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كتاب الأبحاث الكاملة للمؤتمر الدولي الرابع للتنمية المستدامة والمجال

4. Uluslararası Sürdürülebilir Kalkınma Kongresi Tam Metinleri

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مقدمة

يواجه العالم تحديات كبيرة في أقامه توازن بين التنمية المستدامة والحفاظ على البيئة من جهة ومن جهة أخرى تحقيق الامن الغذائي والذي أصبح من أولويات الدول بفعل الاحتكار واختلال التوازن بين الطلب والإنتاج، ففي الوقت الذي يواصل فيه الاعتماد على الطرق التقليدية في الزراعة المعتمدة أساسا على تساقط الامطار والاستهلاك المفرط للمياه الجوفية غير المتجددة، فان هذا له أثرا كبيرا على نضوب الموارد الاقتصادية غير المتجددة واستقرار الامن الغذائي بالعالم. ولذلك يتجه العالم إلى مصادر الطاقة المتجددة والبحث عن بدائل تضمن احتياجات السكان وفق مبدا التنمية المستدامة.

وتعد الطاقة المتجددة بأنها الحل الأخير لمشاكل الطاقة والبيئة في العالم، مما يتيح إمكانية الطاقة الرخيصة وغير المحدودة تقريبا الخالية من التلوث، حيث نجد بان العالم يستهلك الطاقة من مصادر عديدة، فمنها المصادر التي تأتي من خامات الوقود الأحفوري مثل الفحم والنفط والغاز الطبيعي، ومنها الطاقة التي تأتي من مصادر صناعية مثل الطاقة النووية. كما يحصل على الطاقة أيضا من مصادر طبيعية مثل الطاقة الشمسية والطاقة المستخلصة من الرياح ومساقط المياه والتي تسمى بمصادر الطاقة المتجددة.

ان المشاكل المتفاقمة من خلال أزمات الطاقة والتخوف من احتلال الامن الغذائي ولاسيما في الدول الأكثر فقر، يستوجب إعادة التفكير بشكل جوهري على المستوى الدولي وفق استراتيجيات مستدامة تحقق الاستقرار على مستوى العالم وتجنبا الوقوع في أزمات دولية ستركز أساسا على الاستغلال العقلاني للموارد الطبيعة واعتماد طاقات متجددة وأساليب جديدة في الزراعة لضمان تحقيق استدامة في الامن الغذائي والحفاظ على حقوق الأجيال القادمة.

د صيد احمد سفيان

رئيس اللجنة العلمية

Preface

The world faces great challenges in balancing sustainable development and environmental preservation with achieving food security, which has become a priority for countries due to the monopoly and imbalance between demand and production, while continuing to rely on traditional agricultural methods based mainly on rainfall and excessive consumption of non-renewable groundwater, This has a significant impact on the depletion of non-renewable economic resources and the stability of global food security. Therefore, the world is turning to renewable energy sources and is looking for alternatives that guarantee the needs of the population in accordance with the principle of sustainable development.

Renewable energy promises to be the latest solution to the world's energy and environmental problems, allowing for the possibility of cheap and nearly unlimited energy, free of pollution, as we find that the world consumes energy from many sources, including sources from fossil fuel ores such as coal, oil and natural gas, and energy from industrial sources such as nuclear power. It also draws energy from natural sources such as solar, wind and watersheds called renewable energy sources.

The problems exacerbated by the energy crises and the fear of the occupation of food security, especially in the poorest countries, require a fundamental rethinking at the international level in accordance with sustainable strategies that ensure stability at the global level and avoid falling into international crises based mainly on the rational exploitation of natural resources and the adoption of renewable energies and new methods of agriculture to ensure the sustainability of food security and preservation of the rights of future generations.

Dr. Sid Ahmed Soufiane

President of the Scientific Committee

ÖN SÖZ

16. Uluslararası Sürdürülebilir Kalkınma Kongresi, 28-31 Ekim 2022 tarihlerinde Antalya'da gerçekleşti. Bu kongre, Saygın Bilim Derneği'nin (Saybilder) organizasyonunda ve Mardin Artuklu Üniversitesi ile Ajloun National University'nıin (Ürdün) ilmi desteği ile düzenlenmektedir. Kongreye 5 farklı ülkeden davetli konuşmacı katıldı. Aynı zamanda Türkçe, İngilizce ve Arapça duyurular yapılarak bilim insanlarına çağrıda bulunulmuştur. Bu çağrılar sonucunda yapılan başvurulardan 28'i Türk bilim insanları tarafından ve 48'i farklı ülkelerden (Cezayir, Filistin, Libya, Mısır, Morocco, Tunus ve Umman) katılan bilim insanları tarafından hazırlanmış toplam 76 sözlü bildiri sunuma uygun görüldü.

Bu kongrede tüm bildiriler üç hakemin onayına sunulmuştur. Hakemlerin en az iki tanesinden olur alan bildiriler programa dâhil edilmiştir. Aksi takdirde bir görüş bildirildiğinde ise bildiriler ret edilerek başvuruları iptal edilmiştir. Bu süreç içerisinden bildirilerin önemli bir kısmına hakemlerden düzeltme talebi gelmiştir. Hakemler tarafından talep edilen düzeltmelerin yapılıp yapılmadığı da özenle kontrol edilmiş ve düzeltilerden sonra kabul mektupları düzenlenerek yazarlarına gönderilmiştir.

Bu kitapta kongrede sunum yapan bilim insanlarının bildirinin tam metinleri yer almaktadır. Kongreye iştirak edemeyen ve bu konulara ilgi duyan kimselerin metinlerden istifade edebilmesini sağlayacak olan bu çalışmanın bilim dünyasına hayırlara vesile olmasını diliyorum.

15.10.2022

Prof. Dr. Şinasi Akdemir

Düzenleme Kurulu Başkanı

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Contribution of Agricultural Technology and Innovations to The Development of Agriculture in Turkey and in The World

RA. Kasım Eren TUNA
Cukurova University

PhD Student Yann Emmanuel MIASSI
Cukurova University

Prof. Dr. Şinasi AKDEMİR
Cukurova University

Abstract

Technology and digital are often perceived by governments and experts as an opportunity to be seized to contribute to the evolution of agriculture, for the benefit of farmers, consumers and more generally society. What digital technologies to develop for this? What are their potential impacts? Although these development boosters have proven themselves in developed countries, they nevertheless remain at an embryonic stage in developing countries. This literature review brainstorms the contribution of technology and innovations in agriculture.

Keywords: Sustainable development, food security, agricultural sector, technology.

1.Introduction

Humans' most instinctive need is food, ensuring food security for over 7 billion people is not easy (Pakdemirli et al. 2021; Ağır et Utlu, 2011). Throughout the world, food systems are undergoing profound changes under the impact of external pressures (climate change, organization of value chains) and intrinsic factors (innovations, reduction in the number of farmers). Food security, the number 1 concern worldwide, is today accompanied by strong requirements on production methods to make them more sustainable as well as on the maintenance of a living rural fabric, around family farming. attractive (INRAE, 2022).

Agriculture in the Caribbean and Pacific countries, for example, faces many challenges. Although their countries depend heavily on agriculture for economic growth, food security and employment, young people see this sector as an unattractive career choice (CTA, 2013).

Even today, agriculture continues to be a fundamental driver of development of countries' economies. Evidenced by figures from the FAO that reveal how agriculture promotes the economy of most developing countries, while historically in industrialized countries very few of them have been able to experience rapid economic growth and poverty reduction without having experienced a decisive influence from the agricultural sector (Martinez and Sanchew

2007). However, statistics only consider agriculture as an "economic" activity, even if it represents a way of life, a heritage or a cultural identity without monetary value (FAO, 2005).

Technologies play a vital role in agricultural production and impact the lives of farmers around the world. Technical innovations such as the plough, irrigation, mills, crop rotation, fertilizers and many others have shaped the history of mankind . Even in our time, where technologies are easily accessible and innovations abundant, the process and impact of applying new agricultural technologies remain complex and difficult tasks and involve multiple risks and unknowns (CIRAD, 2018). To have a positive impact and benefit broad stakeholder acceptance, technologies should be introduced with caution and easily adapted to the requirements of a specific environment (FAO, 2015). They must also be easy to understand and use. It is important that they consider the socio- economic base and existing agricultural practices in order to bring an immediate benefit (World Bank, 2017). Studies listing the initiatives in this area in the countries of the South underline the potential of these technologies, covering a very wide field going beyond the provision of information to farmers: financial services, automation of tasks, traceability and security. food, risk management, management of collective resources (World Bank, 2012).

It was also towards the end of the 2000s that questions about the usefulness of ICTs for providing agricultural advice gained momentum. Since the early 2000s, several works have been published on the potential of technologies to transform the agricultural sector. It emphasizes the necessary evolution of advisory services and ICT towards models governed by demand (demand-driven), as part of a more global approach to agricultural activity (FAO, 2013). In this sense, ICTs offer great potential to support the development of an interactive, comprehensive approach based on farmers' needs (Richardson, 2006). It is with this in mind that this short literature review brainstorms the contribution of technology and innovations in agriculture.

2. Concept of technology

For Mansfield (1970) technology is "a set of social knowledge concerning the industrial arts" and Mélèse (1972) considers it as a subsystem of a company and defines it operationally, at the level of the production workshops, the sales force, etc. The term technology is widely used, but paradoxically its meaning is very varied. There are many definitions of technology (Dussauge and Ramanantsoa, 1985). According to Hawthorne (1971), "Technology is a set of methodical processes based on scientific knowledge employed in production". Judet and Perrin (1971) define "technology as a complex set of scientific knowledge, machines and tools, but also the systematic mastery of an efficient organization of production".

For Nicolas and Tronchon (1979): "Technology is a reflection on technique", that is to say, "a discourse on the explanation of technique and the data of its implementation". Salerni (1979) characterizes it as "a complex of techniques, machines, instruments used to transform raw materials and information. It contains in its structure part of the information necessary for the transformation process. Information to be developed by human labor".

Bizec (1981) designates it as "the set of methods and tools necessary to make, use and do useful things". Finally, Le Duff and Maisseu (1991) describe it as "the organized coherent whole of techniques, tools, materials, methods and know-how, all applications of the contents of the sciences employed for ends most often economic, with the aim of produce marketable goods or services".

3. ICT and agriculture

In the agricultural sector of Mediterranean countries such as Turkey, for example, drone technology, agricultural robots, automatic irrigation, variable-rate fertilization systems and automatic animal milking-feeding systems are their evidence (Pakdemirli et al. 2021). Like all sectors of activity, agriculture has opened to information and communication technologies (ICT). Digital technology is an increasingly important determinant in agricultural and rural development strategies. The use of mobile telephones and the Internet is a typical example of technologies that have become essential, whereas they were only very little adopted by the agricultural world at the turn of the millennium. The adoption of ICTs, and related services, therefore, penetrates an agricultural world connected to modernity and revolution. This leads even an agricultural revolution in the production methods and practices implemented to provide increasingly demanding consumers with food in quantity and quality (Lacirignola et Abis, 2018).

Such global dynamics are spreading in the Mediterranean countries, especially in Turkey. The productive, logistical and environmental challenges for agriculture in this region are considerable. They demand that many solutions be formulated and applied to reduce the risks in this vital sector and to strengthen the food security of populations more broadly. In the Mediterranean, the prospect of an agriculture without farmers, which the aging of agricultural workers everywhere at work is already causing to hover, would constitute a formidable scenario. Socio- demographic in a context where, at the same time, job markets in cities and in other sectors of activity are not expanding (FAO, 2013). Hence the importance of innovation that is socially "intensive" in the context of the technological and digital push in agriculture, inviting the construction of new links between territories and throughout the agro-food chain (Lacirignola, 2018).

Indeed, technology can provide solutions. Fence alert system laser electronics, for example, is one of these innovations (CTA, 2013). This approach has been developed and proven in Jamaica. This invisible laser fence is installed around a property – and triggers SMS messages or voice calls to mobile phones when an intruder crosses it. Invisible to the naked eye, it is undetectable by people ' outside the property ' and it uses a medium that is both familiar and widely available. Today, almost two-thirds of the population have access to a mobile phone. Mobile phones could also help solve another crucial problem for farmers: poor market information and inadequate contact between producers and buyers. According to CTA (2013), an SMS information database (SMS ID) would connect the two parties and allow, on the one hand, farmers to communicate the price of their products by SMS or by phone voice and, on the other hand, to retailers, intermediaries or consumers to find out about the lowest prices of different products, using this same very simple system.

The increased need to improve productive efficiency in Spanish protected agriculture and to adapt production to market demand in terms of sizes, qualities, colors, production dates, etc., as well as the capital importance of sector from an economic and social point of view, would explain the fact that any kind of innovation or technological improvement has a high impact (Morais and Boaventura, 2000). The use of ICT technologies in agriculture can promote better control of the factors that condition production (environmental, physiological variables, equipment management) and facilitate remote access, in such a way that we have the possibility not only to monitor and control remotely, but also what is more important is the possibility of developing an application remotely (Serodio et al., 2000; Martinez and Sanchew, 2007).

4. Evolution of technology in agriculture

According to statistics published by the UN and the FAO, the size of the world population is growing with more than 7 billion inhabitants in 2022 and it could reach 9 billion in 2050. In Turkey for example, the size of the population has increased from 22.5M to 80.8M (Akdemir and Küsek, 2019). This leads to an increase in the demand for food and agro-food products. Meanwhile, the areas of agricultural land are in freefall. Agricultural land areas were estimated at 0.375ha / person in 1970 and 0.215ha / person in 2000 (Figure 1). In addition, economic and political instabilities manifested by civil wars, electoral crises, health crises and the fall of monetary currencies will only increase the gaps between supply and demand for agricultural products. In a context where the world population is growing, we wonder what will happen to household food security by 2050. As a result, we are seeing changes related to the quantity of food demand, the nature of the agricultural products available on the market, as well as the technological tools used in agricultural production.

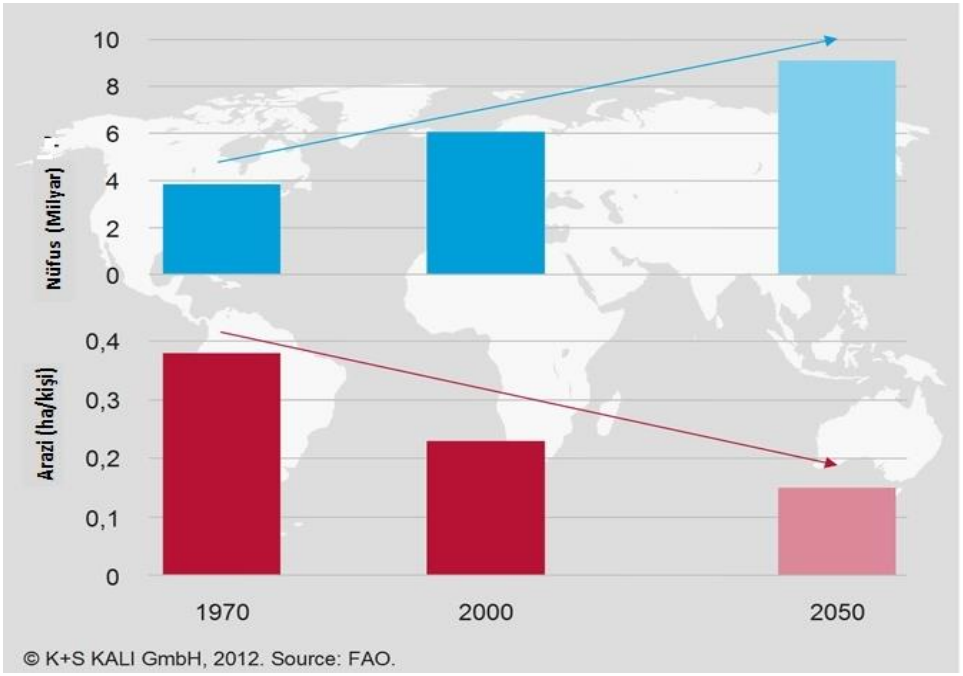


Figure 1: Population world and agricultural land

Table 1: Total population and development of agricultural area in Turkey

Years	Population (Million)	Agricultural land (Million hectare)	Agricultural land used per farmer (Decare)	Number of people benefiting from 1 hectare
1950	22,5	20,5	9,11	1,10
1960	27,7	25,3	9,13	1,09
1970	35,6	27,3	7,67	1,30
1980	44,7	28,2	6,31	1,59
1990	56,5	27,8	4,92	2,03
2000	67,8	26,4	3,89	2,57
2010	70,8	24,4	3,45	2,90
2017	80,8	23,3	2,90	3,45

In agricultural revolution has always been the prerequisite for an industrial revolution. This was the case not only in 18th century England but also throughout the "Western experiment" which saw industrialization spread from Belgium and France from 1820 to the United States . United around 1860 and in Japan in 1880. Recent empirical studies confirm that the role of agricultural technological change remains essential for industrialization. In Brazil, technological progress reducing the labor required for soybean production contributed to national industrialization by freeing up this labor and transferring a financial surplus to the banking system.



Image 1: Tractor used in the early 2000s



Image 2: Tractor used at the beginning in 2022

The use of technology is the panacea to this problem threatening the food security of populations. 79% of farmers today use the Internet. One more proof that digital technology is increasingly present in agriculture. According to Bellon-Maurel and Huyghe (2016), the technology took its first steps in agriculture working in agricultural robotics in the 1980s with cow milking robots. The number of farms equipped with at least one milking robot has multiplied by ten since 2005 and by two since 2010, reaching approximately 4,800 at the end

of 2015. Europe has been a pioneer on the subject: the company Today's market leader Lely, which marketed its first milking robot in 1992 in Holland, sold its 20,000th milking robot in 2014 and also produces a range of robots for barn cleaning and animal feeding. The penetration of milking robots in the USA only started in the 2000s.

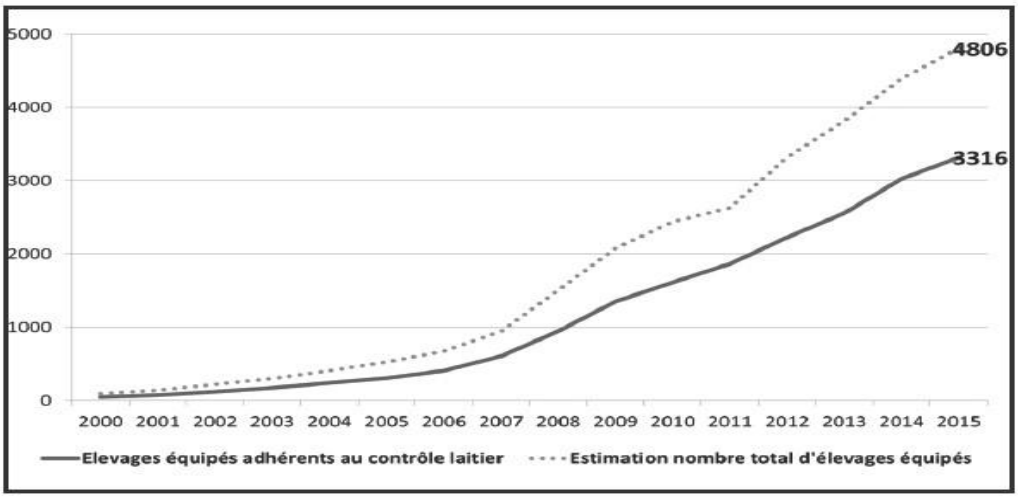


Figure 2: Number of dairy farms with at least one milking robot

The agricultural sector is constantly changing. The integration of new technologies into farms has paved the way for increased productivity and fewer pesticides. Drones, robots, connected sensors are now increasingly used in the agricultural sector in France . During the 2018 edition of the agricultural show which ends on Sunday, 500 square meters were even devoted to these new technologies at the service of agriculture. Because farmers love it. Between 2013 and 2015, the Ministry of Agriculture saw a 110% increase in the use of professional apps by farmers with smartphones. 79% of them use the internet, according to the agriculture-innovation report 2025. Drones are now increasingly used for the collection of geographical data in agriculture (Image 3). Thanks to drones and sensors , farmers also collect data on their crops (Image 4) .

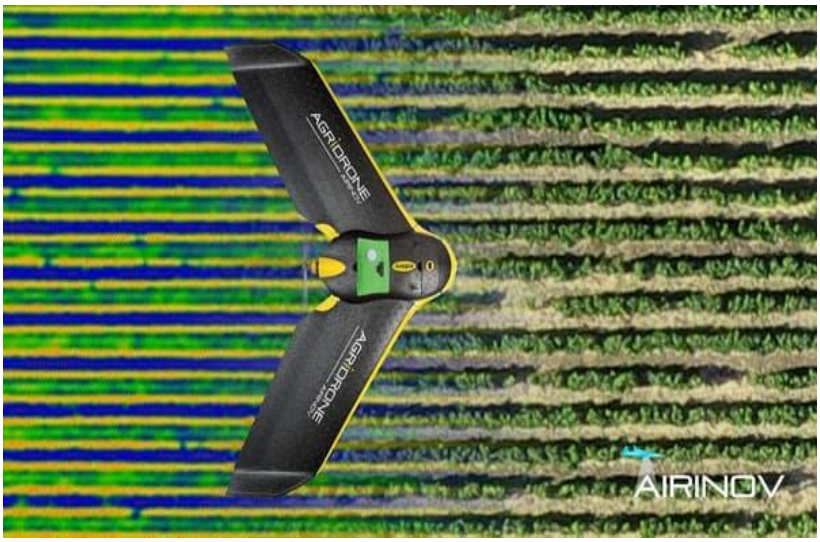


Image 3 : Drone used in agriculture



Image 4 : Sensor used in agriculture

5. Producer risk aversion and food security

Used indiscriminately and without evaluation adapted, technological innovations can quickly evacuate older, proven systems, very specialized and well- adapted, to the detriment of sustainability and food safety (Pakdemırli et al. 2021). In general, people trust proven technologies. Conversely, new technologies risk appearing as a gimmick and/or a tool for the wealthy targeting more income growth than food security. This perception sometimes hinders their acceptance by small farmers, who are traditionally risk averse. Factors that influence the acceptance of new technologies are often, among others, the sex, age and level of education of the farmer, the size of the farm, access to information, ownership or not of title to land, non-farm income and infrastructure (Lacirignola, 2018). The larger the farm, the more self-confidence the farmer has, the higher the level of farm and off-farm income and the better informed he is, the more likely adoption of new technologies is (Richardson, 2006).

On the other hand, agriculture must accelerate its transformation to set up more ecological production systems and to reduce its impact on the environment (reduction of the use of inputs such as antimicrobials, fertilizers, pesticides, use natural resources such as water, reduction of soil compaction and greenhouse gas emissions, better use of biological regulations), even to contribute to the storage of CO2 and the maintenance of biodiversity. For seventy years, agricultural dynamics have favored intensification and specialization. Agricultural sectors are based on price competitiveness, a phenomenon exacerbated by globalization. Basically, they are the object of unbalanced power relations between actors with diverse or even divergent interests. In addition, agricultural activity fits into territories, many of which are specialized, leading to imbalances. The resulting great complexity (in terms of specialization and interdependence of these elements) amplifies instabilities, multiplies the risks of failures and finally constitutes a considerable brake on change. Thus, it is crucial to implement strategies very quickly to improve production techniques and organizational methods of the agri-food system to increase their resilience.

Conclusion

ICT are tools that are well known and used, but are not sufficiently widespread, which makes them a means with differentiating power in the face of competition. In addition, given the heterogeneity between crops, productive systems and even climatic zones, the improvements achieved with these techniques are precise and specific, rather than global, becoming strategic solutions over competitors. Without the appropriate information on prices and contributions,

the consumption of materials raw materials, management and collection of information and new communication techniques, the farmer would find himself very disadvantage to maintain its business in the face of its competition. Therefore, it is recommended to continue working to increase and improve the implementation of ICT, through a "top-down" approximation model, so that the steps to be followed would be the following: facilitating collaboration between farmers and application developers, collecting and disseminating case studies and good practices, developing specific tools for the needs of each agricultural sector and creating information services via websites web.

References

Ağır, H. and Utlu, S. 2011. AR-GE Harcamaları ile Ekonomik Büyüme Arasındaki Nedensellik İlişkileri: OECD Ülkeleri Örneği. Uluslararası 9. Bilgi Ekonomi ve Yönetim Kongresi Bildirileri, 269-280.

Akdemir, Ş. and Küsek, G. 2019. Türkiye'de Tarımsal Ürünlerde Fiyat Dalgalanmasının Araştırılması İçin Alınması Gereken Yapısal Tedbirler. 5. Uluslararası İnsan, Toplum ve Spor Bilimleri Sempozyumu, Antalya, Türkiye, 23 - 25 Mart 2019, 201-207.

Bellon-Maurel, V. and Huyghe, C. 2016. L'innovation technologique dans l'agriculture. *Géoéconomie*, 80, 159-180. https://doi.org/10.3917/geoec.080.0159

Bizec. D. 1981. Les transferts de technologie. Politique étrangères. 46 (3) : 743-744.

CIRAD. 2018. How is the use of information and communication technologies transforming advisory mechanisms? International Agricultural Research Center For Development. 19p.

CTA. 2013. TIC et Agriculture, La parole aux jeunes. 67 p.

Dussauge P. and Ramanantsoa B. 1988. *Technologie et stratégie d'entreprise*, Collection "Stratégie et Management", Mac Graw Hill Paris, 1985. Duverdier A. : "Agent à l'étranger, pour qui ? Comment ? ", *MOCI*, n80.

FAO. 2005. Agricultura y diálogo de culturas. Nuestro patrimonio común. Numéro de publication: A0015. ftp://ftp.fao.org/docrep/fao/008/a0015s/a0015s00.pdf

FAO. 2013. ICT uses for inclusive agricultural value chains. Rome. 87 p.
FAO. 2015. Success stories on information and communication technologies for agriculture and rural development. 108p.

Hawthorne E. R. 1971. *Le transfert de technologie*, OCDE, Paris.

INRAE. 2022. Agriculture et numérique. Tirer le meilleur du numérique pour contribuer à la transition vers des agricultures et des systèmes alimentaires durables, 198p.

Judet P. & Perrin J. 1971. A propos du transfert des technologies pour un programme intégré de développement industriel", *Document IREP*. Université de Grenoble II.

Lacirignola, C. and Abis, S. 2018. Innovation et technologie: quels enjeux pour l'agriculture et le monde rural en Méditerranée ? Tendances économique, 3p.

Le Duffm R. and Maisseu A. 1991. Management technologique, préface de Pierre Lassègue. Editions Sirey , Management des Organisations.

Martinez, E.D., Sanchew, J.R. 2007. Application of new technologies in Spanish intensive agriculture. CIHEAM. 5p.

Mansfield, E. 1970. Technological Change. Norton, 165 p.

Mélèze, J.1972. L'analyse modulaire des systèmes de gestion, A.M.S., Puteaux, France : Editions hommes et techniques.

Morais, R. and J. Boaventura. 2000. Agritronics: A distributed data acquisition and control network for agriculture environments. International Conference and British-Israeli workshop on greenhouse techniques towards the 3rd millennium. Acta Horticulturae. 534, 319- 325.

Nicolas H. and Tronchon J.-F. 1979. Petites et moyennes entreprises industrielles et transfert de technologie" *Conseil et développement*, St-Etienne.

Pakdemïrli, B., Bïrïşïk, N., Aslan. I, Söñmew, B., Gezïcï.M. 2021. Tüŕk Tarımında Dijital Teknolojilerin Kullanımı ve Tarım-Gıda Zincirinde Tarım 4.0. Toprak Su Dergisi, 10 (1): 78-87.

Salerni, D. 1979. Le pouvoir hiérarchique de la technologie. Sociologie du travail. 21 (1) : 4-18

Serodio, C., Boaventura, J. and Couto, C. 2000. Bringing the world wide web to agricultural systems based on the java environment. International Conference and British-Israeli workshop on greenhouse techniques towards the 3rd millennium. Acta Horticultarea. 534, 293-297.

World Bank. 2012. E-Transform Africa: The Transformational Use of ICTs in Africa. The World Bank, African Development Bak, support from the African Union. http://documents.worldbank.org/curated/en/802551468204543390/pdf/882230WP0Box3800Agricu lture0summary.pdf

World Bank. 2017. ICT in Agriculture (Updated Edition): Connecting Smallholders to Knowledge, Networks, and Institutions. The World Bank. https://doi.org/10.1596/978-1-4648-1002-2

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