. Often the replacement of endogenous resources by exogenous ones leads to the complete disappearance of the use of one or more of these resources in the production process. The specificity of soils and the pedo-climatic conditions in which the farmer operates as well as the influence of history on natural and human resources and capital, means that this process of substitution is not neutral. This is particularly true in regard to two important variables: environmental sustainability and the economic returns of the farm.

The search for economic efficiency, viewed as the maximisation of profit has historically been a key objective of agricultural modernisation. This process has led to agricultural activity becoming progressively disconnected from the endogenous resources on which it was once based (van der Ploeg 1994).

Within the modernisation framework innovation processes are inspired by the Fordist model of industrialised mass production within which intensification and standardisation are central. The pursuit of technological progress capable of increasing factor productivity, provided farmers with technologies created outside of the farm. The adoption of these innovations has been facilitated by the emergence of TATE as the techno-institutional environment within which farmers have to order their business relations and practices. This environment has played an important role at several different levels: the development of technology in research centres; the adoption of technologies by farms, through a system of incentives and services; and, more generally, the creation of an

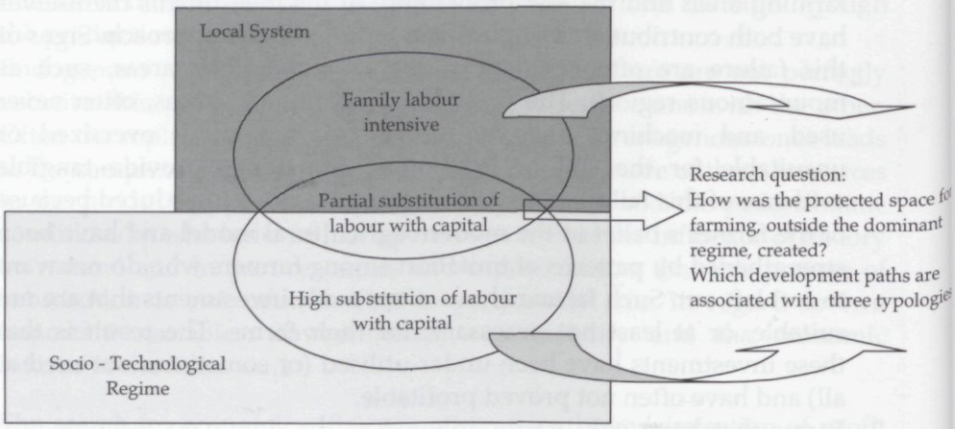
abstract stereotype of a modern and successful farmer (van der Ploeg 1999).

Farms have adopted different positions in respect to the dominant technological regime. In marginal areas three main positions can be identified (see also Figure 6).

1 Farms that have wholeheartedly followed the technological regime, trying to imitate the performance of the farms for which the technological regime was constructed (even though they are located in different contexts/areas). These farms have invested heavily in automation and in structures that aim to overcome the limits imposed by natural conditions (infrastructure, climatic conditions) and in increasing the productivity of natural and other farming resources (e.g. fodder, fertilisers, seeds, the introduction of improved breeds, artificial insemination, etc.). The high production costs associated with the difficulties of absorbing (unsuitable) investments into marginal farming areas and the low profitability of the investments themselves have both contributed to widespread failures of this approach. Signs of this failure are often evident in the most marginal areas, such as mountainous regions. The presence of abandoned barns, often never used, and machines and equipment that are either oversized or unsuitable for the soil or local relief sometimes provide tangible evidence of this failure. Such innovations are often introduced because of the farmer's belief in the modern agricultural model and have been strengthened by patterns of imitation among farmers who do not want to feel left out. Such farmers have often made investments that are not suitable, or at least not necessary, for their farms. The result is that these investments have been under-utilised (or sometimes not used at all) and have often not proved profitable.
2 Farms that have only partly adhered to the dominant technological regime, carefully selecting the technologies and adapting them to their own organisation of the production process and the functions of the farm. An important element of this strategy is often the family base of the farm. Decisions regarding investments and the introduction of innovations are made within the family, which evaluates not only the economic profitability but also the new work division that these changes will bring about and the extra-farm requirements of the family itself (e.g. children's education). Furthermore, regional extension services have, in some cases, mediated the introduction of innovations, trying to steer the farmer's choices towards those technologies that are most appropriate to farm household aspirations, which are also often the technologies that are most compatible with local environmental conditions.
3 Farms that have resisted the modernisation process. These farms are considered to be marginal by the dominant technological regime. They

have continued to use family labour as their main resource. They may have made few investments in structures and automation and may also have implemented strategies designed to enhance the artisanal characteristics of their own farms. These farms have a strong family character, and often implement forms of diversification which include activities outside of agriculture, often integrating these activities with those of the farm. Because they are considered marginal, the strategies of such farms have often remained hidden, whilst the farms themselves have survived within a protected niche, outside of (and ignored by) the dominant technological regime. Their continued success and/or survival derive from their capacity to build themselves a market capable of increasing the value of their production.

Figure 6 Farm strategies in response to institutional changes in Abruzzo mountain areas

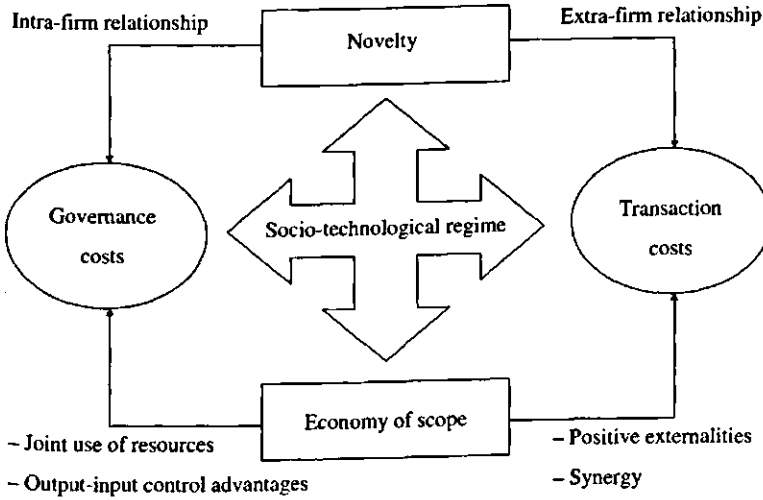


In marginal areas the model of mass production has often failed due to the inappropriate nature of cost-saving or production enhancing technologies in these areas. Often the lack of resources and their specificity have made it even more difficult to successfully adapt such innovations to local conditions. Such failures have brought about survival strategies that no longer aim to maximise output (competition strategies related to cost) but which seek to integrate activities downstream of the agricultural production process. Such activities may fall outside of classic definitions of agriculture, but are capable of creating economies of scope through the use of farm resources, (e.g. holiday accommodation environmental services, etc.). Such an organisation of the innovation process has led to the reintroduction of technological innovations in both agricultural production processes as well as at other stages, such as in on-

farm processing. As such this has also led to newly emergent uses for natural resources within the farm.

The failure of the technological regime in meeting criteria relevant to internal farm management has been paralleled by a general inability of the dominant technological regime to guarantee consumer safety or maintain environmental standards and quality. Recent trends in the development of technologies have started to accept this and focus upon production factors and methods that are more compatible with the ecosystem. However, the construction and adoption of these technologies does not significantly differ from those they are replacing. Finally, there are alternative patterns of innovativeness (of novelty production) that coexist with, and start from, the existing technological regime. These patterns will always lead to a change in the organisation of the firm resulting in changes in farm governance costs[16] and the cost of using the market (see Figure 7).

Figure 7 Novelty impact on firm relationship and economy of scope response



In many contexts such costs also depend on the institutional framework within which the farm operates. In many cases the institutions internalise a considerable partion of these costs. Agricultural policies can change the distribution of transaction costs between the various economic and institutional operators. According to neo-institutional theory, there are different forms to govern transaction costs. These different forms of governance are the result of the firms' position within and interaction

with the institutional context. The role of institutions thus becomes important in creating the conditions for the innovation.

The organisation of the innovative process and the institutional context

The learning process that generates innovations may be situated either within or outside the firm. According to Teece (1982; 1986; 1988) decisions concerning the organisation of this process depend on the transaction costs associated with specific and tacit forms of knowledge as well as on the possibility of the innovation itself being appropriated by others. Keeping innovations within the organisation provides an alternative to the market: one that can potentially reduce transaction costs. In agriculture innovative processes are characterised by a strong division between formal and informal organisational forms. The contextualisation of knowledge in agriculture is often learned collectively, which can be explained by two main reasons:

- the homogeneity of agro-pedo-climatic conditions within a specific territory, increases the possibility of a rapid transfer of successful innovations made by individuals through imitation;
- the positive externalities deriving from such rapid adaptation. When co-ordinated such changes can generate the critical mass necessary to achieve the economies of scale required to satisfy market demand, even if that demand is framed within the context of mass production.

These characteristics become transferred to all the learning phases, even those concerning the generation of formal knowledge, the establishment of public research centres and the support services capable of successfully engaging with farmers. The progressive modernisation of the agricultural sector has acted as a filter selecting those farms that find it worthwhile to remain within this organisational structure. This process was preceded by the pre-eminence given to formal scientific knowledge over contextualised knowledge, not only within the farm, but also within the socio – technological and institutional context (TATE) constructed around the farm (with public research and service centres being integral parts of it). At the same time, this formal knowledge strongly intertwined with the logic of economies of scale and the advantages deriving from network economies, in which innovations are adopted by a very large number of parties. The 'scientification of farming' implied an increasingly limited space for manoeuvre for those learning phases whose focus was upon contextualising technologies. For example, today's agricultural machines are a combination of technologies that come from very diverse scientific fields (electronics, mechanics, hydraulics, material engineering) and are produced in very specialised contexts. The combination of these various kinds of knowledge is now not only external to the farm, but also external to TATE itself. It is no longer only the farmers who lack the expertise to

repair and maintain agricultural machinery. Because of their technological complexity, even the suppliers themselves often need to resort to specialised personnel from the firms that manufactured individual components. As the resulting technologies and techniques are socially constructed through connections and relations of a social-technical nature (Benvenuti 1994), this process means that these social constructions take place in environments that are increasingly distant from the farm and its organisational context of reference. Thus farmers are less able to play an interactive role with the actors devising these new technological solutions.

We thus move from a 'weak' or inter-institutional organisational dominance exercised by the TATE to a 'strong' dominance by economic actors who control the production of knowledge, artefacts and the division of learning processes. The effects of this dominance have been described by a number of authors (see Nelson and Winter's *Technological Regime* (1982) van der Belt and Rip (1987), Dosi's *Technological Paradigm* (1982; 1984) and Freeman and Perez's *Techno-Economic Paradigm* (1986)[17]). The cumulative nature of the learning process allows a progressive internalisation of knowledge within organisational structures that are reinforced by socially and technologically constructed ties[18]. These organisations, which may be traced to the TATE and to the public Scientific and Technological System, have become increasingly self-referential. As a result they are less able to respond the needs of farms or to those of civil society. In consequence many forms of innovation devised by formalised technological knowledge are redundant, as there are limited possibilities for combining and internalising these innovations on real farms. The technologies are produced on the basis of a virtual representation of the 'farm of the future' rather than in the context of actually existing farms (van der Ploeg 1999).

As a result of this we can conceptualise the innovation processes as following two distinct paths. The first involves the internalisation of innovative process within the farm itself, mainly through new territorially localised organisational forms, which are sometimes even inter-sectoral (as is the case with the Tuscany wine routes; see Brunori *et al.* in this book). The other involves the complete externalisation of the learning process to external agencies, which means that these agencies expropriate the cognitive element of innovation, leaving the farm only the work of implementation.

The first path is characterised by farms that reorganise their entrepreneurial activity towards multifunctionality, where complex innovations – of product, process, and organisation – predominate. These farms operate in market niches where the competitive advantages are connected with the inter-sectoral relations and the synergies with other activities of the territory, and with the farm's capacity to continuously

readapt its commercial strategies towards new markets. These niches are characterised by 'alternative' micro – TATEs, whose expansion is often hindered by the dominant regime and the norms that it imposes. In other words, the innovations that characterise these niches often do not succeed in becoming technological trajectories because of inadequate organisational and institutional support.

The second path is characterised by the acquisition of innovations directly from the global market, where the mechanisms of dominance are constructed by single actors through the almost monopolistic control of research and development functions, driven by productive and commercial logic. In fact, these firms, in addition to selling the artefacts coming from highly specific scientific and technological knowledge, often impose contracts for the supply of the technical and logistic assistance necessary for the production and marketing phases, and control the latter through forms of royalties.

Paradoxically this leads to the institutions that have traditionally formed the core of the TATE becoming the weakest link in the organisation of the innovation process as they are progressively excluded from the innovation process. The weakness of this link reinforces this process (and the process of organisational dominance within the sector), as the actors responsible for negotiating the trade offs between the private interest of agricultural entrepreneurs and society at large have a greatly diminished role.

The creation of protected spaces

Institutions have the capacity to intervene in three spheres that, according to Nelson and Winter (1982), provide the characteristics of a technological regime: opportunity, appropriateness, and accumulation of knowledge.

Opportunity refers to the ease with which economic agents can innovate and identify the pool of untapped potential within each technology. Appropriateness refers to the capacity of innovators to make personal use of the results and derive profit from an innovation – in other words, the possibility of using an innovation as a factor of differentiation and competitiveness (Malerba and Orsenigo 1990). The accumulation of knowledge can occur at two levels: at the farm level and at the sectoral level. In the first case it is led by the owner's capacity to learn, which is closely linked to his willingness to innovate. In the second case new innovations depend strictly on previous ones and therefore the technological process proceeds in an incremental fashion on the basis of the available knowledge. Hence, path-dependency becomes a built-in feature.

In agriculture, opportunities are politically structured by a system of financial incentives and by public and private extension services. The political preference for the modernisation paradigm has led technology in

the direction of constantly increasing economic efficiency, in narrowly defined terms. The appropriateness of the technological regime has often been limited by the standardising effect of the modernisation trajectory, which aims to produce uniform inputs for the agro-food industry. Thus the appropriateness of innovations has been constrained by the requirements of the food processing industry (at one end of the chain) and the development of agricultural technologies designed to meet these requirements at the other. Finally, accumulation of knowledge at the farm level has been progressively reduced, while at the institutional level it has grown considerably, especially within the biochemical field. At the farm level, the pace of technological change rarely leaves enough time for the farmer to learn the processes involved, creating an ever increasing dependence on technical experts. These experts have become increasingly integrated with industry, partly as a result of the processes discussed above, but also partly because of the general privatisation of extension and support services, which has occurred because of political aims of reducing public expenditure.

Farms' relationships with these three different spheres vary widely as farms have different assets and different organisational forms. Such differences can be found even within a single territorial area, where very heterogeneous styles co-exist. Furthermore, the presence, even within the dominant technological regime and/or single territory, of a great variety of innovative behaviours and different manners of organising the innovative process (Malerba and Torrisi 1990) can also be explained by the existence of different external contexts and the varying backgrounds and attitudes of individual entrepreneurs. It is possible to recognise different entrepreneurial approaches that aim at reducing uncertainty, and different learning processes which, since they are cumulative by nature, come to depend on the very history of the farm. In addition different mechanisms (including authority, loyalty, etc. depending on the social and political context) influence the degree of organisational inertia.
Heterogeneity may be found within a single technological regime or in the simultaneous existence of several technological regimes. In the case of a single regime this may be explained as a result of farms with different patterns of incorporation and institutionalisation (van der Ploeg 1990a). A greater emphasis on the economic aspects of farming may lead a farm to delegate more activities to third parties. In fact, institutionalisation often obliges farms to accept instructions as to what to do (power of allocation) and how to do it (power of authorisation), placing them in what we have called a technological trajectory (Benvenuti 1982a).
From the economic standpoint, innovation can lead to a competitive repositioning of the firm/farm. However, technological innovations in the agricultural sector are increasingly characterised by their low level of appropriateness to farms. This is because of strong private sector

involvement in the organisation of innovation, which has led to an overwhelming priority being given to standardisation and the pursuit of economies of scale. This has configured the market of agricultural commodities to a competitive market (Baumol *et al.* 1982). Agricultural markets are currently characterised by a nearly complete lack of technological entry barriers, where the economic agents behave like price takers and the only possible strategy is that of cost reduction. Such reductions are pursued through economies of scale and the introduction of associated process innovations. Under such circumstances it becomes almost obligatory, for farms, to adopt such innovations, to the point where their adoption becomes incompatible with the continued existence of the farm itself.

When several technological regimes exist simultaneously, heterogeneity is guaranteed by the social construction of protected spaces, market niches, local systems, districts (Iacoponi 1999), etc. In these protected spaces, the organisation of the productive process and the farm's relations with its own institutional environment are consistent and support self-referential forms of 'efficiency'.[19] Therefore it makes little sense to speak of economic efficiency of individual farms. The key issue that emerges is the efficiency of the institutional system (farms included) as a whole. Both the institutional environment and the farm innovate continuously; however, these mutual processes of farm – environment adaptation do not take place in the same way for all farms. Inertia and resistance to innovation, which is generated both by the farms and the institutions themselves, hold partly back such processes.

The strategies of firms tend to place a high priority on defending assets (in order to maintain their future use) and maintaining the relationships (organisational form) that they have constructed. The organisation of the firm is, in itself, an investment: one that will reflect the firm's strategy for managing transaction costs in the past (*ex-ante* costs), present and future (*ex-post* costs). Membership of an organisation (such as an agricultural co-operative), gives rise to forms of loyalty, that might exclude new solutions and ways forward. Similar inertia may also be caused by mechanisms such as reputation and authority that have evolved as methods of regulating and minimising transaction costs.

There are often time lags in the innovation process and the institutional context and the firm do not respond to the changes simultaneously. This may generate forms of organisational inefficiency, which may imply costs that have to be shouldered either by the firm or the institutions. If this time lag lasts too long, the innovation may remain limited to one or a few firms who have created a protected space represented by a specific market segment, and the forms of governance of the transactions may not be reproducible on a broad scale. Many such innovations will have a short life, and even if they may represent a temporary success for the firm,

other firms will see them as representing an opportunity that is to be appropriated.

Opportunity and appropriateness are embedded not only within the technologies themselves, but also within the socio-institutional context. Incentives help define how opportunity and appropriateness are perceived. These incentives may be formal (as in the case of public policies supporting innovation, or informal, coming about through mechanisms of 'collective' diffusion). Such incentives may encourage different technological regimes to exist alongside the dominant one, even within a single territory. In time they may even evolve into a new regime that is capable of challenging or even supplanting the dominant one.

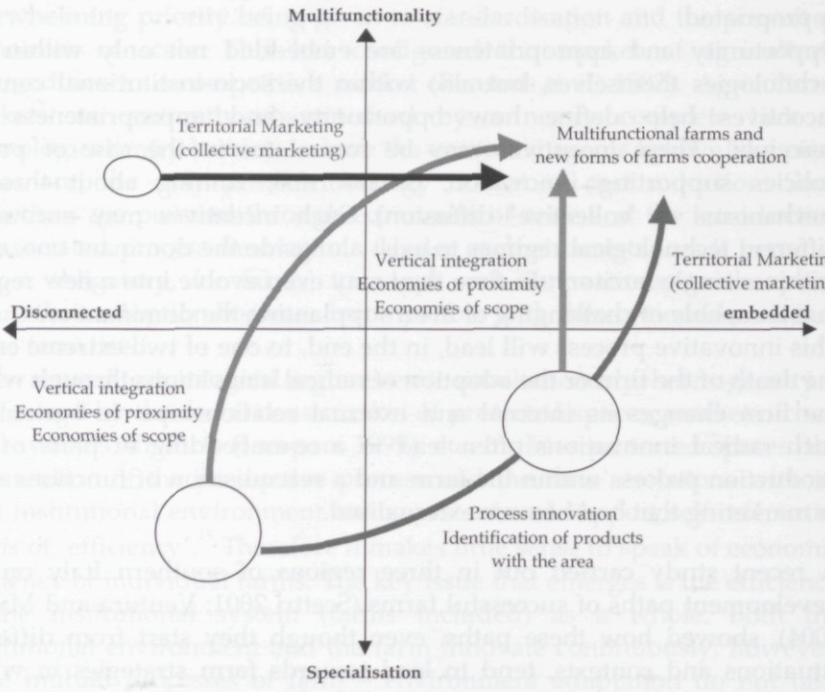
This innovative process will lead, in the end, to one of two extreme cases: the death of the firm or the adoption of radical innovations through which the firm changes its internal and external relationships. In agriculture such radical innovations often lead to a re-embedding of parts of the production process within the farm and a reacquisition of functions such as marketing that had become externalised.

A recent study carried out in three regions of southern Italy on the development paths of successful farms (Scettri 2001; Ventura and Milone 2004), showed how these paths, even though they start from different situations and contexts, tend to lead towards farm strategies in which multifunctionality and reconnection with the territory play a key role. This is achieved through the diversification of production (in the case of a multi-product farm) and/or an increase of the functional ties with the territory (services, intersectorial synergies).

The paths implemented, as shown in Figure 8, are varied: for example, the specialised farms have sometimes pursued strategies of differentiation of their products in the market which have, in turn, led to the rediscovery of the vocation[20] of the territory. This then comes to play a role in helping them maintain their competitiveness. Later they rediscovered synergies deriving from collaboration with other businesses, both in agriculture and other sectors (e.g. tourism, handicrafts, etc.) are discovered and explored. Equally, farmers pursue strategies of diversification, seeking economies of scope through the reintroduction of hybrid systems that result in a different use of the local resources in the pursuit of the 'vocationalities' specific to the area.

The crisis of the modernisation model in agriculture is encouraging these processes at a grassroots level. It is leading to a new regrounding (van der Ploeg *et al.* 2002), in which the functional connections of the farm to the territory in which it operates are strengthened. It is, however, a process which also requires institutional actors who can reclaim influential positions within the TATE, in order to stimulate entrepreneurial behaviour that is responsive to the emerging needs of the European society.

Figure 8 Different paths of innovative farms



Through these processes traditional agricultural systems are becoming increasingly differentiated not so much on the basis of specialisation, but more in terms of the specific relations that exist between farms and their economic structure of reference. Opportunities for extra-agricultural employment, connections with tourism and the environment and opportunities for transforming, marketing, and distributing produce all influence the direction that differentiation takes in different territories.

Novelties need a new political and normative scenario if they are to fully develop. In the absence of appropriate protection, many of the new agricultural activities will be stifled due to the presence of normative barriers associated with the dominant regime[21]. Furthermore, it is necessary that there is a series of conditions that consist of complementary assets, both tangible and intangible. In fact, the novelties consist of technical and organisational knowledge that make it possible to improve the production processes or the firm's functions, with respect to both the firm's competitiveness and, especially, to its compatibility with the collective prosperity. Especially when novel innovations are of the type that we called 'break', i.e. systemic, they need complementary investments[22] (Teece 1986; 1992) that are part of the system itself, i.e. which concern the structure and organisation of the firm's new environment of reference. This is particularly evident with innovations that imply a multi-activity of the farm as, for example, in the case of agri-

tourism, where the presence of investments in sectors that are synergetic with them (infrastructure, public and private agencies) often determine the success and development of these innovations. Public intervention cannot, therefore, be limited to financing the specific investments that the entrepreneur makes in the innovation process, but must provide for measures that concern the complementary investments, both those made by the entrepreneur but more especially, when they are based on a functional type of territorial division among different sectors and/or firms.

The regrounding of agriculture (Iacoponi *et al.* 1995; Iacoponi 1999; van der Ploeg 2000) necessarily entails an enlargement of the institutional and economic framework within which the firm is operating. This creates new opportunities for the firm, but implies also an increase in the complexity of its informational and decision-making processes. Hence, the role of institutions in mediating the needs of the various actors, in the articulation and co-ordination of the different interests, and in supplying the firm with the instruments needed to govern such complexity, becomes strategic. From an institutional standpoint, this needs decentralisation of decision-making to regional territorial bodies and local organisations. However, this entails several risks connected with the territorial, socio-economic differences that characterise the European regions. Particularly the shift from sectoral to integrated territorial approaches might turn out to be difficult and risky – especially when the capabilities of regional administration and government are limited.

The territorial heterogeneity connected with the availability of natural resources, but also with the history of the territory and the heterogeneity of entrepreneurial styles, cannot be governed through common administrative rules, but requires common regulatory principles that must find, time and again, specific and variable forms of local application. This process of decentralisation has already started in Europe through sets of 'horizontal legislation' that must be applied by the single Member States.

Thus, the role of the State, regional and local Administrations, becomes itself a success factor for the firms, and therefore for the territory. This also holds true for the possibility of creating protected spaces for the development of novelties that meet the specific environmental conditions. In short, the decentralisation process needed to reorient agriculture towards a multifunctional role requires a reacquisition of the local administrative capacity to elaborate knowledge as well as the norms necessary for the construction of an adequate framework for bargaining. This must not lead to a confusion of roles: the political area remains responsible for the identification of the rules and the common priorities, whilst the administrations and firms are responsible for the processes of regulatory and operational construction of the local solutions. In this same

scenario, the roles of the research centres, universities, and technical assistance become important for the identification and validation of those novelties that may constitute a response to the failure of the dominant technological regime.

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Notes

1 Economies of scope exist when the cost of jointly producing outputs Y1 and Y2, is less than the cost of producing each output separately: C(Y1; Y2) < C(Y1) + C(Y2)

2 External economies are quite common; they derive from locational externalities and innovation in one industry that can lower costs in another (Teece, 1982).

3 In particular, the notion of support space is used to describe three kinds of 'non-market' relations:

- strategic relations of the firm that involve its partners, suppliers and customers (privileged exchanges of information, collaboration/partnerships/joint ventures);
- qualified or privileged relations at the level of organisation of the production factors (origin of capital, sources of information, technological know-how, participation in the formation of human capital and the processes of collective learning and formation of an innovative culture);
- strategic relations with the other collective actors of the territorial environment (public agencies, private or semi-public associations, trade unions, other groups).

4 These are linked to phenomena of opportunism and moral hazards deriving from information asymmetry and incomplete information.

5 This is not to say that innovation has not occurred in such areas – but rather that it has rarely been supported by the commercial or state organisations that drive 'mainstream' agricultural research.

6'Incorporation' means the process of delegation outside, by a firm, of many of the production phases and functions; 'institutionalisation' refers to the effect of dominance, by outside agencies, that leads the firm to follow exogenous technical directives (Benvenuti, 1982b).

7*Technological – Administrative Task Environment (TATE)* is the progressive interpenetration of the technological and the administrative dimensions (or variables) of the operating environment in which farms exist. Benvenuti identifies seven main elements in this environment.

- suppliers of labour input;
- customers of the farms products;
- suppliers of technical capacity and capital ;
- institutions or authorities with regulatory power over land and its use;
- competitors in the supply and final markets;
- other miscellaneous regulatory and advisory groups, including government bodies, local government units, trade unions and associations, and other territorial or sectoral associations;
- institutions and systems of information and scientific research.

The TATE provides an important element of the farmer's professional environment. It shapes the farmer's role by defining the behaviour or functions that are considered socially and technically appropriate (or inappropriate) for an individual operating within a given social and economic context (Benvenuti, 1975).

8The heterogeneity of farming styles has been identified in empirical research carried out by Van der Ploeg (2000), Roep and de Bruin (1994), Wiskerke (1997) in Holland; by Ventura and Van der Meulen (1994, 1995a, 1995b), Ventura (1995, 2000), Ventura and Milone (2000) in Umbria; Ventura and Milone (2004) in three southern Italian regions (Sicilia, Calabria, Basilicata). These studies show how the organisational and technological set-up of the farm has a 'private' significance, i.e. it depends on individual choices made by the entrepreneur based not only on external pressures but also by the farmer's own strategic objectives made on the basis of the resources available to him and his interpretation of market behaviour and changes.

9 The strong influence of the TATE is due to its characteristic as a 'quasi-organisation.' This derives from the TATE being an accumulation of agencies and formal regulations that, even though it lacks a formal organisational structure, it nevertheless exhibits three fundamental dimensions typical of organisations. These include a) a (informal) structure, b) its own symbolic order, i.e. its own 'culture', and c) a function. The structure emerges 'automatically,' in the sense that once a certain degree of integration of the various parts of the grid exists, a web of limitations, opportunities and obligations emerges 'around' the firm. The symbolic order or 'culture' lies in the values and assumptions that are shared amongst the technical and organisational staff representing different agencies. Lastly, all agencies share a common objective of regulating the production process through the 'standardisation' of the productive behaviour of the actors in question. This in turn becomes the 'function' of the TATE (Benvenuti et al., 1988).

10 Recent research on the innovative dynamics in the agricultural sector carried out in three regions of the south of Italy revealed the diversity in innovative behaviour of the entrepreneurs in terms of their role in coordinating the production process and the entrepreneurial functions (inside and outside of the farm) according to their origin and previous experiences and relations (Scettri 2001; Ventura and Milone, 2004).

11 The role of the national research systems (the universities and public research centres) and of public policies and financial systems, in innovation processes has been the subject of numerous studies, including those by Orsenigo (1989) for the Biotechnology Industry and Iacoponi and Marotta (1995) for the agricultural sector.

12 These may include social, administrative and environmental ones.

13 See also Sonneveld *et al.* in this book.

14 Which in extremis can be taken as far as replacing the land itself with inert substrata

15 Endogenous resources are those whose utilisation and therefore reproducibility are mainly controlled by the farmer, who generally maintains property rights over them. Exogenous resources are those purchased by the farm, which have a limited lifespan, which cannot be reproduced within the farm and over which the farmer generally does not own the property rights.

16 Costs that are different from production costs although they are necessary for managing the firm

17 The Technological Regime and Technological Paradigm are characterised by their ability to define the important problems that must be tackled, the functions that must be satisfied, the technology to be used, and the resulting artefacts. The concept of Technical-Economic Paradigm also includes, in addition to the processes of engineering and production of new technologies, the changes to the cost structure, the conditions of production and distribution that result from the system moving from a micro-technological to a macro-technological concept. Dosi links this concept to that of *Technological Trajectory*, which is defined as the way in which technological progress contributes to shaping the development of the Technological Paradigm.

18 In this approach it is implicit that a technological trajectory is not an autonomous process, but is defined and structured through: the construction of a technical-scientific context that concerns both the importance of the problems, and how they are solved by the methods and techniques typical of the Technological Regime; an organisational and institutional context that defines procedures, technical standards, social norms and rules that concern manners of use of the resources and the division of the property rights over them; the development of infrastructure and demand (Rip et al., 1998).

19 The concept of efficiency is socially constructed as the optimisation of the functions of expected utility of actors characterised by limited rationality.

20 Vocationality describes the optimisation of agricultural practices in relation to the local conditions and natural resources used in the production process. The search for the

vocationality of a territory thus influences both the choice of systems and of the factors used in the production process (variety, breed, knowledge, etc.). Practices aiming to promote the vocationality of an area are inherently sustainable because they pay more attention to the reproduction of the natural resources used in the production process.

21 There are several emblematic examples in various European countries such as, for example, those of the environmental cooperatives in Holland or the services rendered by the farms that are poorly regulated in Italy (agritourism, environmental services, school-farms, etc.).

22 The complementary investments may be specialised, co-specialised, or generic. The specialised investments are those for which there is a unilateral dependence between the innovation and the investment. In the co-specialised ones the dependence is bilateral: one cannot exist without the other. The generic investments, on the other hand, are not dependent on the innovation.