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**Engagement of Policy Makers in Agricultural Innovation
in Tunisia: Stories of Success and Failures**

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FARA serves as the technical arm of the African Union Commission (AUC) on matters concerning agricultural science, technology and innovation. FARA has provided a continental forum for stakeholders in AR4D to shape the vision and agenda for the sub-sector and to mobilise themselves to respond to key continent-wide development frameworks, notably the Comprehensive Africa Agriculture Development Programme (CAADP).

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Abstract

During the past decades Tunisian decision makers have adopted several technological innovations aiming to modernize a very fragile agricultural sector in order to increase its competitiveness towards the global market. All these innovations have been tested in the framework of several research and development projects in most of the Tunisian regions, some are, these days, considered by the scientific community as success stories, and some other as failures. This paper presents the story of five innovations through the eyes of the various officials who contributed to the implementation of these technologies.

Various studies have been conducted in Agricultural techniques innovation and policy making aiming at both examination of the farmers' acceptance of the techniques and their adoption in terms of both success and failure basics. However there has been little focus targeting the detailed "follow-up" of the introduced techniques by the government to understand the reasons of success and failures. The purpose of this research is mainly to investigate the implementation of improved agricultural techniques or, in other words, Agricultural Innovations (AI). Its aim is also to both explore and fully understand the AI initiations and answering different questions concerning the commitment of the Tunisian policy makers in Agriculture.

Keywords:

Innovation, Agriculture, Policy Making, Farmers, Success, Failure, Implementation, Tunisia.

Introduction

“Innovation is an interactive process between researchers, companies and governments resulting from the accumulation of practices and combination of knowledge created or acquired by the company” (S. Hadad, 2013). In this changing world context, innovation is considered to be an important and a vital strategy. That is, not only concerning challenges but also grasping the different opportunities achieving economic, social and environmental goals. Yet, many countries are still struggling with agricultural innovation arrangements and policies (Lawrence Klerkx, et.al., 2009). Especially considering the fact that researchers and policymakers operate under different demands, constraints and reward systems (Philip Gibbons et al., 2008). In fact, the central role of science and technology in development, recognized since the seminal writings of Solow but under-funded over the last decades, is regaining world attention. Although researchers and innovators bemoan the failure of society to use the scientific knowledge already available, decision makers at all levels, from farmers to extension agents to international negotiators, complain that they cannot get the knowledge they need to make judicious choices. This impasse is thought to have led to sub-optimal investment in research for development (Patti Kristjanson et. al., 2009). As a result many countries around the world are attempting to reform and evolve their agricultural innovation (AI) arrangements to develop flexible and responsive capacities. This is particularly urgent in developing countries as agriculture remains a central element of the economy especially that innovation is the key to the agricultural growth needed to reduce poverty (Lawrence Klerkx, Etal., 2009).

In this circumstance arises our study in the context of the Program of Accompanying Research for Agricultural Innovation (PARI) in Africa and India. In fact, the objective of this research is investigating the successes and failures of relevant innovative agricultural technologies (activities) which aim at the identification of the reasons for being brilliantly successful or not refereeing based on several carefully chosen products. The investigation, comparison, discussion and understanding of the success and failure stories based on the sample of activities defined later on in the current study will allow to definitely help the development of the program policy support.

However, before explaining our case study, let us define what is an innovation? According to Khanfir (2015) an innovation is a process of turning an idea or invention into goods or services that create value on the market, produced with a scalable industry. To be called an innovation, an idea must be replicable at an economical cost and must satisfy a specific need. Innovation involves deliberate application of information, imagination and initiative in deriving greater or different values from resources and includes all processes by which new ideas are generated and converted into useful products.

This study is supported by the Forum for Agricultural Research in Africa which is an organization that aims to bring together the major stakeholders in agricultural research in Africa.

Innovation processes and their importance in agricultural studies

According to Khanfir (2015) the innovation is an important driver of value creation, economic growth and social welfare. Innovation is also a social phenomenon which is driven and largely conditioned by public policies (S. Hadad, 2013). In Tunisia, innovation is recognized as a major concern of public policy since at least two decades, it is then common to find Innovation as rhetoric in political discourse concerning all sectors including agriculture.

Khanfir (2015) defines the National Innovation System (NIS) as a system including all the private and public institutions that contribute to the generation and commercialization of science and technology in a global value chain of Research, Development & Innovation. NIS aims to improve the innovation capability of the country through interactions between the actors and institutions in both business sector and academia, which includes enterprises, universities and government research institutes to better identify and exploit technologies, and to produce an enabling environment for knowledge dissemination and commercialization. The flows of technology and information among people, enterprises and institutions are the essential elements produced by NIS.

Concerning the agricultural sector, it is a domain with significant application of high technology and during the last century, exceptional advances in engineering knowledge have changed farming (E. Cavallo Et al., 2014). Science-based innovations have played a vital role in our society (Ruud Smits, 2002). Between 1950 and 1970, thousands of studies were conducted across the world which sought to explain why and how people came to adopt, or not, new agricultural technologies and practices (Cees Leeuwis, 2013). In fact, the establishment of innovative systems is the decisive factor of scientific and technical development of nations which aim joining the list of the world leaders. In addition, an innovative system is a system of institutions ensuring the continuous process of creation and materialization of knowledge and technology as a condition for formation of a postindustrial economy (Ivan Et al., 2014). Speaking of economy, a social science, economists devoted little attention to the factors which influence the rate and direction of innovation (David Et al., 1979).

It has been known for long that this segregation often leads to weak linkages between research and extension, which limits their ultimate impact. Moreover, the linear conceptualization of the innovation process tends to reduce innovation to technological innovation based on scientific experimentation only, while ignoring the hands-on learning by economic actors that is learning by doing, using and interacting. It is important for more sector-specific innovation policies, such as an agricultural innovation policy, to coordinate their actions with the national innovation policy and concentrate on the instruments that are sector-specific.

PARI sponsored a study on engagement of policymakers in agricultural innovations processes for PARI partners in Africa. For the Tunisian case study, 3 success and 2 failures were selected (see figure 1).



Successful Innovations

- The new improved wheat variety 'Maali'
- Organic olive oil
- Introducing Legume crops in the cereal rotations



Failed Innovations

- Labelling systems of animal products: case of "Tarentaise breed".
- Conservation Agriculture in Tunisia

Figure 1 Cases of success and failures in Tunisia

The report is organized as follows. Section 2 deals with the objectives of the study and the expected results. Section 3 summarizes the study methods, highlighting the questionnaire used as a survey instrument, the procedure of data collection and the method of analysis. Section 4 provides the results and discussion through the analysis of the success and failures of engagement of policy makers in Tunisian agriculture. Finally, section 5 gives the conclusion and policy implications.

Objectives of the study and expected results

In order to better understand the cases of success and failures in Tunisia, the INRAT socio-economic team has conducted several surveys with policy makers and public officials.

The major target of this report is to conduct different surveys in the specific following objectives:

- Identify and document brilliant success cases (and failure cases) of engagement of policymakers/authorities/officials in agricultural innovation processes (that took place in the last 4 to 10 years) in Tunisia;
- Investigate the different cases;
- Draw and document lessons about key success and failure factors of engagement of policy makers in agricultural innovation processes in Tunisia.

The expected results are the full understanding and identification of the frame that answers the following questions: To what level policymakers in Tunisia are committed? On what exact base the agricultural decisions, whether to support an innovation or not, are made?

To answer these questions, interviews were made with key partners from public institutions on each success/failure case to identify the major strengths and weaknesses related to each agricultural innovation.

Study methods

The major objective of this report is to conduct a survey with the main goal to understand agricultural innovation's success and failures in Tunisia. That is mainly based on the policy makers and their decisions as specified earlier. This will help to identify the weaknesses and strengths of the different decisions making an innovation successfully implemented or not.

The questionnaire (Survey Instrument)

The questionnaire was designed and developed by the socio-economic team in PARI and implemented on field by the National team. In fact, the final format included the following major topics:

1. Respondent Information (Name, Gender, Professional Profile, Contacts ...etc.)
2. Most significant agricultural innovations (Successful agricultural innovation cases, Non Successful agricultural innovation cases...etc).
3. Additional comments and suggestions (Appendix 1).

Sample and target group

The questionnaire was used to collect the data through *face-to-face interviews* targeting more than one institution with a great focus on the agricultural research and development system. The targeted institutions were: 1) The Tunisian Ministry of Agriculture, in particular the Technical Centre of Organic Agriculture CTAB and the Breeding and Grazing Office OEP, 2) The National Agronomic Research Institute of Tunis INRAT, 3) The Tunisian Union of Agriculture and Fisheries UTAP, and 4) The Inter-professional Group of Red Meat and Milk GIVLait.

The main used method was face to face interviews, but it was not the classic type of interview, the enumerator had a long and very rich conversation with the interviewed officers in order to better understand the real causes of failure and success for each innovation; namely the real cause behind the official story.

Data collection procedure

After setting the sample size and the agents who would be interviewed, INRAT socio economic team begun by fixing the meetings with all targeted officials in order to have a proper face to face interview, thus ensuring very good data quality. This long procedure had begun from October 2017 until March 2018. In fact, we started by reaching the most important profiles at

random in different agricultural institutions related to the carefully chosen success and failure stories. All of the interviews were face-to-face that is because of the great failure of getting some profiles to be able responding by phone and especially by emails. In fact, the interviewed profiles were distributed as the **figure 2** shows: the distribution of respondent by categories of organizations

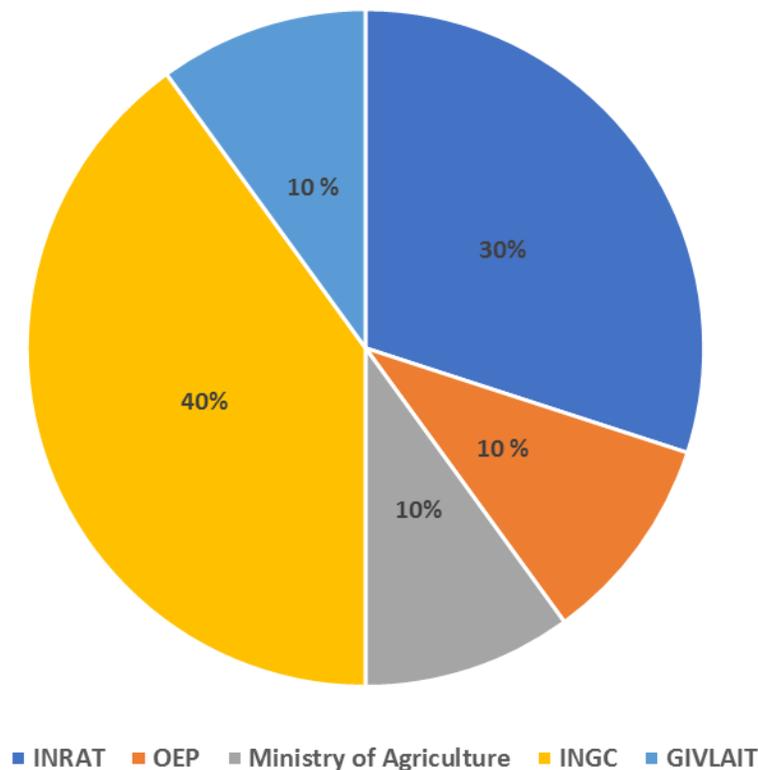


Figure 2 Respondents distribution according to the type of organization

In all, nine (9) respondents were interviewed for all the innovations identified. The distribution of the respondents according to the four innovations were: INGC (40%) INRAT (30%) Ministry of Agriculture (10%), OEP (10%) and GIVLAIT (10%).

Analysis method

The study was a rapid appraisal, which needed the collection of data using a semi-structured questionnaire. In fact, simple descriptive statistics were appropriate to apply and consider since the sample size is under 30 and, even though few econometric analyses were thought of they were not applicable. This is considered as one of the study limitations.

Distinguishing and choosing the most significant agricultural innovations

As mentioned earlier in the study; the choice of the innovations was based on being successful or non-successful mainly. The *HOW* depicting those innovations exactly was based on few different points:

- They have to be Well known in order to contact specific profiles and going even further to know more from interviewees suggesting other great failures and successes;
- To identify concrete aspects and proofs of whether it is a great failure or a great success;
- Existence of adoption proofs or not.

As aforementioned; there are 3 success stories and only 2 failure innovations stories. That is mainly because in some cases like the Rapeseed's production there was a shift based on concrete detailed information from a failure to a success story.

Introducing the context of the study gaining the interviewees trust, discussing the AI's process story and identifying the different factors affecting the engagement in agricultural innovation processes

Some of the interviewed profiles in the governmental institutions were not trusting releasing such information especially politically speaking. In fact, digging about policymakers in agricultural sector in Tunisia, the main thing that was clearly identified is that policy makers are categorized in two: Those who are directly involved and those who are indirectly involved. Another facet of categorizing them was important which was whether they were involved from the beginning or not taking a huge consideration of the timeline and its effect on the decisions made.

Investigating the Key factors of success and failure of the engagement of policy makers in AI processes

Key factors of success and failure of engagement of policy makers were determined thanks to the different points of views of the interviewed profiles. Success was defined as whether an innovation's process demonstrated to be successful or not. That is more specifically, adding value economically speaking, (or reducing costs and increasing production / performance). In other words, a well defended AI's process with concrete proofs being as closer as possible to reality and to future achievements is one of the main Key factors affecting whether the full devotion and engagement or not to a proposed AI's process program. It is all about the perception of the policy makers of the innovation's contributions to the livelihoods of farmers and to the well-being generally speaking.

Results and Discussion

In this section, success and failures of engagement of policymakers in agriculture related innovation processes in Tunisia will be presented.

Table 1: The chosen innovations

Successful innovations	Unsuccessful Innovations
<ol style="list-style-type: none"> 1. The new improved Drum Wheat variety named « <i>Maali</i> », 2. Organic olive oil, 3. Extending Legume and pulse crops area in cereal rotations. 	<ol style="list-style-type: none"> 1. Labelling systems of animal products 2. Conservation Agriculture in Tunisia.

Innovation Successes

The new cereal variety named « Maali »

Initiation of the innovation process

In Tunisia, Durum wheat is one of the most strategic crops due to its multiple uses and mainly because more than 1.5 million hectares a year are devoted to this crop, it has the same economic value as the olive sector in Tunisia. The cereals sector benefits from a wide range of subsidies aiming to improve this sector, a genetic improvement program has been put in place by the government since the 60’s in order to create new varieties with higher yields than the local ones used by the farmers. This national program involves all agricultural research institutes, in collaboration with its national and international partners, and its actions have led to the registration of several varieties in particular; Khiar in 1992, Nasr in 2004, and Maali in 2007. This latter has a higher average yield than the most used Wheat variety named “Karim” by 25%, alongside to its resistance to many fungal diseases.

The creation of the new variety started in 1992 in INRAT, and it was the initiative of researchers from the cereals development laboratory.

Implementation of the innovation process

The implementation of the innovation has started in 1992 due to the usual scientific constraints faced by wheat breeders because of the lack of advanced technological tools at this time. In fact the creation of any new wheat variety lasts at least 15 years. This innovation took place as an activity of the National Durum Wheat Breeding Program launched by the Ministry of Agriculture at that time in order to guarantee the production of a new variety to replace existing ones which showed a noticeable yields decrease after a relatively short period of use. All the steps needed to create “Mâali” were conducted by the manager of the Wheat Breeding Program at INRAT.

Concrete results of the innovation process

Therefore, In terms of contributions to the Mâali variety, an AI's process that was primarily the technical advice, concerning the concrete contributions they were mainly the choice of the crossings and the execution of the program. In fact, one of the main proofs of success was how largely accepted and appreciated by the final users who are actually the farmers. It has been proved that it was successful in terms of performance in the natural or real conditions.

The performances of the variety "Mâali" was evident. The average yield gap between adopters of Mâali variety and their neighbors was 765 kg/ha at Amdoun site and 731 kg/ha at Nebeur site in cropping season 2014/15.

Table 2 Mâali durum wheat yields by location for projects farmers and neighboring farmers in cropping season 2014/15

Maali variety	Frequency	Farmers adopting Maali variety		Neighbouring farmers	
		Average Yield (kg/ha)	Standard deviation	Average Yield (kg/ha)	Standard deviation
Amdoun site	20	2735	418.3	1970	194.9
Nebeur site	11	1867	541.2	1136	294.2

Source: EU-ICARDA-IFAD project

Factors that may have been decisive/most influential in the results of the innovation process

Regarding the key success factors and considering the policy makers engagement and commitment, according to the interviewed important profiles, the main factors that led to the full commitment of political decision makers were that they have personal interests in the process. According to the interviewed profiles the main factors leading decisions were policy makers not getting fully committed in the agricultural innovation process. What would have stopped this AI process from extension was the inability of the seed company to produce seed of the variety in sufficient quantity to meet the demand. Actually, all produced quantities are annually sold.

Level of engagement of policy makers in the innovation process

The level of engagement of the policy makers in promoting the Durum Wheat Variety "Mâali" can only be observed through a single institution; which is the National Institute of Field Crops (INGC). This latter was created in 2009 by a presidential decree in order to transfer the achievements of agricultural research to farmers (especially small-holders), and thus close the

gap between the research and agriculture in Tunisia. The chief engineer of the INGC in collaboration with INRAT organized field days for the farmers in order to show the experiment in real time on some experimental plots which have been done in collaboration with volunteer farmers, in order to persuade as many farmers as possible to adapt this innovation, in the best possible conditions.

The policy makers at the Ministry level i.e. the General Direction of Agricultural Production (DGPA); focus more on the organization of the cereal sector and the development of the seed production levels without preferring one improved variety to another, due to the country's improved seeds deficit. All the available varieties have to be produced with maximum quotas and not only according to the preferences of Tunisian cereal farmers.

Process of engagement of the policy makers in the innovation process

The Tunisian Government has spared no effort in the promotion and organization of the seed sector, thus a new regulating sector has been created with a more appropriate legal framework than the previous one. It adopts new texts and procedures allowing it to play an important role in the modernization of Tunisian agriculture in accordance with all international treaties signed by the Government. This new law protects intellectual property, i.e the breeders and years of research are now protected from all kinds of robberies especially from the international firms. In this very specific context, the Ministry of Agriculture has decided to increase the sale prices of improved seeds by 3%. This increase is only valid for seeds marketed through exploitation contracts such as "Mâali", "Nasr" and "Hidra"...etc. the benefits of this increase are attributed to the National Institute of Agronomic research in Tunisia (INRAT). It is a recent method that requires all stakeholders to make greater efforts to try to promote the recent and yet very productive varieties, tolerant to certain diseases, drought and that can respond to the intensification in terms of added-value.

Organic Olive oil in Tunisia

In Tunisia olive growing is a particular sector in more than one way. In fact, for thousands of years, olive oil has been important in all the great civilizations that flourished in Tunisia. The olive tree was cultivated by Phoenicians, Greeks, Carthaginians, Romans and Arabs, in a tradition handed down from father to son. The Phoenicians were the first to introduce olive farming in North Africa, the other Mediterranean civilizations of the classical world continued to expand it. During the Carthaginian period, the farming of olives spread by granting several advantages to the farmers. The Romans continued this expansion by installing intensified irrigation and olive oil extraction techniques. The collection of archaeological and ethnographic objects certifies the importance of olive oil.

Olive production is an important economic sector in many rural areas of the Mediterranean area (José Felipe et al., 2017). In fact, the olive tree (*Olea europaea* L.) is the most important cultivated crop in the Mediterranean basin and the olive oil sector has a remarkable economical importance in this region (Killi and Kavdir, 2013). In fact, during the last decade, olive oil consumption has experienced a major breakthrough in the world, not only in producing countries but also among those who are not. Undoubtedly, this growth in consumption is a consequence of the

consolidation of a cultural phenomenon established between the main producing countries (Spain, Italy and Greece), owing the so-called Mediterranean diet (José Felipe Et al., 2017).

Initiation of the innovation process

Tunisia is the first country in Africa to have established a legal framework specific to organic farming, starting in 1999. With 140 000 hectares of agricultural area in biologic farming, it ranks 5th in Africa and 40th worldwide. The number of Bio certified operators was around 3300 in 2014. Exports of Tunisian organic products registered a trend up sharply since 2004.

Concerning how it was initially produced, biologic olive oil was successful as an innovative plantation, due to multiple factors. They are mainly related to decision policy makers' commitment and full devotion. According to the interviewed profiles, the introduction of organic farming was initiated by the former Tunisian President as he was very attentive to health issues, but also it was expanded due to the farmers' great ambition in the early 90's and their beliefs in the success of the *"bio products"*.

Therefore, the private sector and specific producers are considered as the spark that turned biologic olive oil into a very successful product. As described by interviewed profiles: *"Entrepreneurs trusted in the Bio production and made it concrete before the Government did"*.

Implementation of the innovation process

After its initiation, the technical centre of organic agriculture was established at the Ministry Of Agriculture in Tunis (MOA) in the late 90's. In fact, almost all of the questioned profiles admitted that the organic olive oil was successful because of how it derived from its extensive culture adopted by farmers for years. Also, one of the main influencing context's conditions was again the farmers themselves. Being aware of the organic olive oil as an innovative product and targeting a better profit, they fully and confidently opted for the change. In fact, both of farmers' awareness targeting a better profit and the technical centre of Organic Agriculture's definition of steps for granting the certificate of conformity to biologic olive oil made the organic olive oil success become exponential.

The technical centre of organic agriculture (CTAB) defines the steps for granting the certificate of conformity to biologic olive oil as follows:

- Application form

The operator makes a request to one or more organizations of control and certification while identifying its exploitation (surface, speculation, treatment)

- Study of the files and estimate

The organization reviews the request and sends an estimate of the inspector's fees to the operator.

- Confirmation and commitment

Following the approval of specifications, a commitment in writing will be established with the control and certification body to comply with the regulations of organic farming (specifications).

▪ Regular Visits / Reports of visits

The inspection and certification body have to make at least one announced inspection visit and one unannounced inspection visit per year. An inspection report is drawn up after each visit.

▪ Decision of the Certification Committee

Inspection reports will be forwarded to the certification committee of the organization. In case of compliance with the rules of organic farming, a certificate of conformity is established and sent to the operator. This is combined with multiple financial incentives for the bio agriculture sector and logo of Bio Tunisian Products:

- Grant of the logo of Tunisian Bio products;
- Withdraw the request from the CTAB or the APIA;
- Deposit of the application accompanied by the certificate of conformity issued by the Ministry of trade to the CTAB;
- Order of the Minister of Agriculture granting the logo of organic products;
- Control of the use of the logo by the ministry of trade.

Concrete results of the innovation process

Concerning concrete results, *“Even though at the national level its consumption is still very low, 30% of the olive oil production nowadays is organic”*, an interviewed important profile stated. First of all, one of the main concrete results is the increase of the areas of organic olive trees thus increasing the organic olive oil production. In fact, even though, as described by a specific interviewed profile : *“The farmers run to us wanting to switch to organic olive plantation thinking it is nothing but a procedure and a paper work. And that is of course our job as a department to grant the certification for ONLY those who deserve it and match all the requirements”*. In fact, specific incentives for the organic farming sector are presented in the following table (Table 3).

Table 3 Incentives for the organic farming sector

	Types of Incentives	Responsible agency
A	50% subsidy on the cost of equipment and tools specific to organic farming with a ceiling of 500 TND.	Agency for the Promotion of Agricultural Investments (APIA).

B	50% subsidy on materials and equipment specific to the production of compost and recovery of organic waste.	APIA
C	70% subsidy on cost of control and certification for organic farming for 5 years with a ceiling of 5 thousand TND for individuals and 10 thousand TND for groups.	Regional Commission for Agricultural Development (CRDA)
D	Exemption of customs duties and VAT on certain inputs specific to organic farming.	Technical centre of Organic Agriculture (CTAB)
E	50% subsidy for analysis, registration and testing of inputs specific to organic farming	CPPQAP

Factors that may have been decisive/most influential in the results of the innovation process

This initiative succeeded thanks to both the full devotion of farmers targeting a better living and an effective engagement of policy makers. In fact, the organic farming sector development projects were among the most influential factors of success. First, the development project of the 20 sectors of the organic farming that aimed at the development of the bio farming's sectors through several actions:

- The development of organic production;
- The creation of environmental preservation incentives for organic farms;
- The creation of specific incentives according to the sectors;
- The creation of central bio products;
- Integration of products and biologic exploitation in regional Eco-tourism circuits;
- The establishment of an annual training plan for operators.

Second, the creation of 5 Bio territories (Figure 3) which aimed at the creation of 5 pilot areas specializing in organic agriculture representing different bio-climatic stages as a tool for regional development integrated in synergy with other components of the local economy, environmental, Eco-tourism and social-cultural.

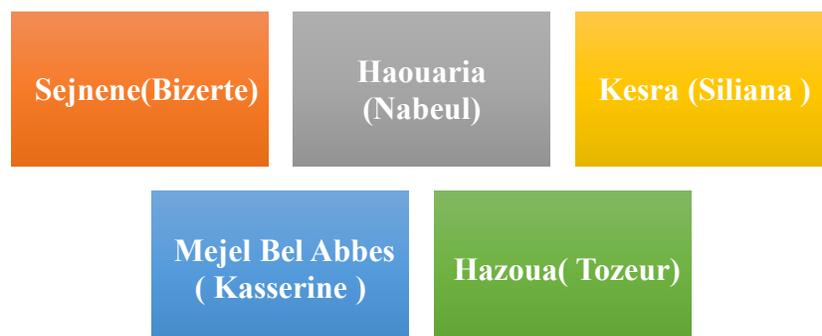


Figure 3 The five pilot areas specializing in organic agriculture

Level of engagement of policy makers in the innovation process

The policy makers engaged in organic olive oil as an innovation process were mainly motivated by the mandate of their institution: The ministry of agriculture. According to the head of the department of organic production, the attempt of innovation will enhance farmers revenues as key factors driving the engagement in the innovation process.

The engagement of policy makers for this innovation was at different levels:

- First, the information program that aims to ensure the dissemination of useful information to the various stakeholders in the sector with the organization of regional events (information days, seminars...) elaborated by the biologic directory in the ministry of agriculture;
- Second, a training program or what is called also the *annual national training plan* for operators in organic farming which aims providing training adapted to the needs of operators throughout the value chain;
- Third, an encored program where the central and regional services of the DGAB offer technical support to the operators. Actually, this program includes technical visits, organized visits, pilot projects and experimentation;
- Fourth, a promotion program for organic products which concerns mainly the organization of promotional events and the participation in national and international fairs in relation with the bio farming;
- Fifth and finally, a program of financial incentives in bio Farming. In fact, the Government offers financial incentives to encourage the implementation of organic farming projects. The CTAB works in partnership with the Public and Private sectors to set up new incentives according to the specificity and the need of the sectors.

Process of engagement of the policy makers in the innovation process

The process of engagement of the policy makers in the innovation process is concertized through the general direction of organic agriculture and divisions of the Bio Agriculture. In fact, the decree N° 2010-6250 of April, 5th 2010, amending and supplementing the decree N°. 2001-420 of February, 13th 2001, on the organization of the Ministry of Agriculture mirrored the setting of the following missions:

- Develop strategies and operational concepts for the development of organic farming;
- Prepare the development plans of organic farming;

- Execute the development plans and develop the sectors and contractual relations;
- Support projects and investments in the sector and ensure their follow-up;
- Ensure the permanent secretariat of the national commission of organic agriculture;
- To ensure international cooperation and to represent the ministry to the organizations and international organizations concerned. In addition, even at the level of the regional commissariats for agricultural development, the Decree n° 2010-2013 of August 16th, 2010, completing the decrees bearing specific organization of the regional commissariats for agricultural development.

Rapeseed crop

Initiation of the innovation process

The innovation process started in 2014-2015. In fact, the integration of the researchers and the interviewed profiles were mainly through the Ministry of Agriculture in Tunisia since June 2014. But, it should be noted that the rape crop had started in Tunisia in the 90's in an area of 2200 hectares and then it stopped during 13 years.

Rape crop is a plant with yellow flowers grown for the production of edible oil, rich in essential fatty acids and omega 3 and 6. The rapeseed flowers also produce abundant nectar from which bees make honey. The researchers at the National Agronomic Research Institute of Tunis (INRAT) affirmed that rape farming was a success for more than one reason. It was about a steering committee for recovery where INRAT was a member. The innovation process was initiated and carried by the government of Tunisia, a project that is a part of a partnership bringing together:

- The know-how and skills of the group AVRIL and its subsidiaries CRISTAL TUNISIE, LESIEUR, LESIEUR CRISTAL and SANDERS TUNISIE in terms of structuring and development of agro-industrial sectors;
- The recognized expertise in the fields of production, processing and organization of agricultural sectors AGROPOL, inter-professional body for promotion and international cooperation of the French vegetable oils and proteins and TERRES INOVIA, a technical institute of professionals of the sector.

The valorization of the first harvests is ensured by the following industrial partners:

- The group CARTHAGE GRAINS, the only grinder in Tunisia, ensures the valorization of seeds in oil and cake;
- Refining is provided by a Tunisian refiner;

- CRISTAL TUNISIE ensures the conditioning and the marketing of the refined oil under the brand LESIEUR;
- SANDERS TUNISIE ensures for its part the valorization and commercialization of rapeseed cake for animal feed of Tunisian livestock.

Implementation of the innovation process

The implementation of this crop started in 2014; it was initially articulated around the establishment of an upstream chain that brought together more than 100 farmers growing more than 3000 hectares. In fact both of the development and structuring of this sector, which is an organized chain of processes from upstream to downstream, provides these farmers with outlets covering all the links in the value chain, from the field to the bottle. The department manager and industrial crops at the Ministry of Agriculture, stressed the importance of this agricultural activity in the crop rotation. "A national commission is currently providing field trips and organizing information days to promote rapeseed to farmers," he said.

Concrete results of the innovation process

One of the main concrete results is that the project allowed Tunisia, a major consumer of vegetable oils, to launch the production on its soil of rapeseed oil, while the demand of Tunisian consumers for this oil known for its nutritional benefits is growing. In fact, in one year, the area sown has almost tripled from 470 hectares in 2015 to 1390 hectares in 2018. Established mainly in the cereal production areas of Bizerte, Beja, Kef, Manouba, Zaghouan and Nabeul, they are expected to know a wider expansion in the future. It was, actually, one of the objectives set by the Ministry of Agriculture which is to reach a total area of 4000 hectares, an increase of 750%, over the last two years, as confirmed by the general manager, Carthage Grains, specialized in the field.

Rapeseed has many agronomic, nutritional and other benefits. This crop can indeed break the cycle of cereal diseases. In addition, wheat crop rotation on rape can reduce wheat production costs and increase yields by at least 20%. Another concrete result concerned the promotion of the rape cultivation in Tunisia and its expansion. It was highly encouraged by Carthage Grains, an industrial company operating in the agri-food sector and specialized in the crushing of oilseeds such as soybean or rapeseed. In addition to providing and financing seed and associated herbicides, it provided farmers with the appropriate know-how and support and undertakes to buy the harvests obtained at an extremely attractive price determined in advance. The "trituration" of rape seeds allows extracting mainly protein rich meal, used for animal feed. But also, vegetable oil, rich in vitamins and Omega 3 and 6, used in food in the production of biodiesel. The development of this sector will certainly create direct and indirect jobs. On the other hand, and at the agronomic level, this crop, if integrated in a rotation system with wheat (wheat-wheat-rapeseed), would improve cereal yields. Rapeseed cakes made in Tunisia would minimize feedstock for cattle and increase milk yield. It is mainly these arguments that prompted the Tunisian Ministry of Agriculture to introduce this culture into the country.

Factors that may have been decisive/most influential in the results of the innovation process

Several factors contributed to the success of this innovation, some of them are purely technical while other are related to some socio-economic aspects, others are related directly to the goodwill of policy makers since oil is one of the most important foods in Tunisia.

Table 4 Some decisive factors contributing in the success of the rapeseed crop in Tunisia

Technical reasons	Socio economic reasons	Political reasons
Rape seeds are genetically modified by the international firm AVRIL. The impact of these seeds on biodiversity and human health does not seem to worry the ministry The water requirements of this crop are relatively low. It requires between 300 and 600 mm/year. This means that this crop could be rainfed, but the fluctuation of rainfall will certainly push farmers to irrigate rapeseed fields and to mobilize already scarce water resources.	The rape crop requires a lot of inputs, and only modern farmers with the necessary resources would be able to grow it. Once again, small farmers, however numerous, would be excluded from this new speculation. And this is not a big problem because if the small holders will notice that this crop is more profitable than the standard ones, they will eventually adopt it.	The state support for the rapeseed sector: if the ministry decides to support this sector (whether for production or processing), we will be able to witness a remarkable development of rapeseed areas at the expense of cereals. Thus, the impact on our food security and trade balance will be catastrophic.

Level of engagement of policy makers in the innovation process

Concerning the important profiles and the specific persons that contributed to the success of the rapeseed crop as an AI, few specific people were mentioned. In fact, the special contributions were mainly engaging Agricultural Engineers promoting the rapeseed crop as a more adapted and profitable speculation than other classic crops. The farmers and the company have to sign a contract stipulating that the company must provide all the necessary inputs for this crop in return farmers must apply all the instructions made by the agents of Carthage Grain, all production is the property of this group.

The level of commitment in this sector goes beyond the one between the farmers and the company. In fact almost all policy makers that are related to the development of this sector have a various level of commitment in order to support this innovation, starting from the top; Minister of Agriculture, the Minister of Industry and trade, the representatives of the AVRIL Group, represented by the Chairman and the Deputy Chief Executive Officer. The next level of commitment is represented by the subcontractors of the AVRIL Group in the Tunisian market which are CRISTAL TUNISIE and LESIEUR respectively the leaders in the markets of oils and table and condiments in France and Tunisia. In the lower levels, three private companies are in direct relation with the farmers; Carthage Grain, Cristal Tunisia and Sanders Tunisia.

Process of engagement of the policy makers in the innovation process

The total commitment of policy makers, in the case of rapeseed, is not only due to the multiple benefits of this type of crop especially for the soil rotation and crop diversification, but it is mainly caused by the increasing demands by the local population for vegetable oil, in order to compensate the amount of vegetable oil imported each year in Tunisia causing an increase in the defiance of the National Trade Balance.

The main cause of the introduction of rapeseed crop in Tunisia is a part of national strategic plan to achieve self-sufficiency in staple foods. And this explains the strong commitment of the different political decision-makers and especially the involvement of the private sector. However, this means increasing the area planted with rapeseed each agricultural season, i.e. a significant increase in the number of farmers who will adopt this technological innovation. In addition of that, the byproducts produced by rapeseed processing can be used by the fodder production companies, and this will increase the level of commitment of Tunisian authorities. In order to guarantee the success of this innovation, the decision makers reduced considerably the level of paperwork necessary for all the involved stakeholders in this sector.

Failed Innovations

Labeling systems of animal products: case of "Tarentaise"

Initiation of the innovation process

The initiation of the innovation process began with the initiative of the Interprofessional Group of Red Meat and Milk GIVLAIT. This initiative was in order to develop the quality signs for red meat in Tunisia. It was part of the project to strengthen agricultural support services "Quality Improvement and Capacity Building of Interprofessional Groups" co-financed by the World Bank in 2006. Two signs of quality have been proposed by the GIVLAIT, one for the beef for the Tarentaise cattle and one for the sheep meat of the Black race of Thibar. In our example, we will treat the case of quality sign of Tarentaise Bovine meat.

Why a sign of quality for the Tarentaise breed?

The Tarentaise breed has been introduced in Tunisia since the colonial era. Its introduction was aimed at improving a generally poor cattle population in order to obtain better yields, whether in milk or meat. In 1993, a private breeder took over the imports of Tarentaise animals and tested bull seeds. In fact, the Tarentaise breed is known for the quality of meat produced from bulls which can reach at 18 months a weight of the order of 550-600 kg with a carcass yield of about 57%.

Through the project of the World Bank and thanks to its financing, the GIVLAIT conducted a feasibility study on the possibility of establishing a quality sign for bull meat of Tarentaise origin and marketed it in Tunisia in 2006.

Implementation of the innovation process

This development program was the result of an agreement that took place between the Tunisian Group of Breeders of the Tarentaise (GERT), and the Union of Cooperative Breeding Rhône Alpes (UCEAR) on the other hand, under the Aegis of the Tunisian Minister of Agriculture and the French Minister of Agriculture during the visit of the latter in December 2006.

Because of the first positive results, both Tunisian and French parties had decided to start this research and development program on Tunisia which appeared particularly suitable for the development of milk and meat production among small and medium-sized livestock farmers.

In fact, the managers of this program were both the GERT and the UCEAR, and it was supported by institutional and technical partners such as: the Tunisian Union for Agriculture and Fisheries (UTAP), the Office of Livestock and Pasture (OEP), the Sylvo-Pastoral Development Office of the North West (ODESYPARNO), the Agency for the Promotion of Employment and Housing (APEL), the National School of Veterinary Medicine of Sidi-Thabet (ENMVT), the Higher School of Agriculture of Mateur (ESA Mateur) for the Tunisian part; and the Tarentaise UPRA, the Savoyard Breeders' Co-operative (COPELSA), the Rhône-Alpes Region and the French Livestock Institute.

Development Strategy of the Tarentaise meat label

The "development program" of the Tarentaise breed in Tunisia, named after the cooperation project, had five components in this case:

- Up-scaling the innovation by artificial insemination of Tarentaise bulls with the technical assistance of OEP,
- The establishment of a national program for the multiplication of heifers of the Tarentaise breed,
- Evaluating the Tarentaise product for its fattening and milk production qualities through the creation of specialized fattening farms,
- Support the GERT and provide technical and economic support to the breeders.

In December 2007, a feasibility study of quality sign and the origin of Tarentaise cattle was published. This study fixes all detailed actions to be done for each institution. In fact, this study was the result of a team work that involved 63 Tunisian experts and 10 foreign ones.

This study lead to the proposal of a methodological guide for the implementation of a quality approach "bull meat of Tarentaise origin", proposed in the following table.

Table 5 Steps for the implementation of a collective brand “bull meat of Tarentaise origin”

Steps	Concerned actors	How to do ?
Constitution of the quality group and its	All the actors motivated by the process	-Consultation initiative, meetings initiated by GERT and GIVLAIT. -Legal layout, deposit of the group's statutes

monitoring and
surveillance committee

The choice of the
product's name

Quality Group

- Outsourced Quality Group
- Name Search Deposit of the collective mark

Study tour in France of
the operators of the
quality approach in
construction

Quality Group
GIVLAIT

- In-depth study of a quality meat approach in France
- The understanding of the organization of each step
- Consolidation of the collective dynamics between Tunisian concerned partners and exchanges for the construction of the Tunisian approach

Estimated cost: €
23,000

Consultation and
drafting of the
specifications

Quality Group
with the
contribution of
external expertise
(Institute of
Livestock) and
consultation of
the monitoring
and surveillance
committee

- Drafting of a CDC project by an external expert
- Meeting and deliberation within the Quality Group, led by the external expert
- Finalization of the CDC by the external expert

Estimated cost: €
11,000

Elaboration of the
procedures booklet

Quality Group
with the
contribution of
external expertise
and consultation
of the monitoring
and surveillance
committee

Specific information
system (software +
database) for
monitoring and
management of the
brand (operation of
authorizations,

Specialized
developer

approval of carcasses,
etc.)

Estimated cost: €
20,00000 €

Recruitment of necessary human resources	GERT	-Find public funding to ensure these recruitment and finance these positions plus means of travel and communication during the first years of the process
Production technician	Quality Group	-Recruitment
GERT		
Leader Grouping		
Quality		
Inventory and organization of the offer	GERT	-Communication with producers -Qualification of producers -Linking producers with each other and with the slaughterers
Animation and organization of the marketing	Quality Group	-Communication with the operators of the sector -Qualification of the operators -Linkage of fellers and distributors -Qualification of "accreditation" agents for animals and carcasses
Organization of the traceability of animals and meat within the brand	Quality Group	-Generalization of animal identification in the quality and Traceability information system
Communication/ Promotion	Quality Grouping, with consultation of the monitoring and surveillance committee	-Point-of-sale advertising equipment to equip points of sale (door panels vignette, info-price panel, sign, price spades, posters, etc.) -Country of communication with consumers
Estimated cost: 25 000 € + 600 € / point of sale		
Launch of the approach in points of sale	Quality Grouping	-Technicians
Quality Group		
Technical assistance for the implementation of the quality approach, the first two years of the operation	OE GIVLAIT GERT	Training, supervision, remote support

Estimated cost: €
27,000 / year

Animal approval	OE GIVLAIT GERT	Technicians participation of OEP and GIVLAIT
Carcasses approval	DGSV Quality Group	Participation of attendants veterinarians in the abattoir of the DGSV
Functioning of the information system Estimated cost: 20 000 € / year	All the operators concerned by the Grouping quality brand	
Internal control of the proper functioning of the approach. Estimated cost: € 0.05 / kg carcass GERT	GERT Quality Grouping	-Quality group Development of a control plan - Qualification of the control agents -Supervision of controls
External control GIVLAIT	GIVLAIT	

Concrete results of the innovation process

The innovation process suffered from a failure and an interruption following the refusal of the World Bank to grant a second funding to GIVLAIT for a second phase of the development program of the Tarentaise breed in Tunisia.

In the absence of this funding, the majority of the developed actions in the feasibility study were not done. GERT has tried to advance in the development program of the Tarentaise cattle with the technical support of GIVLAIT. In 2012, GERT obtained funding from the French Development Agency (AFD) as part of the project "Support to the emergence of a new model of agricultural development" but the project's theme did not coincide with the promotion of the quality sign of Tarentaise meat.

Therefore, the achievements in this program are low. The sign of quality is registered at the INNORPI (institute of standardization) but in reality the Tarentaise meat is rarely sold in labeled product since the two sales experiences of this meat, at the level of a retail brand "Monoprix" or a specialized butcher, failed. Another achievement which is the development of specifications is existent but it is rarely respected.

The failure factors of this innovation are mainly due to a poorly organized value chain, and there is no clear support to this sector, the main factors to this malfunction are:

- In the absence of a competitive selling price, the farmer is obliged not to respect the age at sale and the carcass weight mentioned in the quality charter. In this case, Tarentaise meat can be sold in the traditional circuit.
- The limited supply of Tarentaise meat is a significant threat insofar as it is translated by a low bargaining power with butchers and, above all, it poses a problem if it is to guarantee a regular flow of sufficient numbers of carcasses with a big distribution.
- The slaughterhouses do not generally meet the requirements of hygiene and do not respect animal welfare. Cattle are stressed before slaughter, which can influence the quality of the meat. In addition, in most cases the carcasses are not identified and the traceability is not respected. On the other hand, there are also transport vehicles that are not refrigerated when transporting carcasses to points of sale.
- The butchers refuse to ripen and categorize the meat. In addition these butchers make their purchase looking for the best carcass yield rather than the quality of the meat.

The GERT currently has about 100 members with an average of 13 dairy cows and provides support, supervision and technical monitoring while enhancing their products. GERT collaborates with various national partners (OEP, ODESYPANO and GIVLait) and foreign partners (AFD, Union of Rhône-Alpes Cooperatives in France) in various projects for:

- The development of the Tarentaise breed in numbers and quality (genetics)
- Dairy performance control, within the framework of public-private partnership
- Implementation of the quality approach of red meat of Tarentaise origin (organization of the meat sector, traceability with labeling).

The marketing of Tarentaise meat remains the major handicap to the development of this specific sector. The objective of the members of the GERT for the next step is to create in parallel a Mutual Agricultural Service Company (SMSA) to market their productions and better value the quality of the Tarentaise beef, which is being certified under trademarks registered at INNORPI: TARENTY, BLEDEY and ROYAL TARENTAIS.

Factors that may have been decisive/most influential in the results of the innovation process

- The factors that would have been decisive for the failure of the innovation process are the following:
 - The lack of funding remains the main factor of failure, especially after the feasibility study and the division of roles between the various stakeholders in the red meat sector
 - The quality of red meat is not the priority of the Government, especially since the problem of this sector remains linked to production and the current strategy is based on the increase in the number of cattle, the fight against illegal trafficking and the decreased import.
 - The success of the development program of the Tarentaise breed goes through the realization of several restructuring in the red meat sector. Nevertheless, the reforms are time-consuming and involve several officials from several ministries. The example of livestock market control is a typical example of the difficulty of controlling marketing channels as municipalities, the Ministry of Defense, the Ministry of Agriculture, the Ministry of Commerce, the Ministry of

Health are involved in the operation of these markets. Bad governance has also been a source of blockage, putting the sector in a situation of chronic fragility.

Level of engagement of policy makers in the innovation process

The level of commitment of policy makers was different before and after the project "Quality Improvement and Capacity Building of Inter-professional Groups". At the time of the feasibility study, the level of commitment of decision makers was high. This implies the collaboration of numerous public institutions in several Governorates which are; Jendouba, Beja, Siliana, Nabeul, and Bizerte. In fact, each institution has devoted a large part of its human resources to the disposal of this project:

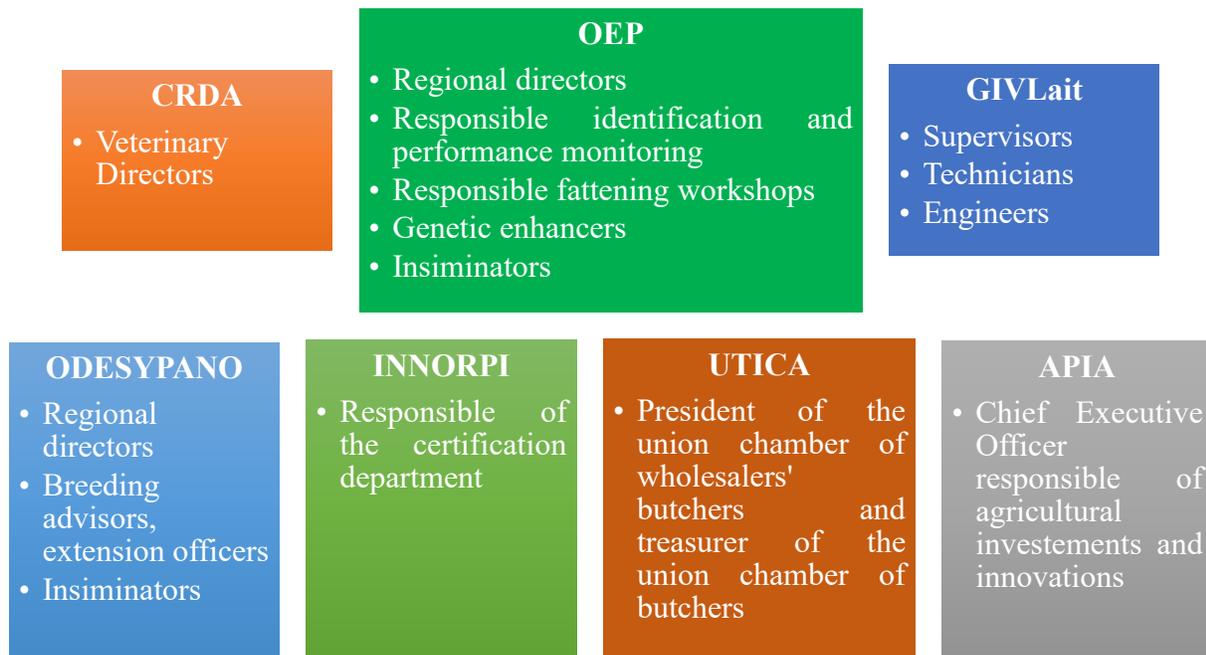


Figure 4 The resources mobilized by the different partners of the project

After the completion of the "Quality Improvement and Capacity Building of Inter-professional Groups" project in 2008, the level of engagement of the various stakeholders has fallen considerably leaving only the GIVLait in charge of a project without any national or international funding.

Process of engagement of the policy makers in the innovation process

The process of engaging political decision-makers in the development program of the Tarentaise breed was different depending on the project period. The commitment of the various managers (director, deputy director, engineer, technician, etc.) was total at the beginning of the process until the development of the road-map (approach to be followed). But it turned weak when the project was not renewed. The political commitment comes from several officials from different ministries, which hinders the continuation of the innovation process. The process of commitment

of decision-makers has rarely been illustrated in the development program of the Tarentaise breed: derogation from importation or technical support.

Conservation Agriculture (CA)

Food production must increase to meet the needs of a growing population with minimum impacts on the environment. A consensus emerges that this requires the sustainable intensification of agriculture where conservation agriculture (CA) has been highlighted as a key component of sustainable agricultural intensification. CA principles are universally applicable to all agricultural landscapes and land uses with locally adapted practices. Moreover CA opens multiples options for integration of production sectors, such as crop-livestock integration and the integration of trees and pastures into cultivated landscapes.

CA is an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. Conservation agriculture (CA) is based on three principles:

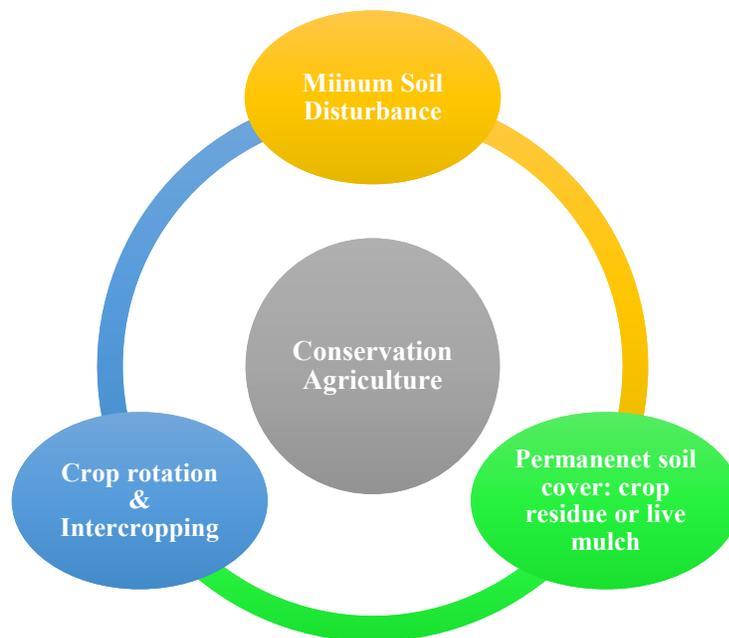


Figure 5 Conservation agriculture principles

CA is widely promoted for reducing soil degradation and improving agricultural sustainability. It is also adopted to mitigate climate change through soil carbon sequestration. CA enhances biodiversity and natural biological processes above and below the ground surface. Soil interventions such as mechanical soil disturbance are reduced to an absolute minimum or avoided, and external inputs such as agrochemical and plant nutrients of mineral or organic origin are applied optimally and in ways and quantities that do not interfere with, or disrupt, the

biological processes. On the other hand, CA facilitates good agronomy practices, such as timely operations, and improves overall land.

Conservation agriculture in Tunisia

One of the main expectations of the CA in Tunisia is improving soil fertility through the increase of soil organic carbon. This impact can be used as criteria of CA extension. The soil carbon content is the key of soil fertility and in Tunisia soils are characterized by a low level of soil carbon content. CA should be promoted in North Tunisia as an adaptation tool to climate variability and change. This is particularly important if we know that climate projections in the region are predicting increased temperatures and irregular rainfall patterns.

Development and research and development projects for CA started in Tunisia in 1999 thanks to projects funded by the French Fund for the Global Environment (FFEM). Fifteen-year comparative studies, funded by several donors, have studied the impacts of this technology on different components of the agro-system. Currently, only 12 000 ha of agricultural land are cultivated under CA and are distributed among 200 farmers operated by 102 direct drillers (41% in the sub-humid, 30% in the lower semi-arid and 28% in the upper semi-arid). The distribution of this CA area is shown in Figure 6.

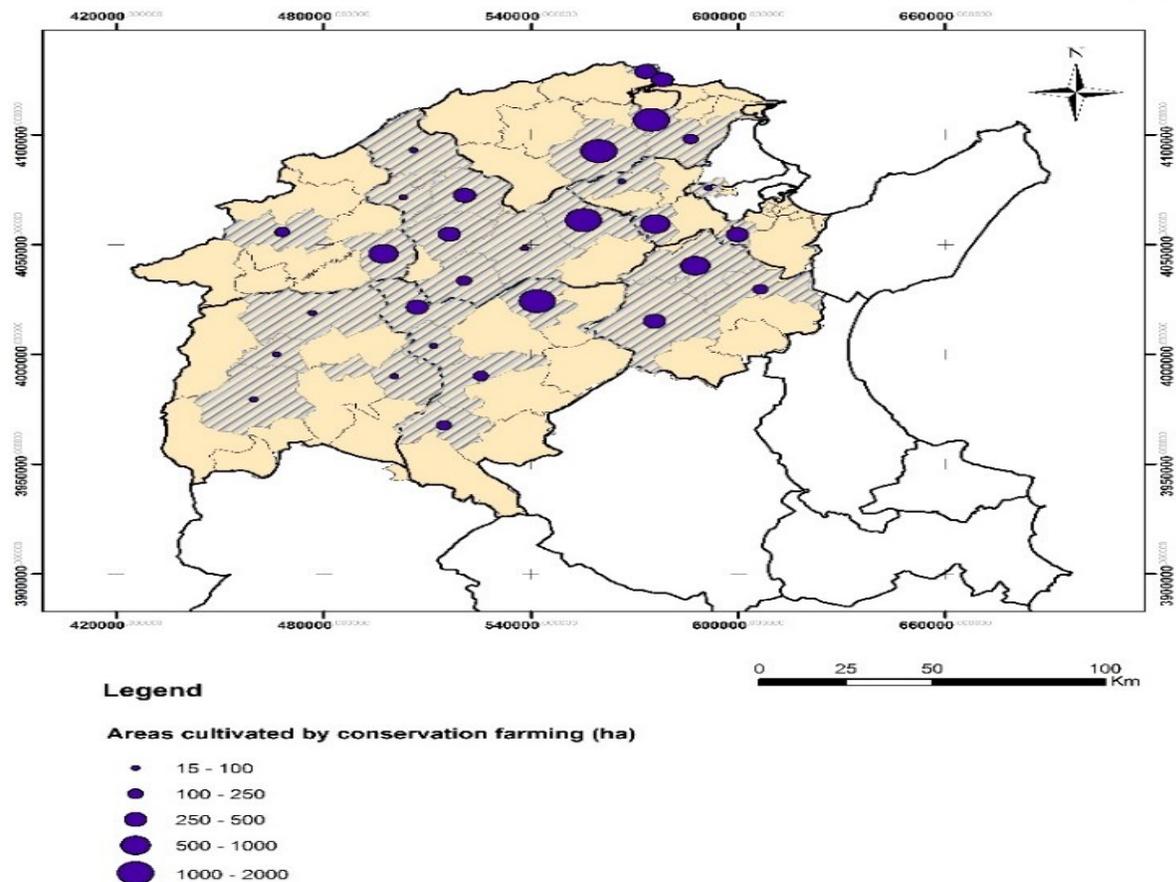


Figure 6 Geographic localization of CA surface

Initiation of the innovation process

In Tunisia, the conservation agriculture (CA) experience started in 1999 when the direct seeding technique was tested in 11 farms located in the North eastern part of the country with the support of the French Agency for Development (AFD). Being implicated in the process, the idea of this innovation started with specific profiles and departments. Mr. Khelifa Mhadhbi, the former director of the Technical Cereals Center, Mr. Moncef Ben Hamouda a professor at the higher School of Agriculture of Kef (ESAK) and Mr. Adnen Abd Rabou, a farmer in Siliana Governorate are in the front line of this initiative. The first objective of this initiative was to combat soil water-erosion in the region where this phenomena prone. So, an agreement between ESAK and CTC (Actually called INGC) was set up in the framework of the integrated rural and agricultural development project (PDRAI, funded by IFAD) to work in the regions of Silianna, Kef and Bizerte.

Implementation of the innovation process

Many research and development projects have been implemented in different regions of Northern regions of Tunisia with the purpose of tailoring appropriate CA packages and speeding up the uptake of this technology. From 2001 to 2006, the French Fund for the Global Environment (FFEM) financed a project targeting large farms (Kef, Jendouba, Béja, Bizerte, Zaghuan and Manouba). Another project, founded also by FFEM, was developed between 2007 and 2012 to track past projects, consolidate results and support the dissemination of CA. CTC (INGC), ESAK and the Association for Sustainable Agriculture (APAD) collaborated for the implementation of these projects project funded by FFEM. Within this period, in 2009, the CTC was transformed to INGC (National Institute for Field Crop).

Since 2012, the interest has been in small cereal farmers with degraded lands (less than 20 ha) with the CANA (Conservation Agriculture in North Africa) funded by the Australian International Center for Agricultural Research Agriculture (ACIAR) and managed by INRAT-INGC-ICARDA. The focus of CANA project was on the adoption of CA by small farmers in Fernana region. Finally, a project under the acronym CLCA was launched in 2014, financed by IFAD and managed by INRAT-INGC-ICARDA. It targets the Integrated Crop-Livestock Conservation Agriculture in Siliana Governorate.

The problem of slow CA adoption (14000 ha) was the object of many recent R&D projects in Tunisia. Small size of farms was identified as major constraint due to the low investment capacity of small farmers in direct drilling equipment, and to the mixed nature of the agricultural production systems of these farms, where the abundance of livestock (especially small ruminants) creates higher demand for biomass leading to less availability of mulch.

Further of R&D initiatives described above, since 2016, agricultural development strategies of Tunisia start to explicitly mention CA as being a potential tool for soil conservation, which will be promoted by the government in order to enhance the adaptation capacity and the resilience of Tunisian agro-ecosystems to climate change. DGAETA, which is the General Directorate for Planning and Conservation of agricultural lands, take into account CA in its strategy as soft techniques for soil and water protection. This a first sign, which is still shy, of CA consideration by decision makers.

Concrete results of the innovation process

The process success can be proved mainly by the increase of the cultivated areas adopting the AC. The Tunisian experience in AC is appreciated at the regional scale. That is considering sharing this experience (mainly R&D) with other countries especially within the MENA area. When asked where to find the proofs the main answer of interviewed persons was consulting reports and scientific papers on the effect of AC principal on agrosystems in Tunisia or simply visiting some implemented plots such as Fernena, Siliana, Bizerte, Béja or even the INGC.

So, even after 18 years of CA introduction and several international projects, this technology doesn't impacted significantly the Tunisian agriculture landscape.

Factors that may have been decisive/most influential in the results of the innovation process

The main answer of interviewed persons that was direct forward to reveal what would have influenced the success or failure of the innovation process's was the government. Actually, it would have been the government support's absence such as the non-adoption of this innovation at the national strategy level for land protection and production sustainability.

Despite the encouraging results of the CANA and CLCA projects the availability of price-affordable direct-driller and the conflict between crop residues grazing and soil mulching still the two main technical factors which limit the success of the innovation process.

Level of engagement of policy makers in the innovation process

As considered by the interviewed persons, people who are highly implicated in the spreading of this innovation are those who are often in the field. But also there are cases where the implication was thanks to also some decision makers when introducing the project. The contribution leading to the future CA success should be mainly seeing as a challenge but also a promising future and being totally convinced in its success.

Process of engagement of the policy makers in the innovation process

The suggestions concerning the implication of the different decision makers were diversified. It was mainly about implicating the politicians from the very beginning, at the very first step of the innovation process implementation. In addition, one of the vital suggestions seemed to actually not only sensitize the society and concerned target group who may benefit from the innovation of its importance but also incite the government in any possible way to promote the introduced technology. Nowadays, any support (financial or structural) for NGO's activities, such as APAD, is done to support the CA activity for this NGO.

Synthesis of factors influencing the engagement of policy makers in innovation processes

The factors influencing the engagement of policy makers, with their different levels of decision-making, are more or less the same for a research director or a simple technician. First of all is the national regulations and bureaucracy, if all the conditions are available for the implementation of any technological innovation Tunisia laws and bureaucracy will break its momentum. In fact, you have to do a massive quantity of paper work for the simplest tasks; a field day, renting a car, hotel reservation for international research staff...etc. And that is why all successful innovation

had at least one commitment from the highest levels in the Government, the Prime Minister, or The President himself.

The second most influential factor is the funds dedicated to develop or setting up new innovations. Usually these funds are allocated to research and development institutions by foreign donors; FAO, IFAD, World Bank, AFD, GIZ, KOICA, JICA...etc in the form of a donation or in the form of a loan dedicated to development projects. And if these funds are unavailable, or the second phase of a project no longer has an external fund, these projects are usually doomed to failure. But sometimes the state gets involved by funding these technological innovations to keep the projects alive until a new donor backs them up.

During the surveys, the decision-makers expressed different opinions according to their perception of the current situation. One of the most frequent responses was “The Personal/Professional/ Politic Interest Groups”, this means that it is necessary that the staff of the project do have any type of common interest; 1) Personal to get a promotion or something like this, 2) professional in order to have a better reputation or a more developed network, or 3) political goals aiming to achieve a political quest. The other most important factor highlighted by political decision-makers was a clear and direct impact on the life of farmers, i.e. an innovation that improves their livelihood, which can be used to reduce the depletion of natural resources in any region, but the most important one is a technology judged profitable by all especially the local population in the case of a very large scale experience. Other policymakers have focused on the changing policies of the Tunisian Government after every ministerial reshuffle, if the new ministers do not have the same strategy as their predecessors; the implementation of any given innovation is doomed. They said that sometimes a political choice can stop the progress of the implementation of any technological innovation in the process of success, and this for incomprehensible reasons due to political decisions which are mainly taken under the pressure of very powerful lobbies in the country, because this technology will break a very profitable importing activity for them.

In overall, the factors influencing the engagement of policy makers are numerous and different in nature, some are purely scientific; others are political, or personal. But the key of success and failure of any innovation in Tunisia is the direct implication of the highest authorities such as the President, the Prime Minister, and in some cases Very powerful Businessmen who have a direct interest in this innovation.

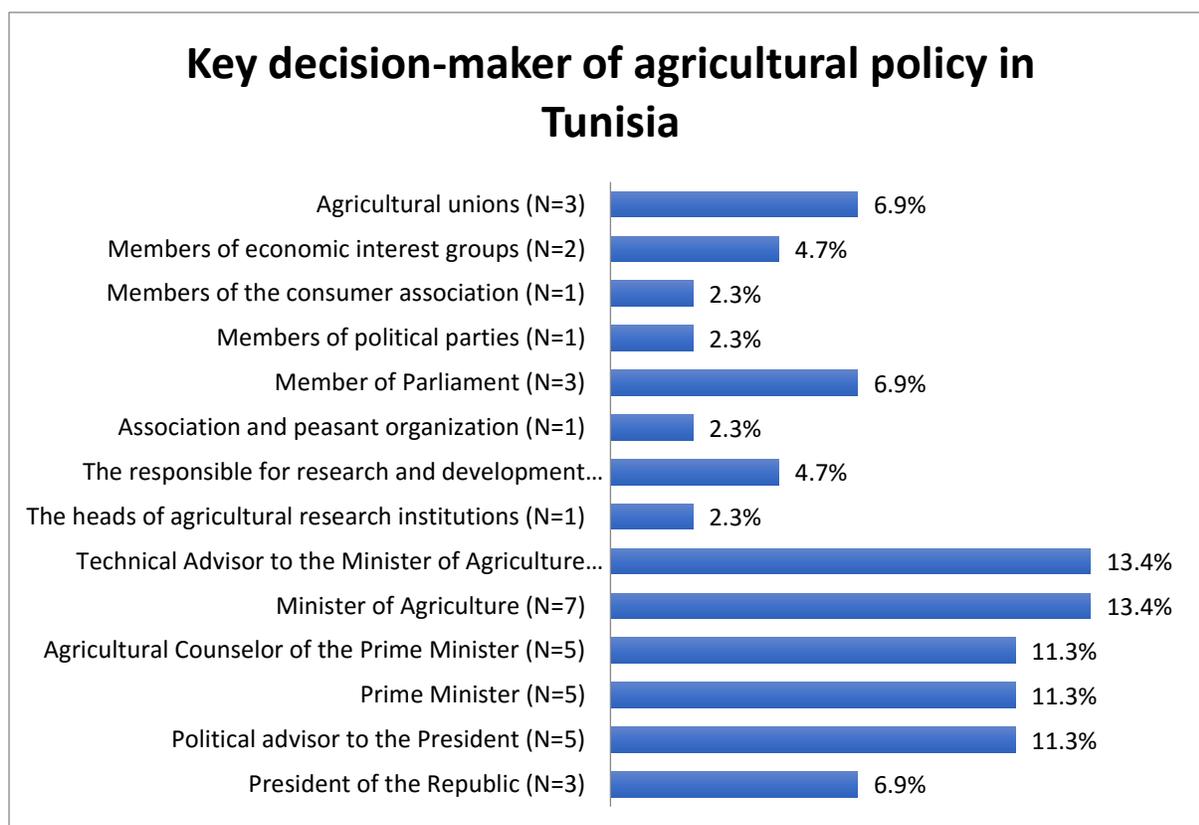


Figure 7 Key decision makers of agricultural policy according to the interviewees

Discussion

In this document we have studied the success and failures of five innovations: Durum Wheat variety Mâali, Organic Olive Oil, and Rapeseed crop as an example of success, Conservation Agriculture, and Labeling the Tarentaise Meat as unsuccessful. All cases regardless their level of success or failure had shown that in order to succeed in implementing any innovation in a developing country more than one factor must come together to achieve the right results, an effective mobilization of human resources is the most important, followed by the appropriate financial resources, and a total engagement from the most influential officials of the government in order to show the total commitment of the state in the innovation process.

The keys of success in the implementation of any new technological innovation in Tunisia are simple but very difficult to gather if we go in depth of this issue. The governmental institutions are in almost total control of the process, which means that any project should have their

approval, and it is a very difficult thing to do especially if the main policy makers do not share the same vision as the research team and vice versa. Despite having total control over the procedure, the policy makers often do not have the necessary financial resources, which means that the innovation had to be funded by a third party essentially the international organizations such as FAO, and IFAD or some international cooperation like GIZ, AFD, JICA, CRDI... etc and this means for sure that there is something to be fulfilled in return; the importation of a prototype, a vital need for a foreign experts provided by the cooperation. This lead most often to a short-lived innovation, which disappears with the funds, leaving behind only archive boxes full of documents deemed useless. In the case of “labeling the Tarentaise meat” despite putting an armada of research and development officers covering almost all the experimentation zone in association with all national and international stakeholders, the innovation stopped right after the withdrawal of funds from the World Bank group, and of course the Tunisian Government did not pursue the development of this innovation because of some political pressure from the red meat lobby in Tunisia. By opposition, the development of the organic oil sector in Tunisia did not need any foreign intervention, a presidential strategy was enough to set up a Technical Center for Organic Agriculture (CTAB), and a national direction attached to the Ministry of Agriculture in addition to the involvement of largest farms in Tunisia which were looking for a high added value agricultural product ensuring a better income. This demonstrates that the political will is enough to put on place a successful innovation in Tunisia regardless the human capital, physical, financial, social and natural.

The two previous examples are not absolute, because in the case of conservative agriculture all the ingredients of success were gathered: the best experts, the political will and the funds. The issue was from another level, in fact the problem is that the experts and researchers do not agree on this innovation, and every time we change the technical responsible the public policy have to suite their will. And until this day the problem still arises, those who defend conservation agriculture still continue to develop this technology within more research project (Consortium Research Program).

In the case of the rapeseed crop an indirect involvement of the governmental institutions by its two major components i.e. the research and the development institutions pushed the private sector to adopt and implement this innovation without a clear governmental help. The initiative was supported by foreign companies willing to invest in Tunisia, and the development of the sector is essentially due to a total commitment of private investors. The secret of the success of this innovation is a very effective Private Public Partnership.

Collaboration with external partners seems to be particularly important with reference to social, organizational, and ethical issues in the context of innovation (Arnold, 2011; Medeiros, Ribeiro& Cortimiglia, 2014; Hossain, 2010). This is the key factor in the success of the new improved variety of Durum Wheat Mâali. Because of its yields above the national average, this variety immediately caught the attention of farmers which are members and non members of the experimentation. The participatory approach adopted by the project members created a domino effect; the farmers member of the experiment have acted as extension agents, who have been successful in disseminating information in a more effective manner than that of standard extension agents. To

be more accurate, the main reason is that this variety regroups the best qualities of two ancient wheat varieties: the local one known as Chili, and the improved and most used one known as Karim. In some cases we only need to implement an innovation that is easily identified by the local population, very easy to quantify and success is guaranteed.

Emerging findings/theories

Designing a research project in order to implement a technological innovation, and succeed it are two completely different things. In order to succeed in any type of innovative technologies we must calculate the least movement, its effects on the rest of the path. We can have all the resources of the world to our disposition: infinite funds, the greatest expert of the world, an irreproachable scientific method, and a technical staff beyond reproaches but this won't guarantee the success of the technology, simply because in the eyes of the target population it is useless for them. For this simple but very important fact, all types of innovation should be born from the real need of people not in an isolated office or in the laboratories of any research institute. On top of that an innovation must not be imposed from the outside for economic, political, or even scientific reasons. It is for this reason that whenever any experiment is set up, a participative approach must be put on place by the project staff.

Other than the social factor, a full and long-term commitment of a top political decision-maker like the President, the Prime Minister or the most powerful political parties is needed to make any innovation succeed. That is because in some cases the lobby that the innovation is going against is too powerful to be fought by researchers or development agents.

The commitment of NGO's, NPO's, Private sector, International Organizations, and International cooperation can also help to improve the market acceptance of innovation out-comes (Achterkamp & Vos, 2006; Holmes & Smart, 2009; Niinimäki & Hassi, 2011). This means that the initiative made by FAO in several projects for the creation of co-operative, SMSA, or the feminine association, can accelerate the adoption of any technology, since the state always prefers to negotiate with a known group/ association rather than some individuals representing their own interest.

SWOT Analysis of the AI in Tunisia policies decision makings based on this current study

In order to better understand the agricultural innovation system in Tunisia, we have reaffirmed a SWOT analysis that highlights the strengths, weaknesses, opportunities, and threats of this system put in place by the Tunisian government and its national and international part partners. Technological innovation in the agricultural field in Tunisia has had a major impact in the life of farmers; in addition it introduced new production process more modern in a traditional model still governed by the familial model. Innovation are no longer subject of study and thesis topic for researchers, they have become a necessity for all including politicians because if a country do not invest in innovation it is going to lose from its competitiveness in an increasingly competitive international market; as we have seen in this report, simple innovations in strategic sectors can make a very big difference in the national economy like the example of the organic olive oil. One

of the most important opportunities of the innovation strategy is a still traditional agricultural sector, which constitutes a virgin ground of technological innovation, thus ensuring a large percentage of success once the political decision makers are totally committed to this strategy. The major threats of the AI are mainly the lost of the most important partners, which are the farmers and the targeted population. This could happen if the policy makers, researchers and politicians will continue to consider these innovations as an objective but not as a tool for sustainable development. If the farmers, cooperatives, social partners do not believe in the innovation itself everything will be lost. The most difficult to do and maintain a delicate balance between development and research in its pure state, because without this latter there is no innovation in any field.

- Strengths**
- Very changing at the level of the farmer's life and activities in good terms
 - A booster of the National Economy of the country
 - Once, effective it is a new door to more opportunities
 - An armor that defends developement with a shield solving problems and agricultural issues

- Weaknesses**
- Highly affected by the "current" or more specifically day-to-day target policy makers interests (Personal interests)
 - The commitement regarding the policy decision makings is not only highly vulnerable but also has to be put in a practical concrete frame of envolvement.
 - Due to any unexpected politics related updates it can lose its meaning losing the full devotion to the success itself.
 - Politicians personal interests can interfere with the agricultural community welfare.

- Opportunities**
- The source of both ideas and inspiration that can be nourishing the policy decision makers are countless.
 - The encouragement of more reasearch and on the field related investigations is attainable.
 - The gain of farmers trust is possible once things are concrete, direct and for the sake of developement.

- Threats**
- The lost of the farmers trust
 - A possible disconnection between innovation developpement related programs and the farmers main interests.
 - Highly dendent on the political interests and orientations
 - Politics and governmental related big changes that may affect the sector where the politic decision makings in agriculture.
 - People who act and believe in AI in Tunisia seem to be few at the practical level.

Figure 8 SWOT Analysis of the AI in Tunisia

Conclusion, decision and policy (transformation/change/innovation) implication

The study aims to identify and document success and failure cases of engagement of policy-makers in agricultural innovation processes in Tunisia and draw lessons about key success and failure factors of the engagement. Five technologies were studied. The new cereal variety “Maali”, Organic olive oil, Rapeseed crop were identified as three success cases and labeling systems of animal products and conservation agriculture as unsuccessful cases of engagement of policy makers in agricultural innovation processes in Tunisia.

In Tunisia, the Government is still the main responsible in the success of the innovation process in agriculture due essentially to the absence of a private sector still reluctant to invest. Apart from its financial support, the state contributes with its institutional arsenal to promote the smooth development of the innovation process putting at disposal all possible resources, human and financial. In addition of that, the public sector ensures the implementation of all necessary measures to ensure the success of a technological innovation, starting from the idea itself to its commercialization after its experimentation. Nevertheless, the government is not automatically fully committed to any innovation process which usually causes failures.

Regarding the main arguments in favor of creating a solid export market for example in the case of organic olive oil by introducing new varieties, or increasing the national production by planting more olive trees, and the development of a sector with high added value. The economic and commercial issues are very important for policy makers. The main keywords declared by the interviewed policy makers define an agricultural innovation as: 1) increase production or productivity, 2) improve income, 3) ensure food security, 4) increase consumption, 5) reduce trade balance and 6) improve competitiveness.

The financing of agricultural research activities remains a problematic issue since this funding will be substantial at the initiation process but will gradually disappear at commercialization phase, which does not allow this innovation to adapt to the new problem, and eventually ends up disappearing or it will be classified as a failure. In this context, successful agricultural innovations usually involve private funders (industrial or other), especially in the technology dissemination and commercialization phase. The rapeseed sector illustrates this public-private partnership to promote a 100% Tunisian vegetable oil. Without the support of the private sector, the rapeseed industry will not be developed. But it still raises the issue of private sector risk-taking during the research phase. In fact, most private companies in Tunisia simply observe the experiments made by the research institutes and if they succeed in producing a commercially viable output these companies take the risk of investing in this technological innovation.

The success factors of the innovation process relate to the financial and legislative support of policy makers from the initiation phase to the commercialization phase. Integrating the innovation process into agricultural policy planning is a key factor in the success of this latter. The development of an organic olive oil sector was in fact a presidential decision that has become later a national strategy. Therefore this sector benefited from several subsidies on all levels from production up to marketing and export (farmers, collector's processors, exporters). Thus a technical center for organic farming and a general directorate for organic agriculture within the Ministry of Agriculture have been created. Furthermore, the commitment of policy makers to olive oil is also explained by the priority of the State to promote export sectors generating the currency for a country whose trade balance is in deficit. Another factor of success is the involvement of the private sector, especially in marketing.

Industrialists always provide financial, technological and commercial support to farmers and help create added value and ensure the sustainability of the sector. Farmers in the other hand adopt technologies that allow them to ensure a smooth marketing and guaranteed revenue. The strong commitment of policymakers in the rapeseed sector illustrates the role of the private sector in the success of the innovation process (growing rapeseed in Tunisia).

Failure factors in the innovation process are mainly related to a lack of funding, a marketing problem or lack of support from the private sector. Insufficient information on the technology can jeopardize the innovation process. Also, poor stakeholder coordination and lack of flexibility are one of the biggest constraining factors. Concerning the Tarentaise case, the lack of funding for a quality sign has been decisive in the weak development of this sector, making it a failure. For conservation agriculture, policymakers are still divided on the benefits and usefulness of this technology. A lack of funding at the level of small farmers (purchase of specialized seeder) and a lack of promotion of technology at the level of policy makers explain relatively the development of this activity.

The success of an innovation process necessarily requires the commitment of decision-makers and their involvement at all stages of this process. A Public-Private Partnership is strongly recommended to ensure the sustainability of the sector. Nevertheless, the government should initiate several reforms of the administrative system for a better organization of the sectors and allow more flexibility to the realization of the transactions. The budget allocated to the research and development of agricultural innovations should increase and cover the costs associated with the different levels of the innovation process, including marketing.

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