European Network of Learning and Teaching in Agriculture and Rural Development. IFAPA. Cordova. Spain

INNOVATION AND NEW TECHNOLOGIES IN THE AGRICULTURE OF THE FUTURE AND THE RURAL WORLD

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A NEW PARADIGM FOR AGRICULTURE AND THE RURAL WORLD

The complexity of the rural world has increased exponentially in recent years, and it would be reasonable to think that we need to learn to understand it better. In a situation that is so new and different we will probably also have to look for new types of solutions and responses. It is important to emphasize that we are living in an information- and knowledge-based society. This forces us to change the way we make our decisions, the way we learn and act. This means that knowledge needs to be placed on a pedestal; knowledge must be king. At other moments in the history of humanity, natural resources were the most important factors, influencing and conditioning a major part of human settlements, wealth and opportunities. Right now, we are in the middle of the process of building a knowledge-based society and things are quite different.

The changes are also affecting geopolitical spaces. They have changed, and presumably they will change quite a lot more in the future; an enlarged UE, the MERCOSUR free trade agreement between the USA, Canada and Mexico, the growing importance of China and India, and so on. Nothing is static and everything depends on constantly changing geometrical variables. In the environment that affects us most, the EU's opinion has become more powerful, and procedures are becoming more rigorous, independently of the fact that from the inside we perceive a multitude of shortcomings. Nonetheless, when we compare ourselves with other geopolitical zones, our situation is reasonably stable, and we live in an environment with consolidated democratic practices and a social welfare system, where the rules of the game are more or less well-defined. We have pretty rational criteria in the collection and distribution of our budgets and we have a great potential for providing peace, prosperity, business opportunities, cultural wealth, etc. Geopolitical spaces are changing at a dizzying pace and polarization occurs on multiple levels. There aren't any actors who can impose their criteria on all levels, and instead decisions depend on are the result of major negotiations and efforts of conciliation.

Social changes are decisive in the present moment as well as for the future. Birth rates, employment patterns, the role of work itself, nutritional habits, travel habits, leisure time habits, relationship habits; social changes are very important and that is especially true for the rural environment. In fact, some of the opportunities available in the rural environment are linked with a different concept of life and work: love of nature, of peace and quiet, values of authenticity, another rhythm of life, which in some way and in some cases can be associated with life in the country. We have to be very much aware of these changes and try to anticipate things more.

The relationship between political theory and action has become more and more complicated. In the case of the European Union, the common agriculture policy has gained in its budget allowance in a major way, an also in public opinion and in the opinion of the administration itself. It has also gained in importance politically, socially and with respect to the environment, etc. Right now, synergies are emerging between the different policies, and we can notice them on all levels: state, autonomous provinces, and municipalities. There is a certain interaction between policies, and it is difficult to deny a certain permeability and to see things strictly limited to each sector on its own. There are several indications that show us that it would not be convenient to limit efforts to isolated sectors exclusively, or not to consider subsidiarity and complementary efforts in the different political actions. Another aspect that needs to be stressed is the role of the public administration in the world of agriculture. In the recent past it was decisive and very interventionist. It took up a lot of space, but relationships between the public and the private sector have changed, not only in their quantitative influence but also in the understanding of how and when public institutions, organised civil society, private individuals and businesses want to participate. A change is necessary when policies are designed, lived and when actions are taken. Relationships between the public and private sector must change and they must look for a way to complement each other. Flexibility and adaption to change, as well as response capability are the signs of the times. We share more and more things with the rest of the world, and globalisation is an ongoing process. It's true, singularities exist, but if the rural world wants to have a chance, we have to work with a global vision and include the singularities of those who are closest to us. An aspect that emerges with more and more vehemence is the need for territorial rapprochement, to see a territory as a totality of experiences, activities, policies, etc.

Until recently and to some extent still today, policies have depended mainly on the actors and the territories. In an attempt to make improvements to the level of efficiency, the focus is changing towards more interaction. When we concentrate more on interaction, and on the systemic approximation and balance this will happen more easily. We can add that it is also important to stress the strong concentration of the demand side of things. Markets and consumers are better informed and more demanding in the true sense of the word. Farmers, too, are much better trained than before. Stronger relationships between cities and the country will have to develop, in which the so-called transfer functions will will play a relevant role. Different locations will have to specialise in specific services for the economy, the environment, culture, etc. However, we need to place them in a context of exchange. If one place specialises in economic and another one in environmental services, threshholds need to exist, and the rules of transference need to be clearly defined.

Another aspect of transcendence is sustainability. We need an intergenerational vision when it comes to social, environmental, economic, cultural and government issues. The most important factor for a permanent innovation is maybe education and training. Learning processes are currently organised in a ubiquitous, permanent and supranational structure.

INNOVATION PROCESSES

The culture of innovation is inherent in a knowledge-based society, and goes hand in hand with an increased creativity, education and training, mobility, and proactive abilities. It is also linked with a tendency to reward risk. This is an important cultural change. When there are many mechanisms in a society which work in favour of this principle, an example of which is not to punish failure, this represents an important cultural achievement for a society that usually does the opposite. We have a strong tendency to punish failure and this works against innovation.

To sum up the idea, innovation requires a state of mind that allows creativity to flow, and which promotes an enterprising spirit, a willingness to run risks, to accept social, geographical mobility, etc. When we talk about innovators, we ought not to do it only with respect to individuals, but also when referring to institutions, networks, etc. Innovation requires an ability to anticipate what will be needed, rigour within an organisation, the ability to comply with deadlines and the costs associated with them. While the idea of innovation seems almost crazy for most regular folk, people who work in innovation processes usually associate it with concepts of control, rigour, the building of a future, etc.

The foundations that allow innovation to occur are the use of adequate technology, with a focus on the use of this technology according to the requirements of the society, and, most importantly, that society as a whole accepts these technologies. The necessary resources need to be quantified and the costs must be acceptable. It also needs to create social, economic and cultural wealth. If it doesn't, we are left with islands of innovation, which make it difficult for the whole of society to make headway together.

AREAS IN NEED OF MAJOR INNOVATION

Among these areas it is important to mention the transition from sectorial policies to transverse policies. Most government departments, on a municipal, provincial and state level, but also groups of countries such as the EU, among others, traditionally work with sectorial policies. Their transition to transversal policies will be neither immediate nor easy. We need major innovation procedures.

However, it is necessary to maintain the logic of the sectorial strategies, which have their own specific purposes, instruments, etc. It would be too much of a simplification to combine everything in a singular department which is responsible for everything. The mechanisms for articulation, coordination, subsidiarity, joint action, loyalty, complicity and political integration in the different territorial contexts require innovation. An important factor is the instinctiveness with which we live through institutional crises in of competency issues. We create artificial situations which make life difficult for innovation. We require mechanisms and good practices in order to avoid institutional crises. We love to fight and win, but the winner-loser principle works against innovation.

The territories which are progressing are those who are using socially and territorially competition-based models. They display a number of smaller and larger connections which help improve efficiency. Many aspects need innovation, but we need to highlight the evolution of the transfer functions, integrated country-city services. It is important to

establish policies in the form of institutional and social mobilisation processes, and not as rigid frameworks, even if they are well planned. It is equally important to identify elements with a great potential impact and concentrate on those. If small changes can create mechanisms that in turn create positive or negative feedback, I will concentrate on those critical elements which are able to produce significant changes.

When designing public policies for the private sector, the public authorities need to encourage positive results and at the same time make sure that the public interest is served in the biggest possible way. A smooth coordination of the public administration is one the key elements for innovation. It is also important to mention that cooperation among companies is scarce or hardly inexistent. There is clear evidence that without mechanisms that enable businesses to cooperate, the territories cannot make progress and contribute to innovation. The incorporation of new technologies, the development of the tech markets is essential. They need to be created, technology must be bought and sold, which is a difficult but important task. We have to put our efforts into creating technology markets or otherwise we will find it difficult to obtain adequate technology.

A crucial innovation process is to be able to respond to the new challenges with respect to the environment, especially when it comes to climate change, providing adequate quantities of quality nutrition and ensuring animal well-being.

Internationalisation in all its dimensions is of great importance, linguistically, culturally, with respect to territories, mobility, alliances, businesses, and between the various public authorities. The establishment of an international factor is essential and requires innovation processes. The territorial rapprochement, the enterprising spirit, social responsibility are also areas that are in need of innovation. I would like to end this section by mentioning the development of new products and processes, diversification mechanisms and open-mindedness when it comes to new technology.

IDEAS ON INNOVATION

In this section we will refer to ideas which can help establish innovation processes.

We have to make an effort to add value to ideas. The linear concept of innovation which assumes that research and knowledge are linked with innovation is wrong. It has been shown that this alone is not enough. Businesses and civil society need to be the main engine of the innovation process. Even if there are ways to intervene and more interventions can be made, it is not at all convenient to oversize the public sector, which has its role to play but ought not to take on gigantic proportions.

However, it is also necessary to have faith in the public sector and its role as an arbitrary, in the guarantees it can give and especially in our culture, but we cannot give it too much importance either, especially when it comes to innovation. People have to feel comfortable when they participate, when they succeed but also when they fail. I believe that the public sector has too much weight, especially in the field of innovation.

Innovation has to help improve competition and become a practical application in the business context. The transfer and acquisition of know-how is sometimes becoming

very obscure. In order to create, first one has to understand the methods involved. The risk of making a mistake is big.

Companies are finding it difficult to incorporate technologies which do not form part of their traditional area of specialisation. There are lots of new technologies available in other areas which could be incorporated with sometimes only small and other times bigger adaptations, but companies are having a hard time to look in other areas because of a lack of confidence, obscure processes, and so on.

An important challenge for the rural world is improving its ability to attract researchers and technicians in areas that are interesting for it, to make them feel at home, give them a space to work in, do their research and come up ideas, so that know-how can develop and flourish at its maximum capacity.

A profound overhaul of the current innovation agents needs to take place, especially at the university level. We have created too many intermediaries in innovation which act with no real purpose. This is currently fashionable but in fact not very reasonable. We will have to submerge ourselves in this world of agents and take a good critical look. Intermediaries are extremely helpful when they are facilitators who fulfil their functions satisfactorily and work creatively, but they can also become an obstacle when they are too inflexible and their only worry is self-reservation, a situation for which numerous examples can be found.

Another important aspect in the context of innovation is the creation of a simplified administration. Administrators need easy, efficient, responsible, integrated acces to services and actions. Not only the implementation of the so-called e-administration is needed, but in fact a lot more. It is a question of work culture, which requires a focus on providing a genuine service, on facilitating, on offering guidance, and on promoting the creation of social capital, and a new idea of civic governmental institutions. The areas and territories which show the greatest progress are those which have been able to create social capital, networks in other words, who have established communication channels and given the citizens an active role, allowing collaboration between the state and the private sector.

It is important to define competencies and make commitments. What can be done, how far can a commitment go? The answer is, more than what is strictly necessary. I repeat, more than what is strictly necessary. We have made some headway with the service definitions in the public and private sector, but need to need to take further steps in this direction.

Those institutions which have a greater capacity to intervene are not the strongest ones, but those are which have a greater capacity to interact and establish relationships. Innovation requires know-how and creativity.

Technological development must not be a reason in itself. When we open ways into a new technology and it seems that the technology itself is in fact innovation, we must see that it really isn’t.

Indecision is counterproductive for innovation, and here the public administration has to accept its great responsibility. We cannot create environments where hesitation and

indecision rule. This doesn't mean risk can be eliminated, that probabilities shall no be weighed, but only that indetermination is not needed. We need to create stable environments, using stable in the sense of balanced, not rigid.

An atmosphere where the different parts complement each other, where subsidiarity exists, and where there is a willingness for collective commitment, active participation and I might add, complicity and loyalty, is what is needed. Innovation usually goes hand in hand with accumulation trajectories, which is not a great idea because it means slow and difficult trajectories.

It is important to move in spontaneous or planned environments where know-how can flow. This mechanism is very important, just like the synergies between territories and actors. We must try to be present with a plan in mind where know-how is generated.

The virtuous circle where know-how and inspiration flow is a particularly useful mechanism and we are not using it in a big and systematic way in the rural context. Innovation occurs simultaneously, is all-inclusive: Everything needs to be innovated and innovation itself is an accumulation of things.

It is important to learn from innovation processes in other sectors, to use methods which help generate ideas, a good example of which is lateral thinking. We must not forget that we must look for tangible results. Without them innovation cannot exist. The innovation processes must also be visible so that everybody can participate.

Proposals must not be idealised, self-criticism must have its place and things cannot just depend on a few individuals. One ought not to underestimate the complexity of the process. A society cannot just become innovative from one day to the next. There are obstacles it needs to overcome, and changes and modifications come at a high political price. They also cost dearly economically, socially, culturally, and so on. Not all innovation means to break with the past. Neither does all innovation need to be technological. Innovation can take place in a very subtle way. A change of focus can sometimes be enough, without the need to change a great deal of things.

Innovation based on products and services we know allows us to reduce the risk and increase the speed with which me might be able to assimilate the changes. To do what we know and to learn to do the things we need is the key. We need to look out constantly for small improvements and focus on people and know-how.

We need to look in an intelligent way and use methods with foresight, we need to build a different future but we need to anticipate things, making use of positive formalities while tempering the negative ones. This is particularly true for the future of the rural world, which is associated with lots of positive and negative formalities and bureaucracy. We should identify and quantify them, evaluate them with transfer functions, or otherwise society will not be able to believe in them or accept them.

It is necessary to help innovation with a number of factors, to look for excellency, coordination, shared leadership, commitment, transferability, and so on.

NEW TECHNOLOGIES AND THEIR ROLE IN THE INNOVATION PROCESSES

Innovation does not simply mean technological innovation, though a big part of innovation culture is based on technologies, with the help of which we have the possibility to make headway in innovation processes.

In the agroalimentary sector there are a number of technologies which condition the present situation, and this will be even more so in the future. In the following lines an overview of some of the most important technologies will be given. I would like to mention first of all the technology of supercritical fluids, which is allowing the development of a new generation of agroalimentary industries, which could be called "laboratory industries". Supercritical fluids are a new state of materials, which allow the extraction and modification of substances which exists only in minute quantities and which are of a certain interest,. In my opinion, this technology will play an important role and we should lay the groundworks for it and revise about industrial innovation patterns. Reactors, laboratory industries, high pressure and temperature and procedures which allow us to control them are other examples of important new technologies.

Nanotechnologies also need to be mentioned. They allow us to modify materials on another level, and enable us to control important physical and biological aspects with nano machines, nano products and nano processes.

Advances in Biotechnology, Genome Sciences, in biosensors, bioindicators, ionic interchangers, intelligent packaging, products which have undergone minimal processing, functional foods, and process reengineering are forcing us to rethink the major part of our industrial processes. Many of these things are already a reality, but they haven't yet been implemented in the agroindustrial sector in major way.

Highly sophisticated social technologies like multi-level governance, crisis management – not only on an institutional level, but also with respect to health problems or technological challenges exist in order to deal with crisis. When it comes to the local dimension of well-being, all the efforts which countries from the north of Europe have made have helped create an important theory of local well-being based on intelligent anticipatory vigilance, complex systems management and the assessment of formalities.

It is also important to highlight the great importance of the new paradigm of the new precision agriculture. The intelligent use of energy, the interaction of biotic and abiotic elements.

As for weather forecasting, we still need to go a long way, from the macro level to the meso level and all the way to the micro level. Decontamination methods and environmental management, water treatment methods, logistics and control elements, ergonomy, the interaction of man and machine in general requires a major effort. The same can be said for the integration of sensors with different temporal, spacial and spectral resolutions.

The ability to interoperate is a necessary tendency, and we should not generate information which cannot be used interoperatively. A good starting point would be the public administration, with systems which help in the decision-making process for example, with management issues and in the distribution of know-how.

Augmented reality and virtual reality also need to be mentioned. Automatic and artificial intelligence, robotics, universal hyperband, which will be a reality in the very near future as evidence seems to indicate. This summary is in no way exhaustive. Only some of the most relevant technologies for the rural world have been mentioned, which are essential for the and necessary in order to carry the necessary innovation processes.