

# Mechanisms facilitating agricultural innovation in France: the case of Mixed Technological Networks (Réseaux Mixtes Technologiques)

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## Abstract

In France innovation policy for agriculture and the agri-food sector is based on a close partnership between public bodies and farmers' professional organizations. The linear, top down model of innovation has worked efficiently after the second world war and up to the 1980s. It resulted in intensive agricultural systems and optimized food processes, providing cheap and safe food to the population. This model is no longer adapted to new challenges now facing agriculture and the food industry, which require more complex and inclusive approaches to innovation. The RMTs (Mixed Technological Networks) exemplify the kind of new tools that could be put into place in the frame of the new paradigm which is emerging nowadays in the field of innovation policy.

## Introduction

Innovation in the agriculture and agri-food sector is essential to its competitiveness and sustainability. Governments in Europe have had different approaches to fostering innovation, combining public and private intervention in various ways, depending on specific historical settings. This paper describes the situation in France. The main actors of innovation systems are presented in the first part. The second part of the paper explains why there is a need for a new paradigm for successful innovation policies. The last part describes a new tool for fostering innovation in agriculture and the agri-food sector, as an example of application of the new paradigm: the Mixed Technological Networks.

## The main actors of agricultural and agri-food innovation

In France agriculture and agri-food innovation has relied on a well organized set up of professional bodies interacting with public entities in charge of research. Agriculture chambers, which are a semi-public kind of organization (*établissements consulaires*) have played a crucial role in extending innovative technologies produced by research centers. They are active at local level (*Département*) and regional level (*Chambres régionales*). They have established an apex organization at national level, the Permanent Assembly of Agricultural Chambers (APCA in French). Co-operatives have also played a major role in fostering innovation in agriculture. But whereas agricultural chambers have a purely advisory role in all sectors of agricultural activities, co-operatives also take an active part in marketing the production of their members and in supplying them with agricultural inputs. Their mode of operation, although very specific, is close to the private sector.

Applied research centers or institutes (*Centres et Instituts Techniques*) in agriculture have been established jointly by the government and the profession. There are specific technical institutes devoted to the major agricultural commodities (one for cereals and forage, one for oil plants, one for beetroot, one for grape and wine production, one for pig production, one for poultry, and so on). There are presently 15 technical institutes in France co-funded by the government and the professional organizations pertaining to their specific commodities (*Interprofessions*). They tackle applied research questions through experiments and design technical and organizational solutions to farmer's problems. They convey their results either directly to farmers' organizations or through agricultural chambers and co-operatives. They also have established an apex body for co-ordination and for dealing with horizontal issues at national level, the Association for Agricultural Technical Co-ordination (ACTA in French).

In the field of agri-food applied research there is a similar set up of 17 Technical institutes co-funded by the government and the industry and dealing with specific branches of the agri-food sector (an institute for fats, one for canned food, one for milk products, institutes dealing with microbiological controls of food, and so on). Agri-food technical institutes also have established an apex organization, the Association for Technical Coordination of the Agri-food Sector (ACTIA in French). The agri-food technical institutes under ACTIA must deal with a very fragmented economic sector where small (often very small) and medium companies dominate.

APCA, ACTA, ACTIA are each endowed with a scientific committee which supervises and validates the scientific activities of their individual members which have themselves put into place their own independent scientific committees. The existence of the scientific committees is a condition to receiving government funding. The scientific committees of members are in close contact with the scientific committees of apex organizations to whom they report.

Last but not least, INRA (National Institute for Agricultural Research) has greatly contributed to the modernization of French agriculture after the second world war. Genetic improvement of crops and livestock, intensification of farming systems, food security and optimization of agri-food processes have been the major areas of contribution by INRA. With time INRA has asserted itself as a world class agricultural research organization, dealing with more and more fundamental issues pertaining not only to agriculture in a narrow sense but also to the environment and to food research. As a consequence INRA is often perceived as having distanced itself from agricultural production issues.

INRA is placed under the supervision (*tutelle*) of the Ministries of agriculture and research.

The combined efforts of INRA, the technical institutes of ACTA and ACTIA, of the agricultural chambers and the co-operatives is often referred to as the “chain of knowledge” leading to the improvement of productivity and efficiency at farm and company level. The numerous components of such a chain have put into place communications channels allowing exchanges of information on research needs to be tackled and of research results to be applied by farmers. This chain of knowledge has allowed the extension of “open” or “pre-competitive” innovation, whereas “competitive” innovation resulting from private research has been confined to bigger companies and has followed different channels.

## The need for a new model

The top down model of the chain of knowledge, by which fundamental research produces results that are applied to specific commodities by the technical centers and extended to farmers through the advisory services of agriculture chambers and co-operatives has worked for about three decades after the second world war. During this period CAP provided macroeconomic stability and a secure level of income to farmers, and all efforts were geared towards clear objectives validated by society as a whole: food security and safety, affordability of foodstuff by consumers. Modernization of agriculture lead to widespread rural exodus with farm labor progressively absorbed by industry in a context of sustained economic growth.

At the end of the 80s it appeared that the model could no longer fully deal with mounting issues and novel societal challenges. Agriculture was more and more perceived by the general public as a source of pollution and a threat to the environment (high level of nitrates in water tables, pollution by pesticides, loss of biodiversity). Emerging animal diseases threatened animal health at a new scale and in a new way (apparition of previously exotic pathogens) and called for new methods of “horizon scanning” to anticipate outbreaks. As a number of such emerging diseases are of a zoonotic nature (transmittable to humans) societal concerns grew high. Climate change and its mitigation imposed themselves through recent years as major challenges for agriculture and food systems. In rural areas farmers frequently became a minority in the population and agricultural practices were put under the scrutiny of non farm rural dwellers (noises, smells and ill designed agricultural buildings became the target of systematic complaints in many rural areas). In the mean time the de-regulation of the farm sector sanctioned by iterative reforms of the CAP and WTO requirements confronted the French and European agricultural sector to severe and direct international competition on world markets.

The chain of knowledge which served its purpose towards the intensification of agri-food systems by extending generic, “one-size-fits-all” innovation appeared at pains to generate systemic, multidisciplinary innovation and to integrate the points of view of all stakeholders interested in agriculture and food. However international disturbances on food markets all over the world induced a renewed realization that food security at world level and at national level was not a given fact. Agriculture once again captured the attention of the public and of decision makers, enhancing the political clout of farmers' organization.

## The Mixed Technological Networks

The necessary emergence of innovations that are adapted to the new challenges facing agriculture calls for revisiting the old paradigm of the knowledge chain. In order to tackle the growing complexity of problems and the growing diversity of possible solutions (“tailored made” innovation), it is important to realize that all stakeholders (including farmers, companies, civil society organizations) are sources of innovation, not only research. More than through a “chain” it is through networks that information and knowledge have to be exchanged and hybridized. Moreover, innovation in agriculture can have its sources in other sectors of activity and other disciplines, such as information and communication technologies, synthetic biology, transport and energy and others. Education and training organizations must be included in such networks as contributors and as relays towards a larger audience, especially the youth.

Taking stock of the necessity to change its agricultural innovation policy the French government created the Mixed Technological Networks (*Réseaux Mixtes Technologiques, RMT*) which were integrated in the Farm Bill (Loi d'Orientation Agricole) passed by the French Parliament on January 5<sup>th</sup>, 2006.

RMTs are established at national level. Each RMT deals with a specific topic (eg innovative cropping systems, development of organic farming, agriculture and biodiversity, livestock housing, labor in livestock systems) by mobilizing on a voluntary basis competent individuals and institutions willing to contribute to innovation. RMTs have a 3 to 5 years lifespan and must be composed of at least:

- 3 technical institutes or agriculture chambers
- one agriculture secondary school (there are about 200 public agricultural secondary schools in France)
- one agriculture university or research organization.

The average membership of RMTs currently reaches 20 organizations, sometimes more. They operate in an informal, independent way. Their membership is voluntary. It is required from members that they should devote enough time and resources to the operation of the RMTs. RMTs must submit their work program to the Ministry which approves them after taking the advice of the scientific committees of the apex organizations. Once approved, RMTs are given a basic allowance of 150, 000 € by the Ministry. In some cases the Ministry also provides resources for a specific initial project implemented by the RMTs.

There are currently 17 RMTs dealing with agriculture and forestry and 7 RMTs dealing with food issues. A complete list of RMTs and a short description of each of them can be found on the website of the Ministry : [www.agriculture.gouv.fr](http://www.agriculture.gouv.fr)

Each RMT has their own website.

It is still early to draw full lessons from the experience of the RMTs, as their mid term evaluation is to be completed in 2010 (the first RMTs were established in 2007). Nevertheless, it is widely recognized that the RMT approach has changed the way member organizations work, internally and with other members. Direct interaction between research, applied research, extension and education organizations allows that all dimensions of a given question are considered at once. The variety of outputs already produced by the RMTs is the sign of the multi-dimensional nature of their activity: technical handbooks, pedagogic material, databanks, inventories, expert work at national and European levels, scientific synthesis, literature reviews, student practicals, training sessions, workshops and seminars, response to research calls, observatories, establishment of experimental networks, software of various purposes.....

The informal characteristic of RMTs encourages relaxed, unconventional working relations between members who feel free to express their views without constantly referring to the position of their respective institutions. New partnerships are formed. The role of the RMT moderators is essential in the success of the networks.

## Conclusion

The mid term and final evaluation of the RMTs will measure their added value as compared to more traditional, linear and top down models of innovation in agriculture and agri-food.

RMTs are but one element of a wider reform of the research and development system in France. Such reform, called for by new emerging challenges facing agriculture and food systems in France is not yet fully completed. An unresolved issue pertains to the lack of combination between vertical, commodity approaches mainly geared to productivity gains on a given segment of production systems, and horizontal, multidisciplinary approaches encompassing the whole of farming systems or larger landscape units at territorial levels. Furthermore, the successful integration of farmers and other constituencies operating in rural areas as full contributors to innovation, will be a test for any new approach to innovation policy.