

## Managing Research and Research institutes for innovative research: Lessons from a comparison and a proposed new dynamic

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### Abstract

Agricultural research in general and in developing countries in particular might face a permanent status of “disguised unemployment” if major changes are not undertaken. Through a comparison of agricultural research systems from France, Italy and Tunisia, this article highlights issues that must undergo changes. At the research institute level networking is suggested as well as managing research institutes as private companies with an obligation to generate results. Links must be established with the value chain stakeholders who must be placed upstream of the technology development process. Meanwhile the gap between the research institutes and the universities must be closed as it is the trend in the Northern countries mentioned above. This will enable joint formulation of region-specific research issues. In a world characterized by fierce competition, the new research institute must keep pace with the changing environment in order to survive and remain relevant. It is clear that the time when research institutes relied solely on funds allocated by governments or the good will of some donors is over. In today's world, the research institute must be dynamic and in control of its destiny by its ability to mobilize resources in a competitive environment. It is by implementing these solutions that might look drastic at first that the new agricultural research organization will regain its credibility.

**Key words:** agricultural research, competitiveness, private management, education

## Gestion de la recherche et Instituts de recherche pour la recherche innovatrice: Leçons tirées d'une comparaison et d'une nouvelle dynamique proposée

### Résumé

La recherche agricole dans les pays en voie de développement risque de se confronter à un état permanent « de chômage déguisé » donc d'une sous-exploitation de son potentiel si des réformes majeures ne sont pas entreprises. Par une comparaison des systèmes de recherche agricoles de la France, de l'Italie et de la Tunisie, cet article souligne les points où il y a lieu d'opérer des changements. Au niveau de l'institut de recherche au sens large, la recherche en réseau est préconisée, une gestion de type privé des institutions de recherche fondée sur une obligation de résultats est proposée. Concernant les relations avec les acteurs de la chaîne de valeur, ces acteurs se doivent d'être impliqués dans tout le processus de génération et de diffusion de l'innovation technologique. C'est cette voie qui permet une formulation conjointe des préoccupations de recherche régionalisée. Par ailleurs, la dichotomie entre les institutions de recherche et l'enseignement supérieur se doit de figurer au musée des idées périmées ce qui, du reste, est actuellement la tendance dans les pays du Nord cités. Dans un monde où la compétition fait rage, la nouvelle institution de recherche revisitée se doit d'être à la hauteur pour exister et prospérer. A l'évidence, le temps où l'institut de recherche dépendait uniquement du budget alloué par l'Etat et du bon vouloir de certains donateurs est révolu. Aujourd'hui l'institution de recherche doit être dynamique et actrice de son devenir par sa capacité de mobilisation de ressources sur une base de concurrence. Ce n'est qu'en adoptant ces solutions à priori drastiques, que la nouvelle recherche agricole pourra reconquérir ses lettres de noblesse.

**Mots clés :** Recherche agricole, compétitivité, gestion privée, chercheurs, enseignement

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## INTRODUCTION

Agricultural research faces numerous constraints while carrying out its mission in developing countries (Vose and Cervellini, 1981; Poole and Buckley, 2006). Among the areas to be addressed are the counteracting decades of underinvestment in agricultural research and development; uncertain excessive instability in yearly investment levels; addressing existing and imminent challenges in human resource capacity; and maximizing regional and sub-regional co-operation in agricultural research and development. It is not an exaggeration to say that the agricultural research system is almost in “intensive care” because its usefulness is increasingly being questioned. However, it is clear that without the inclusion of technological innovations in farmers’ practices the African continent is barely able to boost its agriculture (NEPAD, 2002). We therefore believe that several strands of reflection are urgently needed for the research institutes of the South to recover better economic and scientific health. The aim of this paper is to present and analyze some strategic components of the reflection and to make suggestions for a more dynamic research system.

The first part of the paper describes the changes in the research environment and the consequences for the management of research. The second part presents the principles and basic concepts necessary for the efficient management of research institutes, while the final section illustrates these suggestions based on two critical factors for revitalizing these institutions: human resources and funding.

### ***Changes in the agricultural research environment and implications for management***

The analysis of national and international agricultural research environment reveals key lessons for optimizing the performance of applied agricultural research institutes. The research community has undergone deep and significant changes mainly due to the fact that it has to integrate in its approach the heterogeneity and diversity of cropping systems and extend its reach across the value chains. Moreover, whatever the activity considered we are in an era in which monopolies have come to an end. Also, the background against which the direct users employ research results has changed its physiognomy. In fact, we are witnessing today a progressive intellectualization of the rural world. And naturally, stakeholders will approach those who will enable them to calibrate their own activities in order to strengthen and increase their competitiveness.

In African countries, agriculture is currently experiencing some paradigm shifts; it is no longer administered as it was before, and is feeling the positive and negative effects of a liberal inspired economy (Teweldemedhin and Van Schalkwyk, 2010). Agriculture therefore requires from research the identification, penetration and maintenance of promising markets. In reality, agricultural research institutes are forced to abandon pure production-centric approaches in favor of approaches “guided by end users”. It has been also observed that ‘borrowing’ technology from elsewhere is increasingly possible because we are in an era marked by an accelerated circulation of information. It is therefore not useful to attempt to provide solutions to all identified problems. Strategic choices must be made and must be constantly reviewed. We should also note the existence of an international market for “brainpower” which allocates a market value to each facility. This is based on the capacity to multiply innovations in the light of an atomization of identified constraints. Research funds are no longer made available directly to Institutes. They are rather allocated to programs which earn their reputation through competition that combines scientific relevance, quality and the potential for high impact. This approach aside, the concern is that the institutes operate in a mode of “disguised unemployment” and lasting inefficiency. Transparency in terms of management and optimal use of resources allocated to research has today, more than ever, become a necessity leading to scientific credibility (Shiyyo and Schrader; 2003). Furthermore, the opening up of research institutes has become a non-negotiable requirement because it constitutes a condition for the emergence of the critical mass able to address pressing challenges in the agricultural sector.

Faced with such an environment, agricultural research must quickly undergo a true metamorphosis based on current concerns and future issues. In other words, research must be able to (i) read strong messages from the national, regional and international markets, (ii) translate them into relevant scientific themes, (iii) obtain results that integrate competitiveness, diversification and sustainability requirements. Translating results into practical knowledge and communicating them to the users are other capacities to develop.

Research is therefore condemned to generate results in order to survive. Consequently, it should be managed as a private enterprise although it is a public entity (Seck, 2005). This seeming paradox is not one in reality, because any part of the public sector that does not adopt economic efficiency for its

interventions cannot remain protected forever by political orders or decrees. There is a natural selection that takes place in each component of the socio-economical life.

### **Basic foundations of this historical break**

The foundations of the historical break place the reconquest of the internal market and the boost to outputs at the top of the priority list. This means that agricultural research in Africa should be driven by the end users, focused on increasing food security and the sustainability of agricultural systems (NEPAD, 2002). Agricultural research competes to secure available funds at the national, regional and international level. Institutes that currently work well are those that have learnt to formulate research proposals, to be competitive, to convince donors and to confirm their operational capacity through relevant results. Consequently, as a scientist must learn how to communicate his/her potential for inventiveness and expect from the government a healthy environment for his/her self-development. In other words, whatever the individual scientist's capacity for intellectual creativity, he or she will exclude him or herself from the system if he/she cannot fight to have his/her research activities funded. Moreover, mutualized reinforcement of know-how and scientific skills at the national level are favored to create critical masses that are able to address the main constraints of rural development. In this respect, a National Fund for Agricultural and Food Research such as the one in Senegal (Ministère de l'Agriculture, 2009) is an important step because it will enable the emergence of strong interdisciplinary and inter-institutional teams.

The foundations of the historical break also advocate and work solidly to strengthen regional and international scientific partnerships based on sharing research business plans according to comparative advantages and bring together a "mass" of young scientists thanks to a policy of research fellowships to contribute to training through research and ensure follow-up. With knowledge of the state of the art, they make technological "borrowings" whenever possible to save financial resources and improve allocation of human resources. They make shared diagnosis as a fundamental objective and involve stakeholders at all levels of the knowledge and technology generation process. Public and private funds are managed with transparency and respect with the attitudes and behaviors that are essential for quality work.

### **Principles and basic concepts underpinning management of research institutes**

#### **The concept of networking in agricultural research**

An agricultural research network is a group of individuals or institutions linked together because of commitment to collaborate in solving a common agricultural problem or set of problems and to use existing resources more effectively (Faris, 1991). It is also a self-sufficient, cooperative and organizational arrangement between designated specialized institutions in different countries that share common goals and interests and that pool expertise, information, training facilities and other available resources to achieve higher efficiency and lower costs (Boulaares, 1991). Callon *et al* (1992), argue that research and science can no longer be conceived in an ivory tower: drastic changes are reshaping the links between sciences, technocrats, and societies into networks. To accommodate that trend, they suggest building the "wind-rose of research" diagram in which research appears as a complex activity with its nature and results structured around five dimensions: (a) Certified academic knowledge which "contributes to the production and the circulation of certified knowledge: with quality and relevance being assessed by the scientific community (peers); this knowledge takes the form of publications (scientific articles in academic journals with editorial committee)"; (b) Competitive economic advantages and innovations: where "research can participate in an economic value addition process that ends with the production of innovative products or procedures, thereby contributing to the establishment of competitive advantages"; (c) Collective goods (food self-sufficiency, health, well-being, environment, etc.): where "research can also be mobilized to participate in the realization of the objectives of public authorities that correspond to what the economists call collective goods"; (d) Training, integrated skills: where "Research also spreads into training which enables knowledge and know-how to be processed into integrated skills which are in turn used in the socio-economic sector"; (e) Expertise and extension: where the scientists also wish their results to be accessible which lead to the "popularization" role of research which has always been an important dimension of the work of scientists and engineers. In addition to presenting and communicating his/her work, another task is to be carried out; that of the expert who intervenes at the request of economic stakeholders or of the Government to clarify public debates that directly question science or technology (on GMOs for instance)".

Certainly, these finalities have been present for a long time, but scientists had quite considerable autonomy of intervention in these fields. Today, as Callon *et al.* (1992) show, scientists are

increasingly being approached to intervene in these increasingly interactive fields. Public authorities, in particular are more and more demanding the scientific community to build technico-economical networks linking the research community to the economic community in view of creating a homogeneous platform which would facilitate and encourage links and their constant evolution (Callon *et al* (1992). This vision seems appealing because it shows that scientific production can no longer be conceived in a closed world; it should evolve in a network where it will have to involve more players.

This trend should be taken into account and encouraged. Networking should therefore, have direct impact on scientists' or lecturers-scientists' activities and consequently on the evolution of their careers. The current need is to involve university scientists in the agricultural research for development agenda (Seck, 2005).

### **Increasing need to reconcile research and higher education**

The historical French model of complete separation of research from education is outdated. In its traditionally rigid form (diverse status, evaluation criteria, career development, etc.), this model would without any doubt disappear. Currently in France, tremendous efforts are made to unite, on the same campus where geographically possible, the various institutions and to facilitate communication and build bridges between education and research, mixed research unit –MRU-, to establish the equivalence of status of the various units, and to encourage the mobility between institutions. Agricultural research increasingly requires theses that flow from the university system; that is why research laboratories need to be reconciled with those of universities and if possible be linked. INRA France participates concretely to this effort of reconciliation. Many initiatives were started in various INRA regional centers to integrate INRA scientific teams close to university team (INRA, 2011). Today INRA is associated with about 15 schools specialising in agricultural or veterinary studies and nearly 40 universities through their joint research units. About two-thirds of INRA researchers give lectures and tutorials to graduate and post-graduate students. INRA is also involved in doctoral schools and in establishing new Master's degrees and PhDs. Since 2005, INRA has also been delegated by the National Research Agency (ANR) to ensure the management and scientific leadership of programs which directly concern the areas of sustainable agriculture, human nutrition or genomics. This also applies to Senegal where ISRA has joint research projects and laboratories with national universities. This trend does not mean that research and higher education activities are the same or need to be mixed. However, these activities must be designed and planned over several years not for each individual but within teams, units or laboratories; these are collective tasks to carry out based on available skills and timeous<sup>19</sup> planning; but it requires that everything is done to facilitate interconnection and career homogenization.

In Italy, there are four main public institutions that finance agricultural research: MURST (Ministry of Universities, Scientific and Technological Research), CNR (National Research Council), MIPA (Ministry of Agricultural Policy) and the regions. The Faculties of Agronomy and Veterinary Medicine have representatives in these important bodies of agricultural research. In 1997, 27.5% of all agricultural research programs funding were directly allocated to Faculties and most of the funding of CNR, MIPA and the regions, which accounts for 42% of the total, were attributed to University Departments or to Research Centers under the umbrella of these institutions. In 2001 the former Ministry for Universities and Scientific and Technological Research (MURST) was merged with the Ministry for Education (MPI) to establish the new Ministry of Education, Universities and Research (MIUR). All financial resources, staff and functions of the former MIPA and MURST have been transferred to MIUR which promotes scientific and technological research (MIUR, 2001). These centers are very much supported by University Departments, which are frequently located in the same building and run by a faculty professor. This explains why the role of university faculties is critical in Italy when it comes to the number of scientists who depend directly on them; about 3,000 lecturer-scientists versus 3,000 scientists who depend on other institutions. In contrast, in France, two third of agricultural scientists depend on INRA, which until now has very few institutional linkages with universities (although there are a few with graduate schools for agriculture). This gives an idea of marked differences between the two systems. Also a non-negligible part of funds is directly allocated in Italy to agribusiness enterprises for their research (about 12% of the total of agricultural research). Furthermore, regions are increasingly realizing the importance of managing agricultural policy and are consequently funding specific programs of regional interest. At present, the quota of regional funding out of the total expenditure (salaries included) for agricultural research accounts for 11.3%.

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<sup>19</sup>It is the model that prevails in the Anglo-Saxon world (cf. American agronomic universities rely on "Land Grant College" associating research, higher education and « extension », close to what we call « vulgarisation » in French. This model is imposing itself increasingly in the European Community, as indicated by the last French initiative related to the issue.

Far from being the ideal model, especially when it comes to the resources allocated to research, (for all scientific areas in 1992 Italy allocated 1.3% of its GDP to research, against 2.4% in France and 2.0% for the European average, and for agricultural research about 6,000 scientific staff units against 13,000 in France), the Italian system has its strengths derived from concentrating research centers around the university Faculties that are distributed across the regions.

At the administrative and statutory level, the research centers and the university faculties are not necessarily merged into one single institution, but they are clearly linked when it comes to laboratories, research stations and management; with many opportunities for scientists and lecturer-scientists to exchange roles. This fact also translates into the maintenance of informal contacts between lecturers and students, including scientists who are outside the university. Training also benefits a lot from these linkages because of the opportunity to be continuously updated by the results of the research carried in the same place.

In The Netherlands, there is an ongoing progressive reconciliation process between research institutions and the university system. In general, the organization of scientific research is undergoing strong changes across Europe. And as discussed above, even in France which has a strong tradition of separation between universities and research institutions, efforts are being made to integrate the two systems. We believe it is important to have the vision to make decisions today that promote these reconciliations. Our diagnosis of the problems facing the agricultural system in Africa is strongly influenced by this vision of a Research-High Education Partnership System as part of the solution to the problems.

### **Research and extension: the dissemination of research results to end users**

The dissemination of the knowledge generated by agricultural research is a permanent concern and a difficult issue for all countries. A great number of institutions in many countries have created value addition units and extension facilities that propose to disseminate scientific progress and techniques to the ultimate end users of the products of agricultural research, the farmers. Undoubtedly, there are too many stakeholders claiming to be the interface between research and farmers. This precedence given to science, independently from social needs, has many consequences (Chambers *et al.*, 1989; Röling and Engel, 1989; Scoones and Thompson, 1994). First, it strengthens the “top-down” approach to transfer of know-how and consequently establishes hierarchical positions; second, it makes research a sufficient condition for development, when it is only a requirement; third, it causes a systematic under-estimation of references different from research and fourth, it does not support the bi-directional continuum between research and practice.

Innovation is first a socio-technical process (Rand *et al.*, 2009); it is therefore a social product that is built with different stakeholders, particularly socio-economical stakeholders. Without their participation in the research network mentioned earlier, research results will be no more than paper. It is a myth to think that we only have to improve the message or its material for farmers to adopt it as a recipe. Technology cannot be disseminated on its own; these networks that enable its diffusion should be favored. Therefore, every stakeholder of the research-to-practice bi-directional continuum must play its role. Research will play its role better if a group of professionals is organized so as to formulate its needs, propose partnerships in appropriate programs, and engage quickly with the solutions proposed by research. Wherever agriculture has a certain level of development, it is farmers themselves who carry out dissemination of research results, whether privately or funded by ‘taxes’ imposed by farmers themselves.<sup>20</sup> Regionalization of research should allow this to emerge through the reconciliation of various stakeholders from the network.

### **Significance of adaptive research or systemic research**

Adding value to agricultural research results can be encouraged and facilitated by establishing points and situations of interface between research, training and extension. A path we favor is to develop systemic research approaches (Alroe and Kristensen, 2002) combining extension with the implementation of “chantiers” common to all these stakeholders, each keeping to its own competence, but also enabling the various stakeholders to take ownership of research results. This collaboration could be developed within a framework of multidisciplinary work and association between several agricultural system competences. Moreover, such themes are very relevant for training extension agents and other development agents.

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<sup>20</sup>For example, in Tunisia there are farmers’ organizations that know where to find advisory services when they are needed (Agricord, 2010).

The development of sector and thematic research is of course critical. By highlighting the systemic approach, we wish to take into account this complementary, difficult and complex pattern that needs to be favored. Moreover, the systemic approach or global approach seems important to develop even when we conduct sectorial research since it hangs on a state of mind that makes it possible to take interfaces into account in advanced thematic research.

Establishing a typology of farms in a given area (setting out their diversity according to the production system, the unit structure, the level of technology used, the available manpower, the prospects of succession, etc.), backed by a study of local agricultural systems and the identification of technical constraints that prevent the development of systems, is one example of interdisciplinary systematic work. Such work would produce useful knowledge for developing a dissemination strategy. It would also provide scientific tools by identifying themes of complementary research on little-explored technical aspects, giving rise to fruitful collaboration and could be used to train extension workers.

Many benefits will be generated from regional systemic and interdisciplinary research work which brings together scientists and lecturer-scientists from different backgrounds (agronomy, plant breeding, animal production, rural economy, sociology, and various other agro biological disciplines) in regional studies and sensitizes them locally to various agriculture constraints. Furthermore, they are an excellent opportunity to mobilize the potential of diverse institutions (NGOs, schools, etc.) located in the regions. Finally, this research enables scientists and extension service staff to associate naturally; it favors a coming together of professionals who can express their perceptions of local agriculture constraints and their visions for the future. Over and above this, the presentation of study results is an opportunity for exchanges with representatives from agriculture and agro-industry, thereby validating conclusions and establishing new directions for complementary research. These frequent interactions and discussions between research and tertiary education and the world of extension with that of stakeholders from different socioeconomic backgrounds offer many opportunities to understand and accept the various points of view.

### **Regionalization of research without systematic decentralization**

This is an important issue which solution is linked to other problems in terms of reorganization of infrastructures and operations. On this point, there are various opinions some of which are contradictory. We therefore consider it important to suggest a few clarifications.

Research regionalization can have many objectives. Regionalization of an agricultural research system is often talked about when carrying out a decentralization of the scientific capacities concentrated in central research and education bodies, when aiming to meet specific regional needs, or when executing integrated research programs so that experimental stations can verify their research results in a real environment. It seems, however, that this concept of regionalization covers two different aspects: either the establishment of regional research centers (laboratories, experimental facilities, research equipment, etc.) as in many countries. This was the case for examples, in France from the 1960s to the 1970s when an ambitious territorial development plan was implemented and in Italy when universities faculties and research facilities were established in each region. This is about encouraging the establishment of research that takes into account regional concerns and is therefore about regional research, or regionalized research. But, overall it is about avoiding "remote controlled" research, carried out at a distance, the limitations of which are clearly evident from past experience.

On top of this distinction is often superimposed the dichotomy between fundamental research and applied research. We believe that this distinction is neither relevant nor operational in the case of agricultural research, which is by definition finalized research that builds on scientific knowledge and practice to generate results given their significance by both sides of the equation. Regional research is neither more finalized nor applied than so-called national research but it may be more adapted; in either case, recognized scientific work is to be encouraged: there is either good research or no research at all. This means that if regionally-inspired research must often be carried out in partnership or in network with extension services and professional stakeholders, each party must nevertheless play its specific role; with research focusing on the scientific issues.

Two stumbling blocks must be avoided in the implementation of research for and in regions: on one hand that research might go too far in its desire to meet local demand by involving itself directly in large-scale extension (focusing more on know-how than on research); on the other hand research stays with its quest for academic recognition, with the only criteria being publication in international scientific journals (in scientific communities, there is now broad acceptance that there are other criteria of scientific validity and thoroughness).

At all times, research must internalize the needs of socio-economic stakeholders and decisions makers on scientific issues, a process for which it is totally responsible. This would suggest the establishment of partnerships with socio economic stakeholders (farmers, agricultural professional organizations). It is necessary to start the process for creating a “demand for feasible research”. This is very different from the establishment of a “supply” of research by research teams. Systemic and regionalized research should favor the emergence of this partnership.

### **Centralization of research and inefficient allocation of resources**

There is a large agreement regarding the negative effects of excessive “red tape” in research, the lack of autonomy of research units, the dispersion and inefficient allocation of human and financial resources and the poor coordination of research activities. The lack of autonomy of different laboratories and stations is one of the most important causes of the inefficiency of peripheral structures’, especially those that are too far from the center. Many countries have copied the French system by systematically adopting the legal statute of “Autonomous Public Establishments” for almost all their research institutions e.g. Mali, Tunisia, Guinea, Senegal, etc. (Sidibe, 1996; Faye, 1995). However, the organizational structure implied by the “Autonomous Public Establishments” statute is poorly or not always implemented with detrimental consequences for the funding of research programs and the allocation and management of human and financial resources within and between research programs. In particular, complex and time consuming administrative procedures are often put in place without sufficient considerations of the specific requirements of research activities. The numerous constraints that this organization of agricultural research which emphasizes administrative procedures impose on the performance of research institutes have been identified for quite some time, but they seem to be difficult to overcome. The inefficiencies in the allocation of human and financial resources inherent in this organization of agricultural research copied from the French system are perhaps best illustrated by the example of Tunisia.

Tunisia had at some point during 1990s, 580 scientists and lecturer-scientists (264 full-time scientist equivalents) distributed across its research system for a country with 4.88 million ha in area. This corresponds to one scientist for 18,500 ha, which is a very low density of scientists for a country like Tunisia which is not among the poorest developing countries. For comparison, this density is 4,800 ha for one scientist in Italy one of the lowest in Western Europe. The consequence of this low density is worsened by the remoteness of many research stations from the laboratories and headquarters of the research institutes. The research potential and the efficiency of the teams of scientist-technicians is thus reduced by, in particular, an inadequate ratio between technicians and scientists (0.72 or 1.6, if we consider the full-time scientist equivalent). What is more striking in the Tunisian research system is the weight of the administrative staff which seems disproportionate in some case, like IRA where there are 33 administrative staff for 26 scientists and 53 technicians. This is an extreme case but, the weight of the administrative staff is quite strong in other institutes.

Total expenditures in research account for 0.5% of the Gross agricultural product (GAP) in Tunisia; a little bit more than 3 dinars per ha cultivated. This level of research spending is certainly too modest, especially compared to the level of spending reached in the last decade, which, in 1985, was 1.5 times higher in real terms. This decrease in research spending is explained by a combination of an increase in the GAP, the effect of inflation (about 185% between 1986 and 1996) and a reduction in the annual budget allocated to research by the government. The same reduction in research expenditures was also observed during the same period in many other African countries under structural adjustment and even in Italy, where spending on research decreased from 0.95 of GAP in 1993 to 0.81 of GAP in 1996 (from 20 to 17 USD per ha acreage). This limitation of available financial resources has imposed the need to moderate their use by preventing overlapping and waste.

### **Competitive funding of research to improve its efficiency**

An important tool for increasing the efficiency of research organizations is the establishment of competitive funds, which is already going on in some research institutions. It is commendable to have a competitive fund system in research institutes with the support of international institutions (the World Bank, FAO, International research centers, etc.). The justification for competitive funds is that it will link funding with productivity and performance and encourage flexibility and emulation; it is the result of the liberal management approach that we mentioned earlier. The best teams would be rewarded and encouraged in their research. And the opening towards external joint funding of specific themes will broaden and deepen the scope of investigation.

However, the main limitation to a competitive funding of research is that the best teams would be awarded and amplified while weaker teams will remain weak and might become more frustrated and

marginalized. This is the reason why competitive funding can only represent part of research budget. It is obvious that we would need other tools to strengthen the weaker teams, for instance, scientific support, additional human resources, etc. Building national agronomic research capacities cannot be achieved solely by competitive funding.

Another aspect of competitive funding is that scientists are more motivated to form teams in partnership with other institutions and organizations, which also benefit from the acquired funds (universities, research institutions from other countries, NGOs, development stakeholders, etc.). The criteria for selecting research projects should include (i) quality of science and methodology showing that lessons learnt are considered; (ii) commitment to produce articles in scientific journals (the funds can be an incentive to publish in peer reviewed journals); (iii); relevance: usefulness, promising, development, expected products; (iv); partnership; and (v); scientific animation, interdisciplinary collaboration between components and regional integration.

If the above selection criteria seem more appropriate for diagnostic studies and prospective research, other criteria could be added to account for research projects that involve working directly with farmers. Farmers should be better represented in instances that select and fund research projects that generate innovations that are supposed to meet their demands or at least validate their choice. Certainly, the research and development committee should be able to correct the possible shortcomings in the competitive funding mechanism. The relevance of research themes can be improved while making sure that the quality of the representation of the rural world in the research and development committee is good, which should be considered the first level of expression of research needs.

## **CONCLUSION**

This article calls for a new dynamics for scientific research based on examples from three countries (France, Italy, and Tunisia) to save agricultural research from negative perceptions and the status of “disguised unemployment”. The new face of agricultural research should be inclusive in terms of partnership with scientists from various backgrounds, donors but also with value chain stakeholders’ involvement and economically efficient.

Research should be regionalized; i.e. adapted to constraints specific to regions and tackled by multidisciplinary teams from both research institutes and universities. In other words scientific research should work jointly with tertiary education which would be mutually beneficial as students would have an insight of technologies being developed and scientific research would know where to tap to address the issue of dwindling numbers of scientists when they retire.

At last there should be a new breed of scientists ready to compete and attract funds through accurate proposal writing and production of palpable results. Moreover research centers should be run as private enterprises where beneficiary oriented objectives are defined and met and where there is no room for academic research, failures and bankruptcy. Whatever the chosen organizational structure of research, there is need for an efficient research administration. To achieve this, the research institutes should feel genuinely responsible for the autonomous management of their resources and have the possibility of delegating this responsibility to outstations while avoiding hierarchical concentration of decisions. Also, resources allocation should be made on the basis of planned objectives and programs backed by pluri-annual commitment to spending. The control of resource use should be carried out a posteriori, after the fact and not before.

It is important to always keep in mind that there is no possible research without delegation. Scientists should have more autonomy, but their performance must be assessed based on the strategic objectives of the research organization as determined by the stakeholders of agricultural research. Scientists must report to relevant authorities and must be held accountable for the public funds they are given to carry out their research. It is not acceptable for scientists to display individualistic behavior or pursue personal agenda not related to the strategic objectives of their research organization as often witnessed in scientific and tertiary education environments. The mechanism ensuring this “accountability” is still under development in most African countries. It is the role of the managers of research institutions to establish and to implement efficient evaluation and reporting mechanisms that ensure accountability.

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