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## A BIBLIOMETRIC STUDY OF ALGERIAN JOURNALS IN AGRONOMY. METHODOLOGICAL AND POLITICAL CONSULTING ASPECTS

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**ABSTRACT** Our study deals with an evaluative analysis of the scientific articles in Algerian journals of agronomic sciences in order to identify the most productive authors, the most dominant themes and finally the cooperation between institutions and research laboratories. It is a bibliometric analysis of the *Annals of the INA* (2000-2008) and the *Journal Research Agronomique* of INRAA (2000-2009). The results of our study reveal a relation between the publications in the two national agronomic journals and the programs of the National Agricultural Development Plan (NADP), as well as the National Research Programs (NRPs). In contrast, a deliberate intervention must introduce the two journals into a more academic and collaborative context at the international level.

**KEYWORDS** *Scientific Journal; Agronomic Research; Research Evaluation; Co-authorship; Algeria.*

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### 1. INTRODUCTION

Scientific publications are considered as means of disseminating knowledge and research results. Academic journals permit such sharing of knowledge between universities, research institutions, and research laboratories. We will evaluate this scientific production in order to judge its effectiveness and efficiency.

But, the evaluation of scientific production should not only be based on the judgment of the scientific and technical quality on the research work itself. Moreover there might be some shortcomings by peer-to-peer reviews, e.g. scientific rivalry (van Raan, 2003). "What is the use of the best quality works on themes finally, if not related to the aims pursued by the program" (Larédo & Vinck, 1991). Further, the involvement in networks enables to establish additional collaborative links (networking), e.g. publishing with other authors and other research laboratories.

Since Algeria has always been concerned with the food security of the country, it is evident that the agronomic research institutions have to be bound to the research programs and the orientations of the economic sector to increase productivity and ensure food security, and to transfer knowledge through research findings for sustainable development of the country.

The evaluation of scientific production in the Algerian agricultural sector via bibliometrics can be analyzed by scientific publications in national journals of agronomy. In this study, we focus to two main journals in this field: the *Annals of National Institute of Agronomy* (INA; now: ENSA) and the *Review of Agronomic Research* of the National Institute of Agronomic Research of Algeria (INRAA). At the particular time of research these two journals were considered as the most important and oldest periodicals in the field of agronomy in Algeria. This evaluation study is seen as an approach for helping decision-making and management of scientific research.

## 2. METHODOLOGY

There are many descriptive studies that identify the scientific production in the field of scientific networking. Some trace this research field back to the psychologist James McKeen Cattell (1903), who used the counts of scientific publications and citations to make quantitative and qualitative statements about the scientists (as cited after Godin, 2006, as cited after Jovanović, 2012). And in the 30s of the last century the sociologist Robert K. Merton (1973) took bibliographical categorizations of journal articles of the 17<sup>th</sup> century as data for his research on the development and change of research interests. Tunger (2017, p. 390) states that publications on bibliometrics are more growing than the scientific production as such, not at least as a reaction on the demand for more output oriented research. According to Rostaing (1993), the "characteristic of bibliometrics is to enable studies on publications, on quantitative data and not simply subjective (peer opinion). These quantitative data are calculated from statistical counts of publications or of elements extracted from these publications". Indeed, Okubo (1996) reports that "the analyses on cooperation permit to depict the scientific networks, and highlight the established relations between countries, institutions, or researchers, the analysis of a big program, the structure of scientific disciplines and their mutual relations".

Salaün and Van Cuyck (1999) explain these network relationships by saying "the connection of different individuals in a process of more global communication implies the possibility of developing personal knowledge (in the individual sense) and collective knowledge (that emerges from the group and is brought to the group as a whole [...]). In addition, the way to disseminate information, the nature of the links that are formed between individuals, the density of the relationships that are formed [...] modify the different characteristics of the networks and imply networks shaped according to the social connections that structure the individual members of the network". In this sense we continue an older study for the years 1939-1999 (Slimani Rahima 2005) and take the collaborative partnerships in the field of agricultural research in Algeria for our evaluation study of scientific production from the *Annals of the INA* (2000- 2008 with 72 articles, later stopped) and the *Agronomic Research Review* of INRAA (2000-2009 with 167 articles, 2008 was an unusual year as it contained the proceedings of a seminar on Biotechnology, additionally).

Also, we evaluate whether these themes dealt with correspond to the National Agricultural Development Plan (NADP) and the National Research Programs (NRP). These programs were adopted by the NADP and the actions to be implemented within a five-year perspective 1996-2000 (PNDA 1997). For the NRP, the program focused on the five-year projection on scientific research and technological development 1998-2002 (PNR 2008). Accordingly the publication years were selected.

The earlier scientometric study of Slimani Rahima (2005) had been carried out only on the "*Annals of the INA* of El-Harrach". This analysis was on several levels: the quantification of publications, the

chronological evolution (date of publication), the location of the authors (institutional affiliations), the origin of the authors and finally the indexed themes). Now our main analysis objectives are:

- 1) The enumeration of the scientific output of researchers.
- 2) Identification and enumeration of major themes.
- 3) Co-publications as indicators for scientific collaborations.
- 4) A comparative analysis between the two journals.

### 3. RESULTS AND DISCUSSIONS

#### 3.1. EVALUATION OF AGRICULTURAL SCIENTIFIC PRODUCTION THROUGH THE *ANNALS OF THE NATIONAL AGRONOMIC INSTITUTE OF EL-HARRACH (2000-2008)*

##### 3.1.1. Distribution of the articles of the *Annals of the INA* by year of production

This distribution by year (Figure 1) allows us to visualize the evolution over time. In the period 2000-2001, we see that the magazine has a mean publication rate, comparable to the period (2006-2008), whereas between 2001-2002 and 2004-2005 there is a small decrease. 2004 is mostly represented (10 articles).

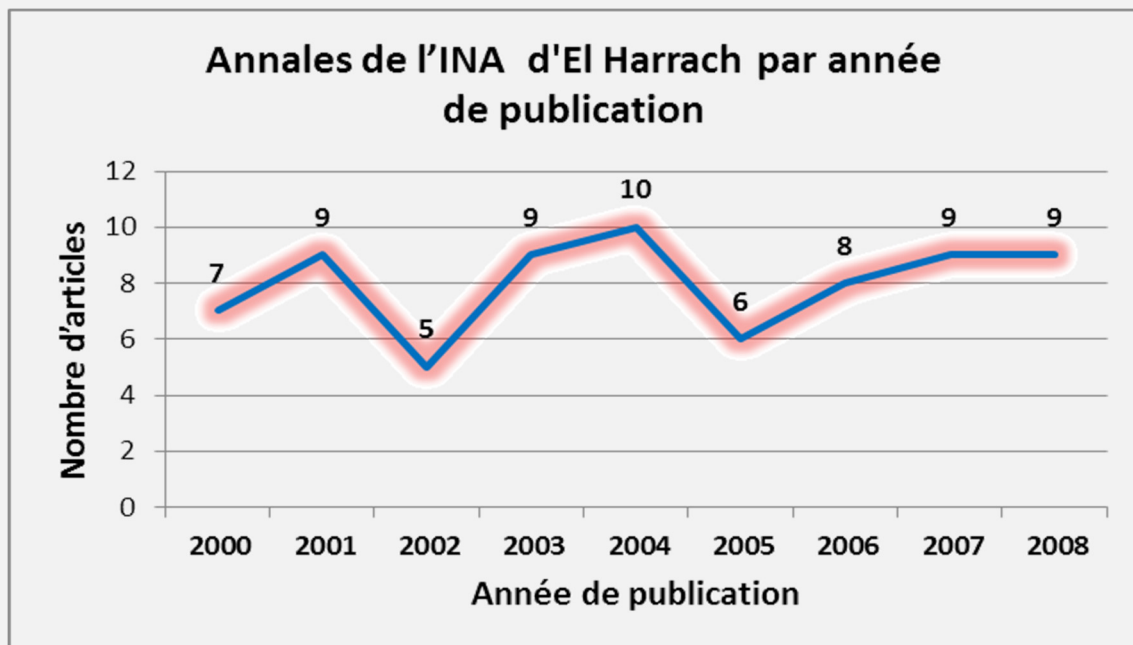


Figure 1: Distribution of the articles of the *Annals of the INA* by year of publication

##### 3.1.2. Scientific production of the *Annals of the INA* by geographical area and by research laboratories

We find that 93.75% of the articles in the *Annals of INA* originate from Algerian laboratories, of which 59.43% result from laboratories of the city of Algiers. 34.32% of the articles are from 16 laboratories in other national cities, but each with a very low rate (Figure 2). Only 5.85% come from foreign laboratories (Tunisia, France and Switzerland). This reveals that during this period of 2000-2008, ENSA (formerly: INA) was little integrated into international scientific cooperation.

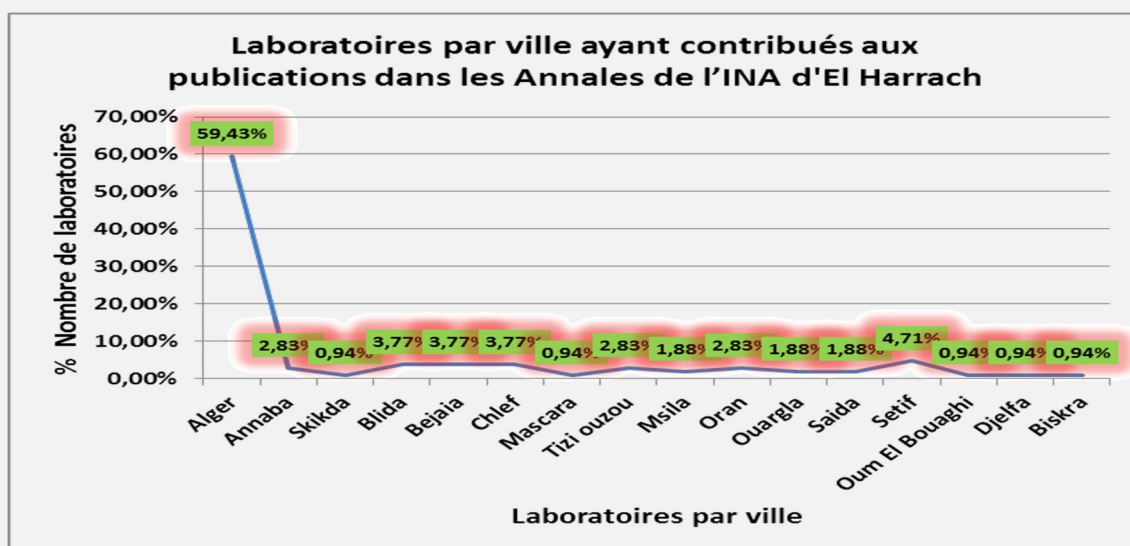


Figure 2: Distribution of laboratories (resp. cities) having contributed to publications in the *Annals of the INA*

### 3.1.3. Contribution of research laboratories to scientific production

41 laboratories in the nine years period contribute to publications in the *Annales de l'INA*. The Laboratory of Agricultural Machinism is heading in 2007 with four publications and in 2008 with three articles. The Laboratory of Biology and Physiology of Organisms holds the second place, with three publications for each year 2005 and 2006. The Laboratory of Genetic Resources and Biotechnology publishes once in each of three successive years (2002-2003-2004). The other laboratories are only able to launch one publication in this period 2000-2008).

### 3.1.4. Scientific production by department

The departments of "Animal Breeding" are the most productive ones, with a total of 27 published articles. Next are the departments of "Phytotechnics" and the departments of "Agricultural Engineering", with a respective total of 16 and 14 articles. This is followed by a total of 9 articles for the departments of "Food Technology". The rest of the departments publish only one article each.

### 3.1.5. Scientific production by subject area

In the *Annales de l'INA* are mostly represented Livestock Production and Crop Production, besides Biology in general. These two subject areas hold 15% and 14%. They are followed by specialized subject areas, which each represent 8 to 10% of published articles. A relatively low profile is represented by the themes Genetic Resources and Biotechnology as well as Biology and Physiology of Organisms with a rate of 7% and 6%. As for other subject areas: they do not exceed 1% of the publications. Examining whether these themes correspond to the National Agricultural Development Plan (PNDA 1997) and the National Research Programs (PNR 2008) shows that the themes addressed by the researchers correspond with the requirements of these two major national programs.

### 3.1.6. Occurrence of the most productive authors of the *Annals of the INA*

The two most prolific teacher-researchers of ENSA reach a frequency of six papers written in the nine years, for the period (2000-2008). Five other researchers contribute with five articles each. On the other hand, 107 authors out of a total of 138 are represented with only one publication. Based on our

exploratory interviews with the most prolific authors, it is found that they have published mostly in the areas of Animal Production, of Machinery, and of Food Technology.

### 3.1.7. Publications co-authored with ENSA

In our evaluation of authors' production in the *Annales de l'INA*, we are also looking at collaborative networks. In a first step, the co-author analysis shows that of the 72 articles published in the *INA Annals*, nearly 36 are co-authored. In this group, ENSA, the journal holder and founder, ranks first, with a contribution of 27 co-authored publications. Here the University of Sciences and Technology Houari Boumediene (USTHB) with its departments Biology and Vegetal Ecology shares seven with ENSA.

At the international level, collaboration of ENSA is restricted only to France, which comes at second position with five co-published articles. These contributions concern particularly the National Institute of Agricultural Research (INRA) and the Center for International Cooperation in Agricultural Research for Development (CIRAD) in Montpellier. But curiously, INRAA only ranks third with three collaborative contributions. But the two research institutions ENSA and INRAA are considered as the hub and the central base of agricultural research in Algeria. Shouldn't there be more synergy in building scientific networks?

### 3.1.8. Synthesis of the quantitative analysis of the *Annals of the INA* of El-Harrach

Publication of articles in the *Annals of the INA* in El Harrach is more or less constant for the period under investigation (2000-2008), with the exception of the year 2002. The publications differentiated by geographical area and by research laboratories reveal the tenacity of research laboratories acting at the national level.

Although scientific production by departments focuses on "Zootechnics", "Crop Farming" and "Rural Engineering", it is primarily specialized in Animal Production and Plant Production. Secondly, it devotes itself to other very diverse disciplines, such as: Food Technology, Mechanizing, Ecology, Hydraulics. In contrast, the themes of Ecology of Marine Environments, Soil Sciences, Economics and Information are mostly marginalized by scientific writings. However, the various themes dealt with are in fact in line with the country's economic development programs.

As for the frequency-based analysis of the authors, there is a limited number of prolific ones together with a general low prolific rate. Finally, the networks of collaborations are expressed by a strong national contribution between the ENSA and the USTHB. On the international level it is only France which is represented with two prominent centers.

## 3.2. EVALUATION OF AGRONOMIC SCIENTIFIC PRODUCTION BY THE *AGRONOMIC RESEARCH REVIEW* OF THE NATIONAL INSTITUTE OF AGRONOMIC RESEARCH OF ALGERIA (2000-2009)

### 3.2.1. Distribution of the articles of the INRAA *Agricultural Research Review* by year of publication

The number of publications in 2000 is significantly lower than in the later years (Figure 3). The outcome more than doubles in 2001 but decreases then somewhat till 2004 and to mount in 2005 again and to rise on a higher level between 2005 and 2008, with an average of about 20 publications. When we add the special issue with proceedings of a seminar on "Biotechnology at the service of the agri-food sector"



in 2008 (in the graph represented as an extra year) it shows a remarkable increase on further 33. As a counter balance, in 2009 it is followed by a decline on only ten articles.

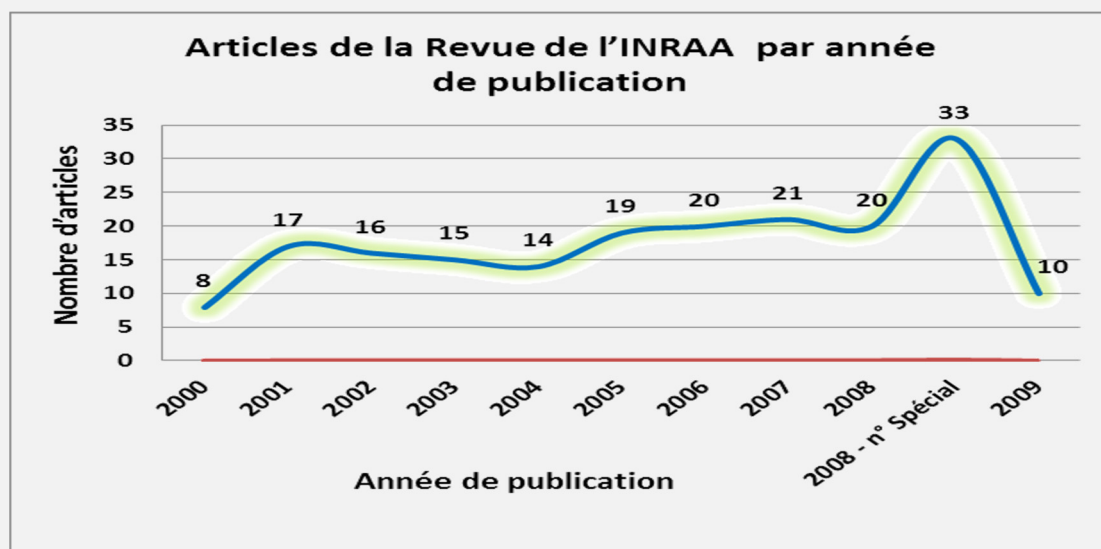


Figure 3: Distribution of articles in the INRAA *Agronomic Research Journal* by year of publication

### 3.2.2 Scientific production of INRAA's *Agronomic Research Review* by geographical area and by research laboratories

Figure 4 shows that the contribution of laboratories is centralized on the city of Algiers with a total of 67 laboratories (40%). Among the 57% of laboratories belong to other cities in Algeria, University of Blida and Sétif are mostly present. The participation of Algerian researchers is very dominant, with 163 articles published in the period 2000-2009 (Figure 6 b). Only a small number of scientific production comes from the neighboring Maghreb countries (Tunisia and Morocco) with a respective total of 2 articles (1%).

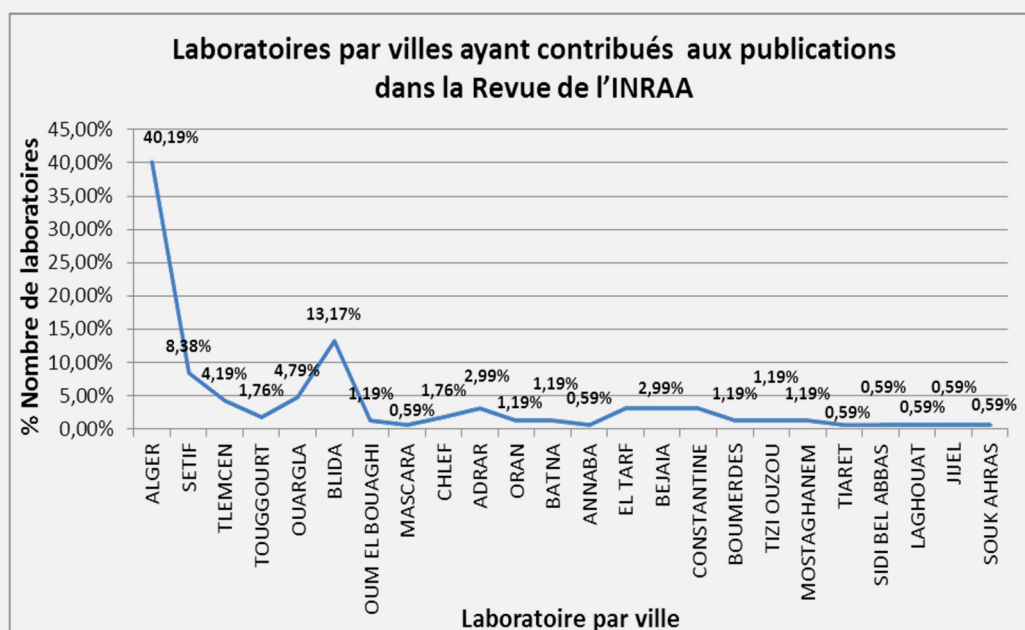


Figure 4: Distribution of laboratories (resp. cities) having contributed to publications in the INRAA *Agronomic Research Review*



### 3.2.3. Scientific production by specialty

Two disciplines of equal importance with respect to the socio-economic aspect are lying in front. The Crop Production produces the biggest number of articles with a total of 38 (26.5%) and is followed by the Animal Production which 28 items (20%). The theme of Economics (and Rural Sociology) as well as the Physical Environment occupy an average of 10% in terms of productivity. On the other hand, the disciplines of Plant Protection, Zoology, Zootechnics, Bioclimatology, Forestry, Animal Biology are little represented in INRAA's *Agronomic Research Review*. Like the themes in the *Annals of the INA* of El Harrach the themes in the INRAA *Agricultural Research Review* are carried out within the framework of the National Plan of Agricultural Development (PNDA) and the National Programs of Research (PNR).

### 3.2.4. Frequency of occurrence of the most productive authors of the INRAA *Agronomic Research Review*

Two researchers rank first with a total of seven articles published in the period 2000-2009. They are followed by two authors with a contribution of six articles. The rest of the 319 researchers were only able to publish one article each in the period 2000-2009. The most productive authors in the INRAA *Agronomic Research Journal* are grouped on the same themes: Livestock Production, Crop Production and Food Technology.

### 3.2.5. Publications co-authored with INRAA

92 articles of 167 articles published in this journal are co-authored. INRAA, the main publisher of its journal, occupies the first place with 35 articles in co-publication, dominated by a collaboration with the Ecole Nationale Supérieure d'Agronomie of El-Harrach (ENSA), with 27 articles. Obviously INRAA needs to cooperate with ENSA in order to carry out research in shared themes.

On the other hand, the University of Science and Technology Houari Boumediene (USTHB) has very little presence in this collaborative networking process. According to our exploratory interviews with INRAA researchers, they indicate that the USTHB is an institution based on education and training in ecology and environment as a priority. Its mission focuses more on basic research, which consists of experimental or theoretical work undertaken mainly to acquire new knowledge of the foundations of phenomena and observable facts, without really considering an application or a particular use. Contrary, INRAA's scientific research is more aimed at an in-depth framework of applied research. Therefore, it is mainly directed towards experimental development, which consists of systematic work based on existing knowledge obtained through research and/or practical experience, with a tendency to launch the manufacturing of new products, to establish new devices, or to improve existing ones significantly.

From a geographical point of view, the international cooperation network seems to be accentuated with France, which appears with seven publications. More particularly, INRAA mostly collaborated with the National Schools of Agronomy, Dijon, Paris and Montpellier. The neighboring countries Morocco and Tunisia are only represented with a total of three articles in co-publication. For Morocco it concerns the Agronomic and Veterinary Institute Hassan II of Rabat and the National Institute of Agronomic Research (INRA) of Kenitra, for Tunisia the National Institute of Agronomy of Tunis.

### 3.2.6. Synthesis of quantitative analysis of the INRAA Review

We note a certain stability in productivity. Only the years 2000 and 2009 are characterized by a rather low publication rate. The breakdown by geographical area and by research laboratories highlights the predominant focus on the national level in relation to the international level, where only few laboratories from neighboring countries are represented (Morocco and Tunisia).

The scientific specialization is mostly on Animal Production and Plant Production. Other themes are poorly represented, such as Plant Protection, Zoology, Zootechnics, Bioclimatology. But the main themes are in line with the country's economic priorities.

In this scientific production, some most eminent occurring researchers are accompanied by a majority of authors who appear only once. Regarding the share of co-publication between national organizations, we observe ENSA in the writings of the INRAA, but less the USTHB. Articles are co-authored with foreign bodies from France and the Maghreb countries only.

## 4. COMPARATIVE STUDY OF THE TWO JOURNALS

The production of the *Annals of the INA* in El Harrach is more or less constant for the period 2000-2008, with the exception of the year 2002 and 2005. During the period 2000-2009 the INRAA magazine shows as well a certain balance in productivity, except for the first and the last two years. Here the editors policy might come into effect.

The breakdown by geographical area and by research laboratories shows the predominance of research laboratories at the national level. Though there is an international cooperation with France in the *Annals of the INA* of El Harrach, it remains absolutely very low. Also, only a mediocre interest is focused on the Maghrebian collaboration for the two magazines.

Most articles published in the two reviews are written on Crop Production and Animal Production. Thus not only a coherence exists between the two journals, but also a sufficient adequacy is revealed with the priorities of the economic development programs. The same holds for the lack of certain special fields. Moreover the most productive authors are characterized by shared interests, such as Animal Production, Crop Production and Food Technology.

According to bibliometric laws, very few researchers are characterized by frequent productivity in the two journals studied. The analysis of the cooperations shows a weak tendency towards a networked scientific activity by connecting with national or international bodies. But curiously, the cooperation between ENSA and INRAA is more apparent in the articles of the INRAA Review than in the *Annales de l'INA* of El Harrach. The contribution of the USTHB is also more present in the *Annals of the INA* than in the INRAA *Agronomic Research Review*. Each journal seems to refocus on itself, either because it does not succeed in encouraging its collaborators, or because its diffusion does not allow a regular contribution of occasional writers.

## 5. CONCLUSION AND RECOMMENDATIONS

This comparative analysis of the articles of the two journals focuses only on a few well-defined themes. But even if the represented research fronts convene with the main expectations of the different primary economic development programs, they remain in a framework of unfavorable institutional compartmentalization between national and international research institutions. In effect the researchers work is only acting within a restricting scheme instead within a one of co-production.

A major problem arises from the impossibility of Algerian researchers to integrate into international exchange networks. Okubo (1996b) states that "scientific creation is still a mostly national act. The co-authorships show that the researchers first count on national knowledge within or between the same laboratories".

We believe that Algerian magazines must react on two major points so that they can fit into the ranks of prestigious and academic journals:

- Internationalization of science through co-publications

Algerian editorial journal boards must imperatively encourage co-publications with foreign bodies and laboratories. Esterle & Filliatreau (2014) confirm the importance of collaborative work when they speak about science and technology indicators: "International co-publications are one of the indicators of the internationalization of science and provide a good measure of the scope and quality of a country's research activity at the international level".

- Reputated journals

According to Durand-Barthez (2005) "the current profusion of scientific publications, which is constantly growing, necessitates qualitative filtering that is increasingly reflected in the quotations. Requiring a researcher to be quoted in high-impact journals is a common institutional behavior". Hence, Algerian journals must reconsider the criteria of scientific production in order to integrate their journals in a much more internationalized science sphere without frontiers.

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