17

A Scientometric Analysis on Documents Associated with Iran on AGRIS

Fatemeh Makkizadeh

Assistant Professor,
KIS, Iran, Yazd, Yazd University
E-mail: makkizadeh@yahoo.com

Abdolreza Noruzy Chakoly

Associate Professor of Scientometrics and
Knowledge & Information Science Department,
Shahed University, Tehran, Iran
E-mail: noroozi.reza@gmail.com,

Mohammad Tavakolizadeh Ravari

Assistant Professor; KIS, Iran, Yazd,
Yazd University

Ali Taherizadeh

Student of English Literature in
Yazd University

Introduction

Agriculture sector is considered among high-priority sectors in development plans of the Islamic Republic of Iran, whereas a considerable part of goals set in the country's national and upstream documents deal with agriculture. The country's main responsible authority for developing the sector is the Ministry of Agriculture. However, academic centers and research institutions have also been given certain roles and tasks especially in developing agricultural science and technologies. Developing agricultural science can largely support the Ministry of Agriculture

and its subdivisions, since development of modern and scientific agriculture mainly depends on agricultural science.

Nowadays, scientometrics enables us, through specific tools and methods, to measure science in different spheres and areas including agriculture and its associated sciences. Through scientometric, one can figure out how efficiently each and every university or scientific institute is performing its tasks. It is now possible to estimate under which circumstances those universities and institutes have managed to play their roles. Moreover, one could evaluate Iran's strengths and weaknesses in agricultural subdivisions so that the country's decision-makers in the sphere can be given required information on management and data.

Since the articles and documents published in authentic international specialized indexes are considered as the pivotal symbols of science production in each area, content analysis of the articles is implemented in order to follow up scientific development in each area. Such analysis is one of the numerous conventional investigations in scientometrics which can be to a large extent effective in identification of trends and developments in every area. However, it is necessary for the analyses to be performed on articles and documents which have been published in specialized and authentic agricultural databases.

One of the most important international databases in agricultural sector is AGRIS which is globally accepted and trusted among the researchers. The database has a long history, diverse documents, high-quality articles, and uses high standards in evaluating and selecting journals, while it has many other outstanding characteristics including comprehensiveness of subjects and geographical coverage. Such unique characteristics make it possible to analyze agricultural articles through scientometric and present the results based on the documents provided by the database. The articles published on this specialized database are often very interesting for the agricultural sector researchers as such articles are up-to-date and short enough, while they easily transfer the results to the readers and introduce the latest researches in a simple way (Agris and Caris, 1990). It should be considered that the articles and their scopes continuously grow in number on the database in a way that they have helped increase the number of agricultural subdisciplines. Growing the number of agricultural subdisciplines, like any other scientific field, depends on numerous factors among which the scope of research for each subdiscipline on the database is of great importance. Therefore, since the published articles on the database act as facilitators of knowledge development in the sphere, they can be seen as tools to establish scientific relationships. Based on specific scientific language, these articles inform the researchers of the latest and most credible scientific and research achievements so they play a crucial role in promotion of science.

Methodology

This research is by essence among the applied researches of scientometric using co-words analysis and clustering. It has been structured based on content analysis method.

Content analysis is an authentic method through which scientometrics could be performed on articles and generated documents in each sector and necessary analyses would be available. The method is considered as a research method and analytical tool in many researches in different disciplines in particular information science and its interdisciplinary fields. The content analysis method is disciplined, objective and quantitative while it is used for analyzing obvious messages of articles through statistical means. It is also the most common experimental approach for analyzing documents. Hence, using content analysis method enables us to present more realistic results and analyses of scientometric on knowledge content produced by researchers in Iran's agricultural sector.

The statistical population is the published documents associated with "Iran" on AGRIS. The keyword "Iran" was searched on the database with limited span of 2005-2014 and the extracted records were saved in 500-record Excel files. In order to implement required analyses, the data in each section (author, journal titles, and the year of publication, article language, and keywords for subject) were separately saved on a personal computer in PreMap software. The data were then extracted into Tab delimited-UTF8 based on text file Notepad and transferred into Excel files. In the next stage, the data were uniformed and 70 keywords were chosen as base words based on Bradford's method. These keywords were taken as main concepts and were considered as the basis for further analyses in the research. Based on Bradford's method, the keywords are divided into three categories: core, close to core, and far from core. In this research, the first group was recognized as the core subjects including 70 basic keywords. By identifying the base subjects, co-subject matrix was made through PreMap (the software makes it possible to make matrices in order to map clustering diagram) and the result was taken into a square matrix known as co-matrix. The matrix is a square the rows and columns of which equal the number of selected concepts while every entry represents the number of times when the two keywords for row and column simultaneously come in a document. This matrix is symmetric while the entries on main diagonal co-matrix equal the total number of repetition of the keyword in the entire document. Ultimately, the hierarchical diagram for zones was drawn using SPSS (Version 20) and also intergroup relation method.

Based on what was presented, this research has been planned and implemented for content analysis using data on AGRIS in order to figure out subject dispersion of published articles. In this way, it will be possible to empower less frequent subjects and prevent too much repetition or redundancy of subjects so that the consistency in publishing articles and scientific content will increase and the authors and researchers will be encouraged to go for new and less frequent subjects. Moreover, the Ucinet software was used to facilitate the process and present results in tables and diagrams using different indicators.

Research Goal

The main goal of this research is to review and analyze scientific productions recovered in agricultural sector during 2005-2014 (a ten-year period) on AGRIS

database and also to map the structure of science using hierarchical clustering in order to identify outstanding subjects in the discipline. It is also looking for some scientific clusters formed in the sphere during the mentioned period.

Research Questions

This research seeks to answer the following questions:

1. How has the growth rate of scientific productions been in the agricultural sector?
2. What type of content have the agricultural scientific productions been presented in?
3. Which research areas in Iran's agricultural sector have been most active?
4. How big is Iran's share in producing and publishing articles in agricultural journals?
5. What are the main clusters in mapping agricultural scientific productions?

Growth Rate of Scientific Productions in Agriculture Field

The results yielded from analyses showed that growth in scientific production in agriculture field on AGRIS over the period 2005-2014 displays an upward trend such that the number of articles during the period has increased 5 times (Fig. 17.1).

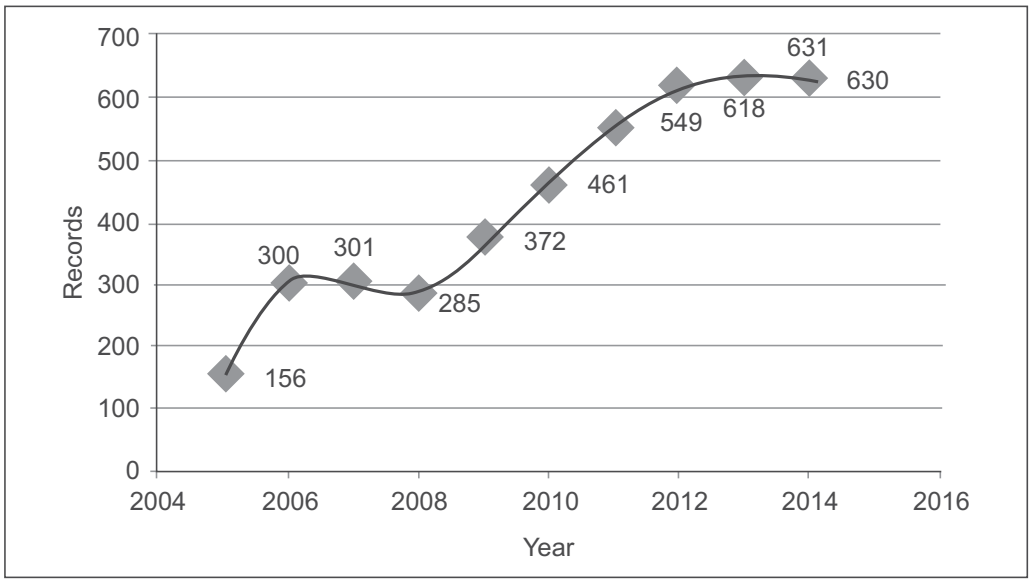

Fig. 17.1: Growth in agricultural scientific productions in Iran over the period 2005-2014

Content type of Retrieved Records on AGRIS in Iran's Agriculture Field

A total of 5,410 records were retrieved on agriculture area which can be seen in the following table separated by content type.

Table 17.1: Content type of retrieved records of agriculture field

Row	Content type	No.
1	Article Journal	4,436
2	Conference	40
3	Bibliography	33
4	Thesis	10
5	Book	3
6	Others	888
Sum		**5,410**

The data in Table 17.1 suggest that the topics in agriculture field are often published in the form of article journal.

The most Active Research in Iran's Agriculture Field

The most frequently used words or the most active research areas in the field were identified through Bradford's Law over the period 2005-2014. Considering the fact that keywords are indicators for the topic, the Bradford's Law shows subject distribution of articles. According to Bradford's Law, the keywords are divided into three categories: core, close to core, and far from core. The first category has been used in this research (70 subject keywords) to analyze data. In order for the diagram not to be overcrowded and efficiently display tags, 20 most frequently used keywords from the first category in agriculture field are introduced over the period 2005-2014 (Fig. 17.2).

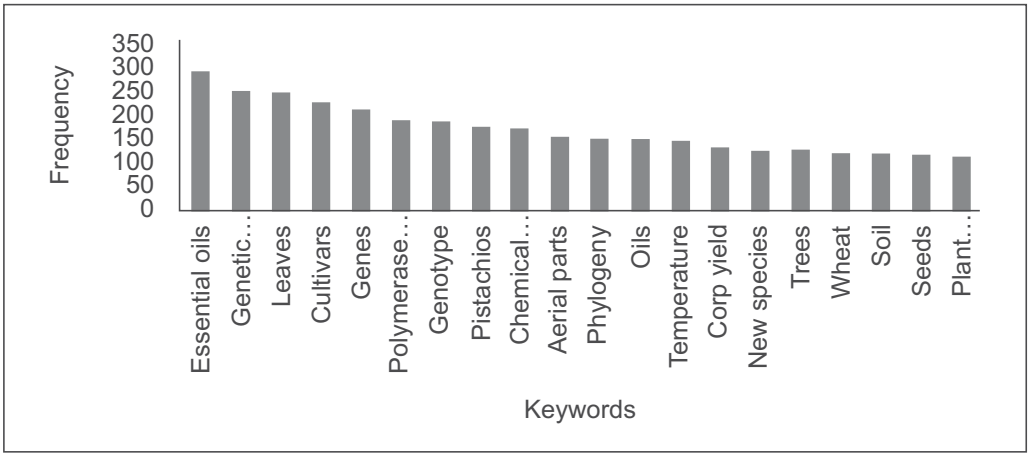

Fig. 17.2: Twenty most frequently used keywords in agriculture field over the period 2005-2014

As it can be seen in the above diagram, the most frequently-used words or the most active research fields over the period 2005-2014 include Essential Oils, Genetic Variation, Leaves, Cultivars, Genes, Polymerase Chain Reaction, Genotype, etc.

Iran's Share in Producing and Publishing Articles in the Core Journals of Agriculture Field

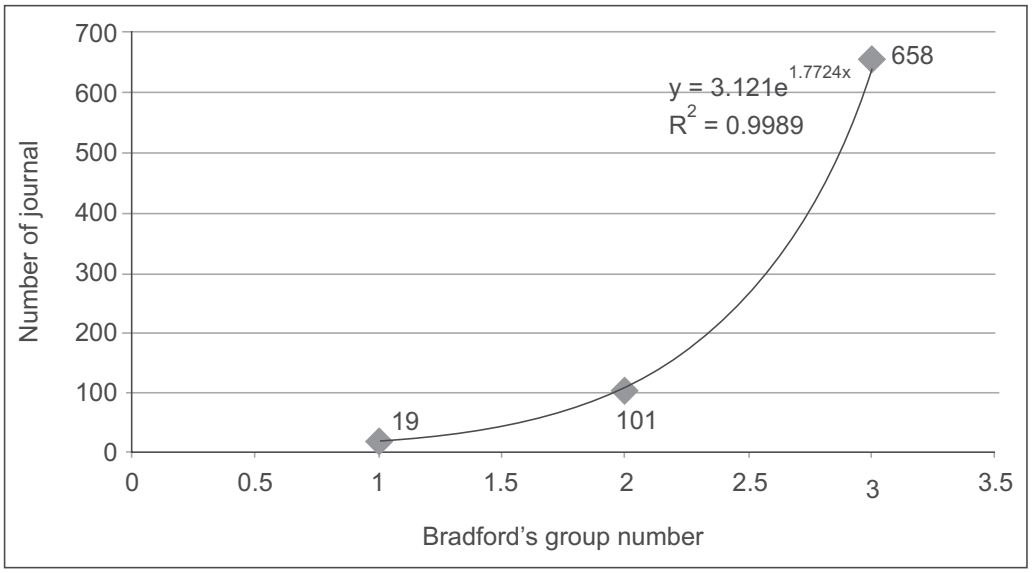

Fig. 17.3: Distribution fitness of scientific documents in Iran's agriculture on AGRIS with Bradford's Distribution

The findings reveal that 4,436 scientific documents were retrieved from 778 journals. According to Bradford's Law, one third of them have been published in 19 journals which are called the core group, while the other one third have been published in 101 journals and the last third have been published in 658 journals. The regression square would be 0.998 which represents a very high fitness with Bradford's Distribution (Fig. 17.2). Table 17.2 below displays ten core journals:

Table 17.2: Core journals based on distribution of scientific documents on Iran's agriculture on AGRIS Database

Row	Journal's Title	Frequency
1	ACTA HORTICULTURAE	412
2	ARCHIVES OF RAZI INSTITUTE	147
3	JOURNAL OF ESSENTIAL OIL RESEARCH : JEOR	122
4	JOURNAL OF ESSENTIAL OIL-BEARING PLANTS	113
5	ENVIRONMENTAL EARTH SCIENCES	66
6	INTERNATIONAL JOURNAL OF AQUATIC BIOLOGY	53
7	WATER RESOURCES MANAGEMENT	51
8	ENVIRONMENTAL MONITORING AND ASSESSMENT	50
9	COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS	46
10	RENEWABLE AND SUSTAINABLE ENERGY REVIEWS	46

Thematic Clusters in Scientific Productions on Iran's Agriculture

After studying all retrieved articles on AGRIS, 14,400 keywords were yielded as a means to cluster subjects for articles related to Iran's agriculture. The number decreased to 12,400 after smoothing and omitting equivalent keywords. Based on calculations, the average number of keywords in every article is almost 5 words. But the total number of keywords decreases since a keyword might come in multiple articles. This is while the frequency increases. Using the Bradford's Law, 70 keywords were chosen as core topics out of the entire keywords and clustering was performed over them.

After core topics were identified, cosubject was calculated through PreMap. In other words, it was figured out that in how many articles has each key subject of agriculture field commonly appeared with other subjects of the area? Since there were 70 key subjects, it was done 70*70 times (4,900 times) and a matrix was formed consisting of 4,900 cells with 70 rows and columns. These matrices made hierarchical clustering possible through Between Group Method. The result of clustering can be seen in Fig 17.4.

As seen in Fig 17.4, at distance 15, a dotted line has been perpendicular to the diagram which is called indicator line drawn by a thematic specialist. On the left side of the index line, there are keywords all in the same cluster.

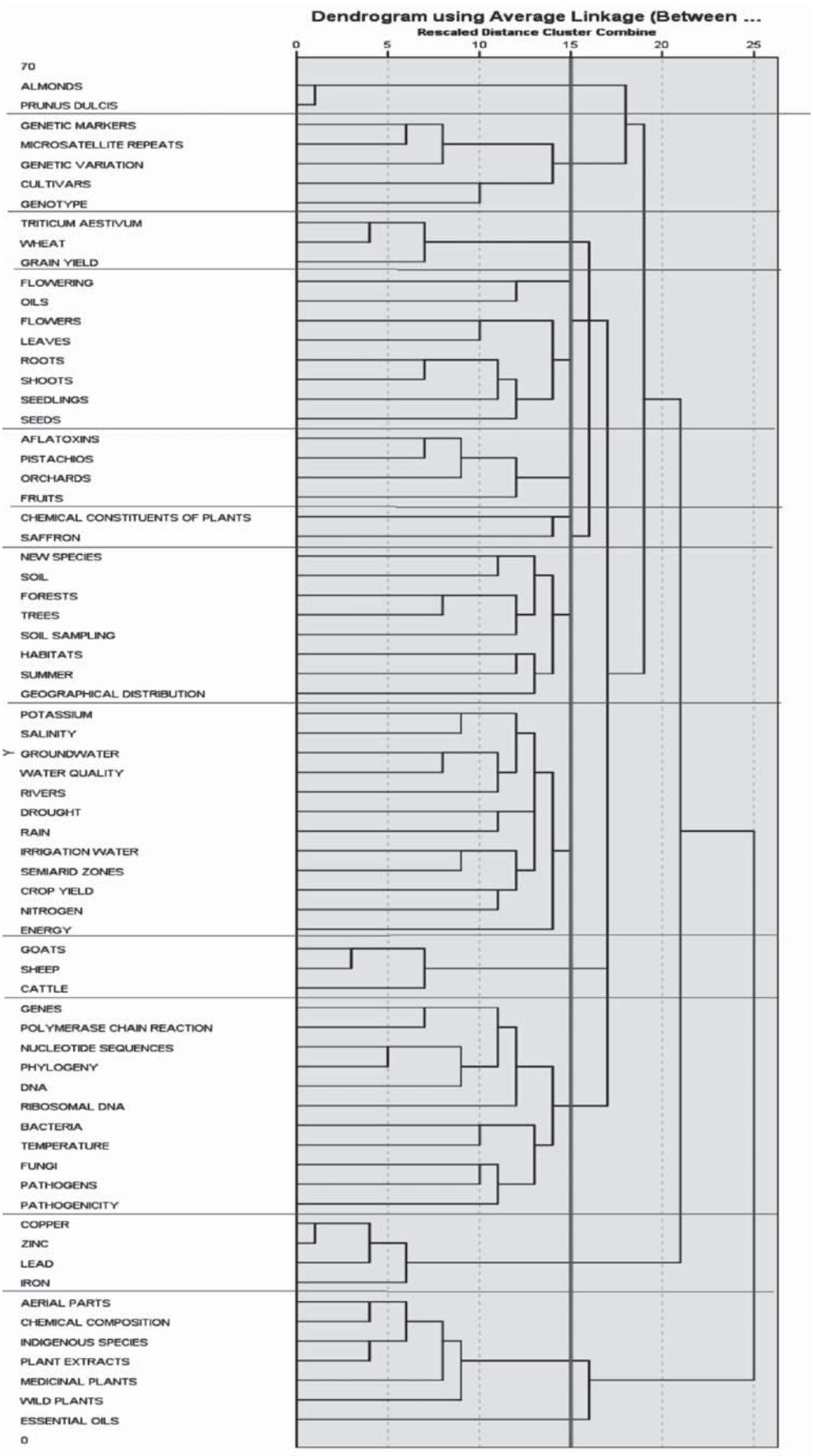

Fig. 17.4: hierarchical clustering of Iran's agriculture field on AGRIS

Table 17.3: Thematic clusters of Iran's agriculture field on AGRIS Database

Descriptor	Cluster Name	Cluster No.
Almonds, Prunus Dulcis	Almonds	1
Genetic Markers, Microsatellite Repeats, Genetic Variation, Cultivars, Genotype	Biotechnology and Genetics	2
Triticum Aestivum, Wheat, Grain Yield	Wheat	3
Flowering, Oils, Flowers, Leaves, Roots, Shoots	Plant Anatomy	4
Aflatoxins, Pistachios, Orchards, Fruits	Pistachios	5
Chemical Constituents Of Plants Saffron	Saffron	6
New Species, Soil, Forests, Trees, Soil Sampling, Habitats, Summer, Geographical Distribution	Afforestation	7
Potassium, Salinity, Groundwater, Water Quality, Rivers, Drough T, Irrigation Water, Semiarid Zones, Crop Yield, Nitrogen, Energy	Irrigation and Water Resources	8
Goats, Sheep, Cattle	Animal Science	9
Genes, Polymerase Chain Reaction, Nucleotide Sequences, Phylogeny, Dna, Ribosomal Dna, Bacteria, Temperature, Fungi, Pathogenicity, Pathogens	Plant Medicine	10
Copper, Zinc, Lead, Iron	Metal Contaminants	11
Aerial Parts, Chemical Composition, Indigenous Species, Plant Extracts, Medicinal Plants, Wild Plants, Essential Oils	Medicinal Plants	12

In the current research, thematic clusters have been investigated regarding the co-occurrence in texts on agriculture. That is why created clusters, contrary to the inventory of controlled phrases like thesaurus, do not represent general and specific relationships between the cluster members (keywords). These categories show hidden relationships between the subjects which are not discoverable through mind-centered approaches. In order to analyze thematic clusters, 70 subject keywords in the research have been divided into 12 subject areas based on their concepts (Table 17.3). Then, an analysis will be presented for subject relationships.

Cluster 1: Almonds

Almond is a unique crop which, in addition to its food value, has wide applications in the Iranian traditional medicine for its leaves, shell, syrup, and oil. Many pharmaceutical experts and traditional medicine specialists are still working on and studying the seed.

In addition to domestic consumption, almond is being exported from Iran every year. Through efficient management and strategic plans, Iran is seeking to increase its share in the global almond market. Such objective will be met through research and training the farmers.

Cluster 2: Biotechnology and Genetics

Biotechnology is a technology born out of biologic sciences and knowledge in agriculture, medicine, and engineering. The resultant technology is based on living creatures or their products and serves to produce materials, products, services as well as meeting human or environment's needs. Biotechnology is considered as one of the key disciplines in the world. Application of this technology during the past decades has made the developing countries feel the necessity to use it so they have started investing in the sector. One of the usages of biotechnology is in the agricultural sector where today's progress in the global agriculture owes to scientific achievements in investment and production of biotechnology sciences. The agricultural biotechnology, also known as agritech, can have a broad range of applications in vegetal agriculture, livestock production, agricultural microbiology, food products, manufacturing new products, and environment. The societies with more advanced science and technology can benefit more from the achievements and advantages of biotechnology. Efficiently seizing the opportunity requires infrastructure and suitable conditions.

Cluster 3: Wheat

Apart from its commercial aspect, wheat is an efficient weapon in political and global arena with growing influence. Just like energy, wheat is a strategic good which is considered as a crucial agricultural indicator. Currently, a significant capacity of Iran's agriculture sector is allocated to wheat. Among all the food products, wheat has always been unrivaled. Providing food security and self-sufficiency in agriculture sector is of high priority in economic, social, and cultural development plans and is on agenda by policy makers and officials. Therefore, a special attention is paid to wheat as a strategic crop which is directly or indirectly the main part of people's food around the globe.

Cluster 4: Plant Anatomy

Since human's life is intensely interwoven with plants and vegetation, wide and diverse researches have been implemented regarding the structure and growth of plants. Diversity of vegetation on the Earth has caused numerous proficiencies in scientific centers around the world. Iran, as a country with diverse vegetation,

requires knowledge and technology in plant anatomy and botany. Research on plants in a country like Iran is in fact an investment for the future of the endangered environment.

Cluster 5: Saffron

Nowadays, promoting non-oil export is seen as one of the most crucial development strategies for Iran's mono economy. Taking into account Iran's capability in producing and exporting saffron, the spice can become one of the axles of non-oil export. Historically, saffron has been of great importance in the evolution of Iran's agriculture, being interconnected with social, economic, cultural, and environmental values in the agricultural societies which produced the crop. Production, processing, trade and consumption of the precious spice have been traditionally formed based on the indigenous knowledge of the societies. Research on saffron has a long history with a growing trend in Iran and also in the world.

Cluster 6: Pistachios

Pistachios are among the most strategic agricultural products in Iran with extraordinary importance in different economic, social and environmental aspects. The value of manufacturing the product accounts for 10% of the total non-oil revenues in Iran (Rafiee, 2015). As the last cultivable crop in pistachios orchards in Iran, the seeds are categorized as the first and foremost export crop. The crises caused by salinity and lack of water on the edge of the dessert on one hand and droughts in recent years on the other, have created a catastrophe where the production of pistachios is merely possible through advanced research and technology. Hence, the output of research on pistachios is remarkable.

Cluster 7: Afforestation

According to the latest statistics, Iran holds a total of 14.2 million hectares of forests (either natural or planted), close to one million hectares of which are planted. Today, afforestation is the primary source to supply wood and it is among the leading factors to reduce deforestation. Those in charge of the country's forest sector require data on woodsy vegetative characteristics in order to make wise decisions and manage farming operations in the forests. Precise and up-to-date information is required for different goals, such as forest management, health protection, biodiversity, climate change impacts, and diverse natural causes. Such information is gained through researches and studies in the area. Afforestation has also been given importance in other researches (Zamani, Azizi and hayati, 2008).

Cluster 8: Irrigation and Water Resources

Specific climate conditions in Iran, as a dry land with poor temporal and spatial distribution of rainfall and high evaporation of water causes a situation in which production of any crop depends on efficiently and reasonably utilizing the limited sources of water. Actually, nowadays water and irrigation are considered as the

most important input in producing crops while it is also the most restrictive factor in developing agriculture. Moreover, the water crisis in international, regional, national, and local scales gets worse by sewage, runoffs, urban garbage, floodwaters and industrial sewage. Under such circumstances, a desirable management to confront the crisis can be troubleshooting. The results by the research in this field will help the government and the responsible bodies pay attention to preservation of water and efficiently utilizing water in their short-term and long-term planning so that they can make decisions based on the research results.

Cluster 9: Animal Science

Animal Science is composed of a group of sciences and techniques utilized in nutrition and health, genetics and modification of crops, physiology, and management as well as poultry and livestock farming. Human's nutritive needs are either met through agriculture production or livestock farming. The latter is known as the best source of supply of problem to societies. The importance of the issue has caused tremendous technical improvements in supply chain of protein resources in the developed countries. As for the country's livestock value which exceeds 75 trillion rials (US$ 2.372 billion based on official exchange rate in Iran) for over 150 million livestock units (Qaee and Safdari, 1387), maintaining such a valuable capital has acted as a propeller for the researchers and scientists in this area.

Cluster 10: Plant Medicine

With regard to pivotal importance of agriculture in nutrition and economy of a country, achieving self-sufficiency and economic independence will guarantee political independence as well. Therefore, any attempt to increase agricultural products is crucially valuable. One way to increase the crops is to curb losses incurred by pests and plant diseases which inflict huge losses annually. It is necessary to replace traditional pest control methods with modern scientific ones so that production increases and the import of agricultural crops decreases.

Cluster 11: Metal Contaminants

Emergence and accumulation of different metals, in particular the heavy metals, is among the problems the modern human is facing following anti-environment activities. Lead and zinc are the main pollutants and contaminants among heavy metals, as agricultural crops contaminated with these two elements can highly endanger human's health. That is why utilizing different organic and mineral materials to eliminate or filtrate metal contaminants of soil is considered as one of the important research areas.

Cluster 12: Medicinal Plants

Nowadays, everyone has come to know the importance of medicinal plants, and the great role the Iranian traditional medicines play in promotion of health,

pharmaceutical self-sufficiency, job creation, and economic development. Iran, as one of the seven Asian countries with the highest amount of herbs and medicinal plants, has witnessed a remarkable increase in the consumption of medicinal plants during the past three decades as people have once again turned to traditional medicines.

Based on the statistics in hand, there are more than 130 types of medicinal plants in Iran (Ghasemi, 2010). Since a year ago, medicinal plants have found a more systematic position following scientific and professional developments. Formation of the National Council for Science and Technology Development of Medicinal Plants and Traditional Medicine, establishment of the School of Traditional Medicine, founding traditional medicine clinics and research centers as well as training physicians and pharmacists are all considered as signs of an upheaval in the Iranian traditional medicines and herbal drugs.

Discussion and Conclusion

The results yielded by analyzing data suggest that the growth in scientific productions of Iran's agriculture, indexed on AGRIS over the period 2005-2014, have shown an increasing trend in a way that the number of articles published have doubled in the last six years (2009-2014). Growth of scientific resources in other subject area during the recent years has been approved through researches by Hou et al. (2015) on life cycle assessment (Hou et. al, 2013), Mahdyzadeh Maraghi, Nazary, and Minaee (2013) on Massage Therapy (Mahdyzadeh et.al, 2013), and also researches on agricultural area (Zamani, 2016).

Studying the distribution histogram of usage of journals in related documents (diagram 2) revealed that the histogram complies with the Bradford's Law, helping with identification of 19 core journals over the period 2005-2014. In terms of compliance with the Bradford's Law, the achievements of this research are in agreement with those of the research conducted by Mokhtari on Colonic Neoplasm Etiology (Mokhtary, 2015) and also the research by Fattahi et al. done on the global status of Ferdowsi University of Mashhad in science production on the university website in the years 2010-1990 (Fattahi, Danesh and Sohail, 2011).

Clustering is in fact the process which organizes elements into groups and categories with similar components. A cluster is a series of elements that are similar and are heterogeneous with other clusters' elements. Clustering aims at fast and reliably achieving correlated information and discovering a reasonable relationship between them (Jain, Murty, and Flynn, 1999). Therefore, noticing the clustering process of agricultural subjects can significantly help recognize trends and basic concepts of the area and finally help develop and promote the area. Implementing the clustering in the present research revealed how bibliographic databases such as AGRIS can be exploited for applications other than merely searching and retrieving documents suitable for information needs. By analyzing subjects related to documents (descriptors), the wide range of sporadic information was grouped into 12 clusters. Different established clusters have structural relationship with one another with common intergroup characteristics.

Considering the research findings, Iran's agriculture field is of crucial importance regarding its causes, effects and impacts in terms of crop production (clusters 1, 3, 5, and 6); animal science (cluster 9); plants (clusters 4, 7, 10, 11, and 12) and water resources (cluster 8). Therefore, it can be anticipated that promotion of agriculture has a communicative-informative essence with varied goals including globalization of agriculture, commercializing agriculture, enhancing efficiency in agriculture, empowering farmers and beneficiaries, and facilitating participation of local groups as well as forming non-government associations within development programs.

As it can be seen in subject areas of these 12 clusters, the research findings confirm that the majority of researchers mainly worked on protection of plants and plant medicine. In the other words, subjects as diverse as biotechnology and genetics, genotypes, heavy metals, DNA, pathogenic and pathogenicity can be seen in the clusters. Each one of these subjects sit in one cluster together with subjects related to plant sciences, such as trees, forests, new species, bacteria, temperature, lead and zinc. This has been endorsed by the findings in a research by Vaziri (2010) (Vaziri, 2010). In order to enhance the efficiency of agricultural products and ultimately to bring about self-sufficiency in the country, it is necessary to train experts who can use their knowledge and experiences to practically fight against pests and plant pathogens. Such experts are expected to make the best use of facilities in the country in order to minimize the losses incurred by the mentioned factors and also to play key roles in implementing research and training plans in agriculture technical schools as well as to plan for plant-medicine sector.

Moreover, despite production of a wide range of crops and fruits in Iran, only four products including almond, wheat, pistachios and saffron are each in a separate cluster and have not been adjacent to other subjects. This proves the importance of these products considering the fact that they, especially pistachios and saffron, are globally important. Based on statistics presented by FAO, Iran has shown a desirable performance in exporting pistachios in 2014 and 2015.

The sixth cluster holds subjects, such as irrigation and drought, water quality and ground waters, etc. Unequal distribution and poor management of water resources across the country, water wastage, decline in rainfall, high amount of evaporation, sand storms, excessive use of ground waters and pollution are among the major problems in Iran's water-resources sector. Management of water resources in Iran was not on agenda for many years and was kept away from the public opinion. But following water crisis and its impacts, the issue has now been given importance more than ever.

Overall, cowords analysis and clustering makes it possible to understand the structure of subject relations in an area through similarity measurement methods and the distance between document descriptors. Therefore, the results yielded from the current research will help present clear and acceptable analyses on the current situation, research subjects, important expressions in agriculture field and the relationships between them. Of course, regarding the application of the results of this research, a limitation should be noted that the studied data are from AGRIS database.

In order to further clarify the thematic status of this area, we suggest that researches similar to current research be done on other major authentic databases as may means to fully recognize the area. As the population for this research was foreign resources, a research similar to this can be implemented for domestic resources as well.

References

AGRIS and CARIS Participating centers First joint technical consultation. Rome: Italy 21-25 May 1990 .Rome: FAO.

Fattahi R, Danesh F, Sohail, F. Global status of Ferdowsi University of Mashhad in the years 2010-1990 on the site of the university with the goal of mapping science. Journal of Library and Information Science 2011; 1(1): 196-175. [Persian]

Ghasemi A. Medicinal and Aromatic Plants, identifying and studying their effects, Tehran: Saveh Sara 2010.

Hou Q., Mao G., Zhao L., Du H. Mapping the scientific research on life cycle assessment: A bibliometric analysis. Int J Life Cycle Assess 2015; 20: 541-555.

Jain AK, Murty MN, Flynn PJ. Data clustering: a review arm computing surveys. ACM 1999; 31(3): 295-323.

Mahdyzadeh Maraghi R, Nazary M, Minaee MB. Mapping of Massage Therapy in the Scopus Database, During the years of 2008-2013. Journal of Islamic and Iranian Traditional Medicine 2013; (4): 342-333. [Persian[

Mokhtary M. A Study on Changes in Thematic Map of Colonic Neoplasm Etiology: A Content Analysis of Medline Documents. M.A. Thesis. Yazd: Yazd University, faculty of Social Science 2015.

Qaee Q., Safdari A. Necessity of Veterinary and its importance in economic growth and Public Health, Veterinary Congress, Tehran, Iran (1387), available in http://www.civilica.com.

Rafiee Y. Export of pistachio and factors affecting it. M.A. Thesis Yazd. Azad University 2015.

Vaziri, E. Prioritizing the Pioneer Islamic Countries Based on Their Agricultural sciences Production: A Case Study of Citation Databases and Open Access Journals Iran Agricultural Extension and Education Journal 2010; 6(1): 89-93.

Zamani, Gh. H. Comparative Scientometric Study: A Strategy for Benchmarking in Agricultural Science Development. Strategic Research Journal of Agricultural Sciences and Natural Resources 2016; 1 (2): 119-132 .

Zamani Gh. H., Azizi T., Hayati D. Trend analysis of scientific progress in agriculture and natural resources fields in Iran: a scientometric study. Iranian Agricultural Extension and Education Journal 2008; 4(1): 33-46.

■■■