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Şinasi Akdemir

Sustainable Development and Management Research

Şinasi Akdemir continues his academic work studies, which he started in 1987 at Çukurova University. He is still working on agricultural sciences, agricultural economics, agricultural management, agricultural marketing, and sustainable development at the same university.

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Sustainable Development and Management Research

Editor

Prof. Dr. Şinasi Akdemir

Şinasi Akdemir continues his academic work studies, which he started in 1987 at Çukurova University. With his determination and hard work, he quickly passed the academic ladder and gained the title of professor in 1994. He is still working on agricultural sciences, agricultural economics, agricultural management, agricultural marketing, and sustainable development at the same university. Şinasi Akdemir, who has dozens of articles indexed in international indexes, has edited more than 10 books. He contributed to this book as both author and editor, with thoroughness work and great academic attention.

Preface

The book Sustainable Development and Management Research is a six-part work written by experts in the field. In the first part of the book, research in the field of sustainable development education in Turkey was examined. In the second part, the use of neuromarketing in the field of health is explained. The third chapter is reserved for the effect of internet-based applications on the functioning of health services. The fourth chapter is about the willingness of people to obtain organic products, which are very important for a healthy life. This subject has been examined in the context of organic dairy products. The fifth chapter explains how the producers produce their agriculture. Here, how the radish producers produce radishes, the problems they encounter, and the product quality are examined. In the last part, agricultural insurance, which is a very important issue for sustainable agriculture, has been researched considering the Togo sample.

As a result, we hope that this book, which includes studies that complement each other in various branches, from education to agriculture, from health to organic products, whose common denominator is sustainable development and management, will be beneficial to readers and researchers.

I hereby respectfully

Prof. Dr. Şinasi Akdemir
Cukurova University

Chapter 1

Content Analysis of Research on Sustainable Development Education in Turkey 1

Prof. Dr. Mehmet KÜÇÜK
Recep Tayyip Erdogan University

Dr. Semra Burkaz EKİNCİ
Rize Employment Institution

Chapter 2

Neuromarketing and Health 29

Res. Asst. Adil AYDOĞDU
Selcuk University

Assoc. Prof. Dr. Mehmet YORULMAZ
Selcuk University

Chapter 3

The Importance of Internet of Things (IOT) Based Applications in Improving Quality of Healthcare Services 45

Lecturer Ali GÖDE
Hatay Mustafa Kemal University

Assoc. Prof. Dr. Mehmet YORULMAZ
Selcuk University

Res. Asst. Adil AYDOĞDU
Selcuk University

Chapter 4

Factors Determining Consumers' Willingness to Pay for Organic Milk in Turkey 65

PhD Student Issaka Saidou ISMAILLA
Cukurova University

Dr. Seyit HAYRAN
Cukurova University

Chapter 5

Examination of Producers for Growing Radish: Case of Kadirli District in Turkey 77

Prof. Dr. Sinasi AKDEMIR
Cukurova University

PhD Student Issaka Saidou ISMAILLA
Cukurova University

Chapter 6

Impact of Farm Assets on the Willingness to Uptake Agricultural Insurance in Togo 93

PhD Student Elpidio KOUGNIGAN
Cukurova University

Prof. Dr. Sinasi AKDEMIR
Cukurova University

CONTENT ANALYSIS OF RESEARCH ON SUSTAINABLE DEVELOPMENT EDUCATION IN TURKEY

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Introduction

Every system in nature has a carrying capacity. Exceeding this capacity leads to the emergence of important problems that are reversible at first, but that cannot be reversed later on. Human beings, the only known being who knows that they are aware of their existence, encounter the most damage because they are beings who always think about what they do. The age of the Earth, the only astronomical planet on which we live and currently known with certainty to contain life and liquid water, is estimated at 4.5 billion years, based on radiometric dating and other evidence. Geologists believe that humans have been on Earth for about 150-200 thousand years, based on their extensive research and supporting scientific evidence (Gedik, 1998).

Although there is no science, which is a fact-based study of why the first humans were on Earth, there are acceptable explanations in the holy books (Sari, 2011). As can be seen in the first combat experience of a person who fell on a deserted island (Bilginoglu, 2020), probably the main purpose of the interaction of the first human(s) on Earth with their environment was first to survive by feeding and then to continue their generation. In this way, the human population begins to increase in a controlled or uncontrolled way. The increase in the human population and therefore the formation of communities leads to the formation of the rules of social life (Kayan & Mardinli, 2020). In this context, the aims of the first human interaction with the environment changed to a great extent, to dominate other living things and the environment, and to live in prosperity by using underground and above resources. This change has led to the rapid use of natural resources, which were initially perceived as unlimited (Burkaz-Ekinci, 2021). Two major problems were encountered. The first is the global problems that are believed to be inexhaustible and non-renewable resources are exhausted, and the second is the global problems that arise due to excessive resource use, including economic and social issues, especially the environment (Bonnett, 1999; Hesselink et al., 2000). The issue that these problems should be dealt with on a global rather than a local basis has started to be discussed by the United Nations [UN] (Weinberger et al., 2015).

For this purpose, many countries with different socioeconomic structures and development levels gathered at the UN Human Environment Conference (Stockholm Conference) held in Stockholm between 5-16 June 1972. At the end of the conference, the subject of which was the environmental theme, the UN Declaration on the Human Environment was adopted and the United Nations Environment Program (UNEP) was formed. The aim of the program is determined as "coordination of the environmental issue in the United Nations, continuous review of the environmental situation at the global level, attracting the attention of the international community about environmental problems and ensuring the development of international and national environmental policy and law". Conferences shaping international environmental policy, such as the UN Conference on Environment and Development held in Rio de Janeiro in 1992, the World Summit on Sustainable Development held in Johannesburg in 2002, and the Earth Summit in 2005, have been influential in both the development and strengthening of UNEP (Burkaz-Ekinci, 2021). At the UN Conference on Environment and Development (Rio

Conference) held in Rio de Janeiro between 3-14 June 1992, a series of principles were adopted for nations to adopt environmentally friendly management styles. The Millennium Declaration and the Millennium Development Goals, which set out a universal framework for development, were adopted by governments at the UN Millennium Summit in 2000 and target 2015, and are considered a tool that enables developing countries to work in cooperation with developed countries for our common future. The concept of Sustainable Development [SD], which has been on the tongues of bureaucrats and researchers for a while, was first included in the Brundtland Report prepared by the World Environment and Development Commission in 1987. In this report, the concept of SD is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their needs". Within the scope of ensuring environmental sustainability in the Millennium Development Goals, harmonizing the principles of SD with national policies and programs, reversing the losses in environmental resources, reducing the loss of biodiversity, and reducing the population that cannot sustainably reach healthy drinking water by half.

The "World Sustainable Development Summit" was held in Johannesburg between 26 August and 4 September 2002 to monitor the results of the Rio Conference and to harmonize the efforts of the partner countries to achieve the Millennium Development Goals. Twenty years after the 1992 Rio conference, the UN Conference on SD (Rio+20) was held in Rio de Janeiro between 20 - 22 June 2012. As a result of the Rio+20 Summit, a final document titled "The Future We Want", which is a roadmap for development, was signed. Most recently, "Agenda 2030: UN Sustainable Development Goals (SDGs)", which consists of 17 goals and 169 sub-goals, accepted as a continuation of the Millennium Development Goals, was approved on September 27, 2015, in New York. With the SD Goals set for 2030, by drawing a new global development framework, environmental issues such as sustainable cities, climate change, combating drought, and protecting biodiversity were included in the SDS agenda (UN, 2015). These goals are no poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation, and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; partnerships for the goals. Indicators are clearly defined under

each of these. In line with these purposes, SD can be briefly explained as improving the quality of life of people while respecting the environment. Two important elements in this definition are economic development and environmental protection (De-Kruijf & Van-Vuuren, 1998). The responsibility for the implementation of these elements falls on society. In this context, there is a close relationship between SD and its environmental, economic, and social components (De-Kruijf & Van-Vuuren, 1998). Environmental sustainability, which is the first component of the SD concept, is a well-known and intensively studied subject. On the other hand, social sustainability, which is the first of the other two components, is expressed as meeting the needs of today's people without harming the needs of future generations, while economic sustainability is expressed as being responsible for the environmental effects of production activity by turning to renewable resources in the production process (Bonnett, 1999).

In line with the indicators determined within the scope of the SDGs, member countries continue their work with the contributions of all institutions in cooperation or separately. In this direction, the UN has published a total of seven SDGs Progress Reports for the years 2016-2022, as well as the Global SD Reports for 2019 and 2023, to track progress (UN, 2015). Since it is a global issue that concerns everyone, it is clear that progress can only be made with collaborative work formed within the framework of a common mind, with the participation of everyone (Burkaz-Ekinci, 2021). What is the role of educational institutions in achieving SD goals and how educational researchers can contribute is a matter of debate.

Education, which is considered the process of creating changes in the cognitive, affective, and psychomotor behaviors of individuals by employing their own life, and the educational institutions where this is applied formally can contribute to the process by providing effective SD training. (Ates, 2019; Burkaz-Ekinci, 2021; Bulut & Cakmak, 2018). Global problems that arise as a result of problems in human cognitive, affective and psychomotor behaviors can be solved by restructuring them. It is believed that the SD can determine a framework that will change the consumption habits of the individual and their attitudes and behavior patterns in this direction for a sustainable future, improve their ability to think forward and systematically and make and implement joint decisions for a sustainable future (Bayazit Hayta, 2009). In this context,

an education that will help students to form and develop a more sustainable economy-environment-social order, think about the future and make strategic planning is emphasized (Bell, 2016). On the other hand, a special article in SD goals directs educational institutions and educators. According to this article, it was emphasized that by 2030 and by promoting SD, all students should acquire the necessary knowledge and skills, sustainable lifestyles, human rights, equality, peace, global citizenship, and cultural diversity should be appreciated and the contribution of culture to SD should be understood (Mochizuki, 2016; UNESCO, 2015).

Studies on SD and global citizenship education have only just begun to be carried out in Turkey. Until today, some studies have been carried out under the auspices of the Ministry of Science, Industry, and Technology, the Ministry of Environment and Urbanization, and the Ministry of Forestry and Water Affairs, and this issue has been highlighted in the commission reports. Within the Ministry of National Education, the most concrete development regarding the inclusion of the concept of SD in the education curriculum was included in the vision, objectives, and learning areas of the Primary Education Science Curriculum, which was revised in 2018 (Teksöz, 2014). One of the aims of the program is "to realize the mutual interaction between the individual, the environment, and society and to develop the awareness of SD regarding society, economy, and natural resources". SD is one of the sub-dimensions of the "science-technology-society-environment" learning area of science courses (Kucuk, 2020). Unfortunately, apart from the science program, there is no other program that directly and explicitly emphasizes SD. As an indirect emphasis, there are subjects for gaining some of the global citizenship competencies in the social studies course curriculum (Kaya & Tomal, 2011). The "Sustainable Development and Education" course has been added as a common elective vocational knowledge course in the New Teacher Training Undergraduate Programs, which was updated in 2018, and where almost all institutions are working to change it again these days (see New Teacher Training Undergraduate Programs, 2018).

There is a consensus nowadays that the most appropriate way to achieve SD goals is through people's education (Bulut & Cakmak, 2018; Laurie et al., 2016). In this context, since the subject of education for SD or SD education is included in the science curriculum as an innovative subject, it naturally attracted the attention of academics working in the field of geography education, especially in the field of science education, since

it includes the component of science and the environment (Cobanoglu & Turer, 2015; Demirbas, 2011; Derman, 2013; Engin, 2010; Er-Nas ve Senel-Coruhlu, 2017; Ozturk-Demirbas, 2015; Turer, 2010; Unal, 2011). What researchers have done so far for the concept of SD, whose conceptual structure is drawn with three components - environment, economy, and society - is an important debate (Kucuk, 2022a; Kucuk, 2022b). In this context, a content analysis study that will work on what has been done until 2030 in the field of SD to be a source for the studies to be carried out in Turkey until 2030 can form a framework both for describing the current situation and for setting the direction for an innovative study of the subject. There are many content analysis studies conducted for this purpose and confirmed to be useful in the literature (Bag & Kucuk, 2019; Kucuk & Kucuk, 2019; Namdar & Kucuk, 2018; Sarac, 2017). The subject of SD, which was chosen as the subject of this study, together with some content analysis studies, including postgraduate thesis studies in the field of education (Yalcintas et al., 2021), studies that only include the field of education have also started to be carried out (Akkas, 2019; Arik, 2019; Ozerdinc et al., 2022; Yildirim, 2020). These studies were subjected to content analysis according to some criteria. As an example, Yildirim (2020), examined the publications within the scope of education from the studies he reached by scanning the YOK Thesis Database, Ulakbim Social and Human Sciences Database, and Google Scholar database with the word sustainable. In this review, the publications were analyzed in terms of publication type, publication year, research method, study group, the topics and concepts discussed, and the results achieved in the research. As a result of this process, the studies on SD have been intensively discussed since 2010, and concepts such as sustainable development/development, education for sustainable development/development, sustainable environment, and sustainability education have come to the fore in terms of subject and concept; the researches are mostly based on due diligence and scanning model; revealed that the issue of sustainability was handled especially about science and social studies education. These findings have also been shared in other studies (Akkas, 2019; Arik, 2019; Ozerdinc et al., 2022).

In addition, it should be explained how the studies on SD, which has an increasing trend between 2010 and 2020, have progressed, including 2022, and to what extent the social and economic dimensions, which are the other two components that are claimed not to be sufficiently taken into account, are included in the studies in question. Similarly, it is a mat-

ter of debate what kind of intervention programs educators have designed for the solution of the problems that have been unanimously put forward in the field of SD after a ten-year due diligence in Turkey. At this point, to put an end to the discussions in question, the need for a new content analysis study on SD in education has emerged. Based on these reasons, the study was carried out to analyze the content of the studies published in peer-reviewed scientific journals on SD education in Turkey.

Method

In this study, the descriptive content analysis method, which is a type of content analysis, was used. The approach that involves identifying and organizing the trends and results of qualitative and quantitative research on a subject is known as descriptive content analysis (Calik & Sozbilir, 2014). Producing a perspective on the subject, not only makes it easier for researchers who want to work on the same subject to have information about what has been done, but also draws a solid path for them. In this study, using descriptive content analysis, studies on SD limited to the field of education were examined.

Data Collection

In this study, the data on SD education in Turkey consisted of articles published in national or international peer-reviewed scientific journals. In this direction, Google Scholar, ULAKBIM national databases, DergiPark, and ERIC (EBSCO) databases were searched in detail to reach studies related to SD education. For this process, the keywords using the binary combinations of the concepts of "sustainability", "development" along with "sustainable development education" were employed. In this way, only 70 studies published in peer-reviewed journals were reached until November 2022. These studies were filtered in terms of features such as clear writing research questions to reflect research or review articles, specifying research methods, data collection and analysis methods, and findings supported by evidence. In this way, descriptive content analysis was conducted on the remaining 60 studies.

Data Analysis

The studies reached in this study were coded in detail in line with the parameters determined by the two researchers. The approach employed in other content analysis studies was used in the creation of the coding scheme (Bag & Calik, 2017; Bag & Kucuk, 2019; Gul & Sozbilir, 2016). Studies were examined according to a total of seven themes, two of which were added to the five themes created in this way (theoretical dimensions of the concept of SD and the subject and objectives of SD research) and used in other studies. The list of studies coded under each theme is attached (Appendix 1).

Validity and Reliability

Both researchers worked together to create the coding scheme. Immediately after, four articles randomly selected from the data were coded together. In this way, a consensus was reached on how to do the coding. The coding scheme is revealed. Both researchers independently coded all the articles according to the scheme they gave their final shape. The consistency of the coding made by both researchers was also checked.

Results

The classification of the studies on sustainable development education [SDE] in Turkey according to the analysis criteria is included in the relevant headings and tables.

Disciplines Conducting Research on SDE

Table 1

Distribution of SD Researches By Disciplines

Disciplines	f	%	Number
Science	33	55,00	1, 3, 4, 7, 8, 10, 11, 12, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 31, 33, 35, 36, 45, 47, 48, 49, 52, 56, 58, 59, 60
Other	14	23,33	2, 13, 14, 16, 32, 37, 38, 41, 44, 46, 50, 51, 54, 55
Social	13	21,66	5, 6, 9, 15, 22, 30, 34, 39, 40, 42, 43, 53, 57

Table 1 reveals that research on SD is predominantly conducted by science educators.

Conceptual Dimensions of SD Research

Table 2

Distribution of SD Researches By SD Dimension

Dimensions	f	%	Number
Mixed	39	65,00	1, 2, 3, 4, 5, 7, 10, 11, 12, 13, 15, 16, 17, 20, 21, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 37, 38, 40, 43, 45, 50, 51, 52, 53, 54, 55, 56, 57, 59
Environmental	20	33,33	6, 8, 14, 18, 19, 23, 25, 28, 35, 36, 39, 41, 42, 44, 46, 47, 48, 49, 58, 60
Economy	3	5,00	9, 20, 22
Social	1	1,66	22

Table 2 reveals that the research on the topic of SD is predominantly conducted in a way that includes all three dimensions - environment, economy, and society. However, there are many studies in which only the environmental dimension is used. It is concluded that the other two dimensions of SD, the economy and the social dimension, are rarely included in SD studies.

Methods of SD research

Table 3

Distribution of SD Studies According to Research Methods

Methods	f	%	Number
Qualitative	27	45,00	2, 3, 5, 8, 9, 15, 17, 19, 20, 22, 24, 25, 28, 30, 32, 35, 36, 38, 41, 42, 49, 52, 53, 54, 55, 59, 60
Quantitative	26	3,33	1, 4, 6, 7, 10, 13, 14, 16, 21, 23, 27, 29, 33, 37, 39, 40, 44, 45, 46, 47, 48, 50, 51, 56, 57, 58
Mixed	7	11,66	11, 12, 18, 26, 31, 34, 43

Table 3 reveals that qualitative and quantitative methods are mainly used in research on SD.

Sample of SD Studies

Table 4

Distribution of SD Studies According to Samples

Sample	Degree	f	%	Number
Student	University	22	36,66	1, 2, 4, 6, 7, 13, 14, 19, 23, 28, 30, 33, 36, 39, 44, 45, 46, 47, 49, 54, 55, 57
	Primary education	9	15,00	10, 11, 12, 18, 27, 29, 31, 48, 60
	High school	4	6,66	3, 16, 26, 48
		13	21,66	9, 17, 20, 21, 24, 34, 40, 41, 51, 54, 56, 58, 59
Teacher		1	1,66	50

Table 4 reveals that research on SD is mainly conducted on university students and teachers.

Sample Size of SC Studies

Table 5

Distribution of SD Studies by Sample Size

Sample Size	f	%	Number
7-50	18	30,00	2, 9, 10, 11, 12, 17, 19, 20, 24, 28, 30, 32, 37, 41, 43, 49, 55, 59
51-150	8	13,33	7, 18, 21, 36, 51, 52, 58, 60
151-300	7	11,66	1, 26, 31, 34, 40, 45, 56
301 and above	17	2,33	4, 6, 13, 14, 16, 23, 27, 29, 33, 39, 44, 46, 47, 48, 50, 54, 57

Table 5 reveals that research on SD is predominantly conducted on study groups of 7-50 and 301 and above.

Data Collection Tools of SD Studies

Table 6

Distribution of SD Studies According to Data Collection Tools

Data Collection Tools	f	%	Number
Interest-Awareness-Attitude-Belief Scales	25	41,66	1, 4, 6, 7, 12, 13, 16, 23, 26, 27, 29, 33, 34, 37, 39, 40, 44, 45, 46, 47, 48, 50, 51, 57, 60
Interview Forms	19	31,66	2, 9, 12, 17, 20, 21, 24, 26, 28, 30, 31, 32, 34, 41, 43, 49, 54, 55, 59
Document	11	18,33	3, 5, 8, 15, 22, 25, 31, 35, 38, 42, 53
Surveys	8	13,33	11, 14, 31, 36, 43, 52, 56, 58
Achievement Tests	4	6,66	10, 12, 18, 27,
Drawing-Worksheet	3	5,00	10, 18, 19

Table 6 reveals that interest, awareness, attitude, or belief scales and interview forms are mostly used as data collection tools in research on SD.

Subject and Objectives of SD research

Table 7

Distribution of SD Research by Subject and Purpose

Subject	Purposes	f	tf	%	Number
Evaluation of curricula in terms of SD Dimensions	Examining the relationship of SD with the subjects and achievements in the curriculum	6	10	16,66	3, 5, 8, 15, 25, 53
	Evaluation of primary education programs in terms of a sustainable environment	2			25, 38
	Examining the relationship between SD goals and geography education	1			22
	Determining the proficiency levels of science teacher candidates in associating learning outcomes with the 2030 Sustainable Development Goals for Turkey and the world and the sustainable development goals in the curriculum	1			58
Measuring variables related to SD	Measuring awareness of SD	6	29	48,33	4, 6, 7, 14, 39, 54
	Measuring attitudes towards SD	4			1, 48, 57, 60
	Examination of attitudes towards sustainable environmental education	1			23
	Examining the views on education for SD and SD	4			24, 30, 44, 59
	Measuring perceptions of SD	2			27, 28
	Measuring beliefs about SD	2			34, 47
	Examination of ideas and thoughts about SD	2			32, 36
	To reveal the views of science teachers about SD, education for SD, competencies in education for SD, and the competencies that teachers should have in education for SD	2			20, 21
	Examination of preschool teachers' self-efficacy beliefs toward SD	1			13
	Determining the knowledge level of science teachers about sustainability and ecological footprint and their views on "education for SD"	1			17
	Examination of attitudes towards sustainable environmental education	1			45
	Measuring behavior towards a sustainable environment	1			46
	Examining the concepts related to SD	1			52

Developing measurement tools to measure SD-related variables	Developing an attitude scale toward SD	1	5	8,33	16
	Developing a sustainable event awareness scale	1			50
	Developing a measurement tool for SD Awareness	1			33
	Developing a scale of beliefs about SD education	1			40
	Developing an awareness scale for sustainable living	1			29
Evaluation of the teaching process and outcomes of SD-related subjects	Examination of the teaching process of subjects related to SD	1	14	23,33	9
	Evaluation of an educational process for sustainable environmental awareness	1			17
	Investigation of the effect of online SD training on students' academic achievement and conceptual learning on SD issues.	1			10
	Investigation of the effect of online SD training on students' water literacy	1			11
	Investigation of the effect of learning environment supported by 3E, 5E, and STEM on attitude and success in SD	1			12
	Examining the effect of the project-supported method on SD attitudes	1			26
	Evaluation of sustainable environmental education	1			18
	Evaluation of an event on sustainable transportation, which is one of the ecological footprint components.	1			19
	Demonstrating the effectiveness of the six hat thinking technique in the teaching process of the subjects related to SD education in geography lessons	1			43
	Investigation of the effect of interdisciplinary science teaching on students' development in SD	1			31
	Examination of secondary school mathematics teacher candidates' views on including sustainability in their teaching	1			55
	Introducing green chemistry events for SD	1			35
	Evaluation of pre-school teacher candidates' pedagogical practices for sustainability in education	1			2
	Examination of teachers' views on ecopedagogy-based environmental education	1			41
Evaluation of the activities of funding institutions and educational institutions in terms of SD objectives	Evaluation of preschool institutions from the point of view of SD	1	5	8,33	37
	Evaluation of the sustainability practices and scientific activities of higher education institutions	1			56
	Environmental evaluation of TUBITAK projects for SD	1			42
	Comparison of the practices of preschool education institutions and teachers in terms of education for SD	1			51
	Evaluation of practices for SD	1			49

Table 7 reveals that the subject of research on SD is mostly about measuring interest, awareness, attitude or belief, and similar qualities related to SD, and then evaluating various teaching practices related to SD. However, there are few studies on the evaluation of the activities of funding institutions and educational institutions in terms of SD objectives.

Discussion and Conclusion

Explicit or implicit inclusion of subjects and acquisitions related to SD in some other curricula (eg, social studies), especially in science, has led academicians working in the relevant field to get to know the subject early and take a closer interest. Therefore, there is a need to explain the scope, purpose, and orientation of the research on SD education, which is an academic field of study and is heavily cited in many platforms, including both written and visual media. The increase in the number of studies on SD has made it necessary to conduct content analysis. There are a few studies of content analysis on SD in education (Akkas, 2019; Ozerdinv et al., 2022). Ozerdic et al. examined theses and articles on SD in education between the years 2010-2020. In this study, research year, research method, data collection tools, data analysis, and research subject variables were employed. It was concluded that qualitative research as a research approach, scanning model as a research design, pre-service teachers as sample level, scales as a data collection tool, content analysis in data analysis, and determining SD awareness as a research subject were more involved. In another study, postgraduate theses on SD in Turkey were examined (Akkas, 2019). It has been revealed that detailed studies on recycling and biodiversity are the subjects of these theses. As a suggestion, he stated that there is a need for new studies on environmental issues such as renewable energy sources, the destruction of water resources, global warming, and climate change. It was concluded that the mixed research method was mostly used in the theses, documents were mainly used as the data collection tool, and the teachers were mostly preferred as the working group. Arik (2019), on the other hand, conducted a study to determine the trend of theses on sustainable environmental education. It was concluded that the sample group of the theses consisted mostly of science teacher candidates, they were designed according to the survey method, one of the quantitative research methods, and t-tests were used in data analysis. Studies in the field of SD and education are not limited

to content analysis. Dogru et al. (2019) explained the trends in the last ten years by examining 7000 studies published between 2009-2018 in the field of SD and education from a bibliometric perspective. The number of publications by years, publication types, publication languages, citation analysis, country collaborations, common citation networks, and concept-subject orientations was examined in detail. The results of this analysis revealed that the interest in the field in terms of both publication and citation numbers increased dramatically after 2015 and that the largest cluster among the subject clusters created according to the citation sources is related to education. The rapid increase in international publications on SD in education or studies on SD education is remarkable. In this context, it is open to debate what the place or should be of the studies carried out in Turkey on this increase.

In this study, the research on SD education in Turkey, including the year 2022, was examined to create evidence for the debate. For this purpose, content analyzes of 60 articles from peer-reviewed scientific journals were made. The results of these analyzes partially or completely agree with the content analyses obtained from the studies in the literature and are limited to the previous two years. As revealed by Arik (2019), the data in Table 1, it is clear that research on SD continues to be carried out predominantly by science educators, as it was until 2019. Unlike this, Ozerdinc et al. (2022), the data in Table 3 reveal that the weights of qualitative and quantitative research methods are almost balanced in research on SD. Akkas (2019), Arik (2019), and Ozerdinc et al. (2022) shared in their studies related to the subject of SD that, the sample mostly consisted of teachers and teacher candidates. The data in Table 4 reveal that this trend continues, that is, research on SD is mainly conducted on university students and teachers.

It is known that interest-awareness-attitude-belief scales for diagnosis are used in studies that are preliminary for the subject of SD (Burkaz-Ekinci, 2021; Kucuk, 2022a). In support of this information, the data in Table 6 reveal that interest, awareness, attitude or belief scales, and interview forms continue to be used as data collection tools in studies on SD. In a scientific study, diagnoses are undoubtedly of great importance for the explanation of the problem and therefore for appropriate intervention. However, it should be emphasized that diagnostic studies on SD have continued since the 2010s and even insisted on these studies. The subject of SD is theoretically composed of three dimensions: environment, soci-

al and economic. Therefore, these three dimensions should be included in the studies on SD education, by correlating them appropriately. In this context, this issue, which was not included in previous studies, was especially examined in the present study. Even though the data in Table 2 reveals that the research on the subject of SD is predominantly carried out in a way that includes all three dimensions - environment, economy, and society - studies that employ only the environmental dimension continue to be conducted. The data in Table 2 also reveals that the other two dimensions of SD, economy and social dimension, are rarely included in SD studies. Putting these dimensions to work is important in terms of the theoretical foundations of the SD concept. The subject of SD is not a subject that can be easily achieved with a single discipline, conceptually or theoretically. Therefore, apart from the environmental subjects and achievements included in the content of the science or social studies curriculum, there is a need to employ the principles of the interdisciplinary approach among other programs that include the economic and social dimensions. In this study, the subjects and aims of the mentioned SD researchers were subjected to content analysis. The data in Table 7 reveal that the subject of research on SD is mostly about measuring interest, awareness, attitude or belief, and similar qualities related to SD and evaluating various teaching practices related to it. On the other hand, there is a limited number of studies on the evaluation of the activities of project funding institutions and educational institutions in terms of SD objectives. Nevertheless, it is a positive situation that studies have started to examine the teaching processes for SD education and to evaluate the effects of intervention programs. However, in these interventions, there is a strong need to reflect not only one but all three dimensions of SD in a balanced way. At this point, studies that focus directly on SD education are, of course, not enough. Within the scope of training for SD, educators are expected not only to measure SD awareness but also to use effective action strategies to solve the identified problems related to it. To achieve this, there is a need to design and implement teaching processes that work in all three dimensions by establishing joint project groups with an interdisciplinary approach, even though the subject of SD is included in the science curriculum and studied by academics in the field of science.

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Appendix 1. List of Reviewed Articles

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11. Küçük, A. (2022).The effect of an online sustainable development education on water literacy of Turkish middle school students. *Route Educational and Social Science Journal 9*(3), 188 -202

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NEUROMARKETING AND HEALTH

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1. INTRODUCTION

The increasing competitive environment in the markets has pushed businesses to develop new marketing strategies and has led to the emergence of modern marketing strategies in this direction. One of these modern marketing techniques is the neuromarketing technique (Tengelimoğlu, 2020).

Today's world is faced with new technological developments every day. Every innovation brings with it new changes that have an impact in every field. Many sectors and branches of science aim to reach the most perfection in their activities by developing new methods in parallel with the opportunities of the age. In this direction, different sciences or sectors can easily go to various collaborations and multidisciplinary studies.

The science of psychiatry is increasingly adopting technologies such as functional magnetic resonance, etc. in order to more clearly reveal the foundations of emotions and social interactions (Fisher et al., 2010). In many other fields like this, expansions made by acquiring the prefix "neuro" (neuroaesthetics, neurotheology, neuroeducation, neuroculture, etc.) attract great attention (Frazetto and Anker, 2009). In recent years, one of the best examples of these collaborative studies has been carried out under the "neuromarketing" of marketing, neurology and psychiatry

disciplines. In summary, neuromarketing is a manifestation of this new neuroculture, defined as marketing designed on the basis of neuroscience research.

Although neuromarketing is a topic that attracts attention among various disciplines, its critical aspects, including exactly what it is, its content or how it is used in practice, are still underexplored. These uncertainties in the concept are perceived as risks by various circles. For example, "buy!" in the consumer brain of neuromarketing advertisers. They argued that they could discover the button, and in this way manipulate the thoughts of the individual in a way that prompted them to consume (Murphy et al., 2008). However, despite all its unexplored features, there are also opposite views on neuromarketing. Accordingly, neuromarketing technology provides a cost advantage over traditional marketing methods by revealing the hidden aspects of consumers' preferences (Ariely & Bens, 2010).

Health management has had to benefit from marketing science due to the increase in competition and health care costs in the health sector, the emergence of the concept of knowledgeable patients, rapid developments in health technology, difficulty in patient satisfaction, and the increase in pressure to use the resources allocated to health in a more economical way (Karaçor and Arkan, 2014). Therefore, being able to learn human attitudes, feelings, thoughts and behaviors correctly is valuable for health management as well as for all sciences. With its different methods, neuromarketing has managed to attract attention as one of the modern marketing methods that can be used in health services marketing.

2. NEUROMARKETING

While trying to obtain data about the preferences and decision-making processes of the customers by using methods such as observation, survey and interview; When it comes to today, doubts have increased that the data obtained as a result of these interviews do not reveal the real feelings and thoughts of the people (Lindstrom, 2010). Increasing doubts have led marketing researchers to different pursuits, leading to the emergence of modern interdisciplinary methods using new digital techniques that can replace classical market research. The tendency of marketing to

understand people's true feelings and thoughts has crossed the paths of this science with neuroscience and medical science. This scientific intersection has led to the reinterpretation of studies on the human brain from a marketing perspective.

In line with the studies on the human brain, when the brain is considered as a machine, different processing centers are encountered in the brain as in all machines in the purchasing process (Morin, 2011). Accordingly, the brain consists of 3 parts.

a) Thinking Brain – New Brain (Neocortex): It is the developed part of the brain only in humans. It is the rational brain that is responsible for logical thinking and represents the conscious mind.

b) Emotional Brain (Limbic System): It mediates and controls emotions and feelings. It is our intuitive brain and represents the subconscious mind.

c) Old Brain: Controls basic functions such as heartbeat, breathing, adrenaline control when necessary. It is the most primitive brain, but it has a very important role in decision making. When we watch a TV commercial or see a product in a shop window, all three of our brains are involved in the buying process. Based on the information received from the thinking brain and the emotional brain, our primitive brain makes the final decision on whether or not to buy that product.

The fact that the final decision on purchasing is made by the primitive brain has drawn the attention of marketing scientists to this brain part. Marketers aim to present products in a way that will enable the primitive brain to buy with the information they have obtained from their researches in this direction (Orzan et al., 2012).

By monitoring blood flow in the brain and reading brain cell activity, fMRI and EEG have developed new possibilities in neurology, leading to significant advances in psychology as well. However, psychology is not limited to the biological sciences. The corporate business world has also met the brain as the "newest business frontier" (Pradeep & Patel, 2010).

The first attempt at neuromarketing emerged in 2002 with a press release

by an American-based advertising company, announcing that they would use the fMRI device for marketing research and that they set up a laboratory at a university for this purpose. In this direction, the research was carried out with the participation of a psychiatry professor. However, this first attempt was brought to court by an anti-advertising non-governmental organization, and it was closed and shelved in a short time (Canli, 2006; Fisher et al., 2010).

Neuromarketing, whose main purpose is to understand consumer behavior in depth (Lee et al., 2007), includes three important parameters of consumers; retention, emotional attachment, attention; It is a method used to measure For example, the attention shown to the shelves during shopping; consumer fears, consumer sympathy; Measuring how much and which part of any picture or object in the advertisement is memorable is one of the parameters researched within the scope of neuromarketing (Yücel and Coşkun, 2018).

In the context of neuromarketing, researchers seek all kinds of information they can get from consumers not only to reveal buyer preferences, but also to produce what the consumer desires and to reveal the decision-making behaviors of buyers. Therefore, there is an opinion that the data obtained within the scope of neuromarketing in studies are used to hack and manipulate consumers (Sieber, 2019).

The technologies that marketing uses for its purposes consist of tools used in medical science. PET (positron emission tomography), FMRI (functional magnetic imaging device), EEG (electro brain graphing device), EyeTraking (eye scanning), SSPT, MEG (magnetoencephalography), TMS, facial expression identification, implicit association test, skin conductivity test are tools (Damasio 2009; Gazzaniga 2005).

2.1. Tools Used in Neuromarketing

2.1.1. Positron Emission Tomography (PET):

PET is a medical imaging technique that helps physicians in the definitive and early diagnosis of diseases. In order to be able to scan, radiop-

harmaceutical drugs are administered to the patient's body intravenously, and these drugs are absorbed by tissues and organs that show intense chemical action. Gamma waves, which occur as a result of positron anhilation of the radioactive substances in the medicine given to the patient, are detected by the device. Tissues that absorb the drug appear as bright areas on the scan due to glare. The color and brightness differences seen in the scan indicate different degrees of tissue functions, so physicians decide on the path to be followed in the treatment of the disease (Akın and Sütütemiz, 2014).

2.1.2. Functional Magnetic Resonance Imaging (FMRI):

FMRI is a widely preferred method for cognitive research and brain mapping based on revealing neural activity in the brain. When detecting neuronal activity in the brain, the so-called BOLD contrast is based on the principle that the increase in regional blood flow during neural activity is higher than the increase in oxygen use. fMRI has a wide range of clinical uses, from guiding neurosurgery to drug development and the development of personalized treatments (psychcentral.com).

2.1.3. Electroencephalogram (EEG):

EEG is performed by placing approximately 23 small electrodes on the scalp and recording the electrical activity of the brain. It is used to describe many neurological problems such as epilepsy. The fact that EEG is less costly and easy to apply compared to many neuroimaging techniques has increased its use in neuromarketing research (Batı and Erdem, 2015: 283).

2.1.4. EyeTracking:

One of the most frequently used techniques in neuromarketing research is the EyeTraking technique. In this technique, where the eyes of the consumers focus on the target object or stimulus is determined by recording

the light reflected on the cornea layer of the eye and recording the growth and contraction levels of the eye with the help of the device. Eye tracking systems, neuroscience, psychology, learning to read, engineering, advertising, marketing, etc. It is used extensively to answer numerous research questions in various fields. Thanks to eye-tracking, companies try to control customer interest by reviewing and editing their logos and emblems, packaging designs, web page designs. According to a study conducted with Eye Tracking, it was observed that a brand increased its sales from 28 percent to 44 percent by simply changing the location of its logo on the package (Yücel and Coşkun, 2018). With this method, analyzes are made on the usability of websites, shelf designs in shopping malls, and in which cases package designs will attract more attention (Özdoğan, 2008).

2.1.5. Galvanic Skin Conductivity:

This test takes place in the form of measuring and graphical reporting of electrodermal activity. In cases where the autonomic nervous system is stimulated, sweating and skin conductivity increase. The reaction that occurs with the increase of skin conductivity is used to measure the response of the person's body. The method is generally used in marketing research to determine the reactions of individuals to websites and advertisements. It can be used for support purposes in neuromarketing researches, as it is easy, inexpensive and portable. While this device is attached, it can move as it wishes during the experiment, sit and stand, and the data can be recorded at this time (Valiyeva, 2015:83).

In addition to the neuro measurement techniques listed above and used in neuromarketing research, spot-scanning proton therapy (SSPT) (Çubuk, 2012), Magnetoencephalography (MEG), Transcranial Magnetic Stimulation (TMS), Facial Coding System, Implicit, which measures which side of the brain is predominantly used. Many techniques used in neurology and neurosurgery are also used in neuromarketing research.

2.2. Uses of Neuromarketing

Neuromarketing, as in all other marketing activities, tries to reach the consumer in the most secure way and aims to make the consumer accept the goods and services it offers in this way. Although marketing activities are seen as a sales-oriented technique used by businesses or large companies, in fact, it is among the activities that actors such as public and non-profit organizations frequently use to announce and have their aims accepted by the society. For this reason, it is predicted that neuromarketing activities can have a wide range of uses like marketing activities.

The areas of use of neuromarketing include logo creation and development, brand loyalty, advertising efficiency, product development, pricing, entertainment industry, architecture, health and politics. The scientificity of the data obtained as a result of neuromarketing techniques ensures that the applied advertising efforts are applied more efficiently by preventing them from being wasted (Lindstrom, 2008); It is thought that it can give important ideas about the nature and development of trust that will enable the brand to give individuals a more reliable image (Lee et al., 2007).

Neuromarketing techniques reveal what points the consumer first focuses on on the packaging of a product, what parts of the package he sees are remembered, and what emotional changes he experiences while looking at the package. Thus, the most effective packaging designs can be created by using the right visuals (Ceylan & Ceylan, 2015). One of the first factors that companies come into contact with consumers is the logo. The data to be obtained by using neuromarketing techniques can be used to reveal whether brands and icons are important for the consumer (Kömürcüoğlu, 2016). One of the important factors that lead consumers to buy is price. This situation puts the companies under pressure to determine the prices of their products in the most accurate way and to position the product in the most accurate way. Variables such as individuals' purchasing behavior, trust in the brand, brand value, discount and motivation affect the price to be paid for the product and service and can direct the purchasing behavior. The data obtained with neuromarketing techniques has an important place in determining the most suitable price for the product.

In addition to the listed sales activities, one of the sectors where neuromarketing can be used is the entertainment sector. Especially in today's cinema sector, the transition from 2D movies to 3D movies is a result of the data obtained from neuromarketing activities. The authors suggested that ISC could be useful for film studies by providing the analysis of quantitative neuroscientific data (Kömürcüoğlu, 2016). Factors such as the appearance of a political candidate, the message he gives and his credibility can directly affect the voter's decision. There are studies conducted with neuromarketing techniques on the perception of human faces and features such as skin color and facial symmetry. Studies have shown that different dimensions of trust, such as reputation, fairness, and uncertainty, are associated with activity in different parts of the brain. This shows that politicians can use various techniques to make their propaganda more impressive (Ariely & Berns, 2010).

2.3. Advantages and Disadvantages of Neuromarketing Compared to Classical Marketing Techniques

Although neuromarketing is a technique that has been used by many large companies around the world for many years, it still emerges as a relatively new technique due to technical difficulties, undefined ethical problems and not being widespread. For example, Google, LLC has made neuromarketing part of its marketing strategy. Wanting to connect its product to the subconscious of the viewers of the ads, Google's plan relies on human psychological attachment to the ad characters to grab the viewer's attention. In such a case, neuromarketing is essential. Just as fast-food giants use colors that evoke hunger in their restaurants for monetary gain, Google uses primitive and emotional triggers of the human subconscious to generate business (Sieber, 2019).

However, in some studies on neuromarketing among all discussions, the advantages and disadvantages of neuromarketing compared to classical marketing methods are listed as follows (Baños-González et al., 2020; Winer, 2011; Pozharliev et al., 2017).

Advantages:

- It provides the most accurate way to determine the reaction of the consumers when they are exposed to the sales message.
- Since no questions are asked to the consumer in this technique, no subjective response is received from the consumer, which prevents the consumer from sabotaging his correct response.
- Neuromarketing techniques prevent the consumer from giving the answers such as "I am not sure, I am undecided, I have no idea" in verbal techniques.
- Neuromarketing has the ability to predict behavior. This ensures that the right messages are revealed that can overcome the obstacles in front of the person's purchase. This predictability provides savings by preventing marketing efforts from being wasted with the right marketing strategies.
- Neuromarketing enables the creation of interesting, surprising and shocking advertisements.
- Supporting neuromarketing techniques with artificial intelligence and computer technologies increases success.
- Neuromarketing helps to obtain accurate information about individuals who do not participate in studies or participate unconsciously, thus providing depth of knowledge.
- It clearly reveals the relationship of the individual with the brand by providing an objective presentation of the person's relationship with the brand thanks to the scientific techniques it uses.

Disadvantages:

- Neuromarketing techniques are performed in unnatural and highly controlled environments. Research in the natural environment is limited. This situation makes the research controversial.
- Examination of people in digital and technological environments by removing them from their natural environments causes people to attach more importance to technology and is guiding.

- Surrounding people with large technological devices during research can cause anxiety in the individual called the "laboratory effect" and cause the individual to act in a prejudiced way.
- The fact that researchers are over-specialized causes the use of different terminologies and reduces the comprehensibility of the research.
- The fact that companies carry out different research activities on their own behalf causes differences between researches, which causes confusion and damage to transparency.
- Neuromarketing works on a limited number of individuals. This makes it difficult to generalize the research results.
- Neuromarketing studies may have to be supported by different techniques.

2.4. The Ethical Aspects of Neuromarketing

There has been a great increase in the marketing techniques applied on the society. In particular, the fact that social media constitutes a large part of life, the acceleration of digitalization and the increase in the level of internet access of individuals have caused the marketing activities of companies from all fields to diversify and gain momentum. The rapid change in marketing has also accelerated the studies on marketing, and some of these studies have focused on ethical issues in marketing. Many studies have been conducted to reveal the factors that affect people's decision-making behaviors during shopping and to understand their emotions.

The sales activities that emerged as a result of various sales researches also revealed various unethical sales activities, thus resulting in negative revenues. There are various concerns that revealing the "black box" in the human brain with various techniques used in neurology will lead to the learning of the factors affecting the purchase of the individual, and therefore the human brain will be deceived and buy. Neuromarketing provides an opportunity for managers to understand how people form opinions about brands, remember and relate to what kind of emotions

in their daily life (Lee et al., 2007). “Consumer Alert” organization, a non-profit organization established in the USA, draws attention to the ethical aspect of neuromarketing and archives complaints made to various official institutions (https://consumer.ftc.gov/consumer-alerts).

Although neuromarketing is a technique that is emphasized by business scientists and is considered important in terms of effective use of resources, its connection with medicine and its direct human-oriented invasiveness raise concerns that various methods such as brain imaging may reach completely unacceptable levels by violating the privacy of people. (Akın and Sütütemiz, 2014). In order for neuromarketing to be used in line with its purpose, researchers or companies dealing with neuromarketing must have basic principles such as honesty, reliability, transparency, obtaining consent, privacy, participant rights, children and youth, subcontracting, publication, commitment and practice (https://www. nmsba. com/neuromarketing companies/code-of-ethics).

3. NEUROMARKETING AND HEALTHCARE

Although neuromarketing in health is a new subject, its boundaries have not been clearly drawn. It is very difficult to predict the future of neuromarketing today, where even the boundaries of marketing in health institutions or health management are not yet clear.

The emergence and development of marketing science has experienced a process that starts with the understanding of production and changes to the understanding of social marketing. Changing conditions have carried the science of marketing far beyond its starting point, enabling other branches of science and other sectors to benefit from this science. For example, advertising techniques used under marketing are used extensively in many fields such as political, social and public health to influence individuals, whether in the form of propaganda or public service ads. Supporting studies on cigarette and alcohol consumption, drug consumption, fight against obesity, protective and preventive health with neuromarketing activities will play an important role in the success of studies prepared with high budgets. The best examples of studies on the subject are the warnings and pictures on cigarette packages. Although

the aforementioned pictures and warnings provide success up to certain points, they cannot completely end consumption and in this context, the researchers state that more successful policies can be carried out with neuromarketing techniques (Maynard et al., 2019).

Another example that can be given as an example of neuromarketing in the field of health is an advertisement in the pharmacy sector in Turkey. The advertisement for the company's product was examined with electroencephalography and eye tracking devices, which are neuroimaging techniques. The research, which was carried out in a laboratory environment with 16 women, was carried out in an environment designed like a living room, with women watching advertisements. It has been observed that women are affected in terms of attention and emotion during watching, and the baby's movements in the advertisement cause a decrease in women's attention. From this point of view, it has been concluded that the product is liked, but the advertising message about the product should be given at the time when the attention curve is high (Şantaş and Şantaş, 2020).

Although neuromarketing is seen as a subject belonging to the fields of communication and marketing, it also has a strong relationship with health in terms of the techniques it uses and the results obtained. The increase in the use of health and communication technologies, the increasing interest in mobile applications, social media applications and virtual reality applications will lead individuals to be more intertwined with technology in the future. This situation paved the way for marketing strategies to develop themselves and to benefit from new techniques.

In health, there are various marketing techniques used in areas such as hospital promotion, healthy living behaviors, environmental health, public health, patient relations management, and health tourism. The increasing prevalence of neuromarketing in the field of health will contribute to the prevention of diseases, prevention of public health problems such as smoking and alcohol consumption, the correct determination of the factors affecting hospital preferences, and the development of the right techniques in order to have a share in health tourism in the world.

4. CONCLUSION

Neuromarketing should be evaluated differently from classical marketing techniques, whether it is the techniques it applies or the areas of application. Although it is not a technique that has been applied for many years, the high cost of the applied techniques, the demand for expertise and the entrepreneurial nature of the researches to be carried out today suppress the rate of increase in the number of studies conducted with this technique, but advances in this field will pave the way for the neuromarketing activities to be used more widely. The precision of the research results for the success of marketing and advertising activities is becoming more important these days when resources must be used more efficiently in every field.

Although it is considered successful in terms of its results, neuromarketing, which brings with it many ethical question marks, provides savings by supporting the effective use of resources to be allocated for marketing activities for companies, and can be used unethically in a way that leads the consumer to unnecessary consumption from the point of view of the consumer. In addition, the fact that the techniques used are applied in artificial environments carries the risk of violating basic research principles such as transparency and privacy, and such situations prevent the full trust in neuromarketing.

Considering the use of neuromarketing in the field of health, although its use is still at a limited level, it will be a subject that is frequently emphasized in the future. As in all other sectors, the policies implemented to increase private health insurance and private health institutions due to the increasing competitive environment in the health sector and the decrease in the subsidy power of the governments will make it important to determine the factors that play a role in the hospital preferences of the patients. The use of medical diagnosis and imaging methods by neuromarketing emerges as an aspect that strengthens the hand of the health sector in the use of neuromarketing in the field of health. In the near future, when the first examples of neuromarketing in the field of health will be revealed, it is extremely important to consider ethical concerns in the steps to be taken in this regard.

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THE IMPORTANCE OF INTERNET OF THINGS (IOT) BASED APPLICATIONS IN IMPROVING QUALITY OF HEALTHCARE SERVICES

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1. INTRODUCTION

With the emergence of the internet and its becoming a part of human life, internet technologies have developed very rapidly, allowing the world to enter a digital age. It continues to grow, with more devices connected to the Internet than ever before. It is estimated that more than 21 billion devices are connected to the internet worldwide in 2020, which means 5 times the number of devices 4 years ago (Kelly et al 2020). With the connection of devices connected to the Internet, the concept of IoT emerged with the formation of a common network that allows them to collect, send, store and retrieve data (Javaid and Khan 2021). The rapid development of IoT technology in recent years has supported the connection of many smart devices with sensors and provided uninterrupted data exchange between them (Minh Dang et al. 2019). This situation makes a significant contribution to the processes such as improving work flow

processes for the public sector and industry, customer-centered service delivery, and improving the performance of the institution and personnel.

Internet technologies, which have a profound effect on the health sector as well as on every sector in the digitalized age, change the balance of power between the provider and the patient, enable new care models, and shift the focus of health systems in countries to customer-centered health services (Mitchell and Kan 2019). From a healthcare perspective, NI can be considered as systems that can collect health-related data from individuals through devices connected to the Internet, such as computing devices, smart bands, mobile phones and some wearable devices, digital drugs or other portable measurement devices (Minh Dang et al. 2019). The growth of IoT technology enables the delivery of health services to become more effective and efficient by integrating various health practices in order to best protect and develop the health of the individual and society (Chiuchisan et al 2014). For example, various services and applications of IoT technologies such as e-health, mobile health, media assisted living, semantic devices, wearable devices, smartphones and community-based health services have been reviewed and developed (Minh Dang et al. 2019). These services are extensively detailed and can have many applications within a single cluster. For example, it includes health practices such as remote monitoring of the health status of individuals by healthcare professionals, improving self-management of those with chronic diseases, rapid symptom identification and clinical diagnoses, providing early intervention and monitoring the use of given drugs (Yin et al 2016).

In the current situation, advanced information technologies open a new door to innovation in our daily life. In healthcare, IoT technology is a newly developing technology that provides medical improvement and better solutions such as appropriate medical record keeping, sampling, integration of devices and causes of diseases. (Javaid and Khan 2021). These practices can better utilize health care resources and provide quality and cost-effective medical care (Dhanvijay & Patil 2019). In this context, it is aimed to understand the concept of IoT and its origin, to provide an overview of IoT technology in health services, to reveal the importance of IoT applications in the development of quality in health care.

2. THE INTERNET OF THINGS (IoT)

IoT is a system of wireless, interrelated and interconnected digital devices that can collect, send and store data over a network without requiring human-to-human or human-to-computer interaction (Kelly et al., 2020). In other words, it is a concept defined as the integration of objects, devices or goods with each other in various ways through advanced sensors, and these inanimate entities becoming connected and communicating with each other (Altınpulluk 2018). In short, IoT is an internet-based communication network whenever and wherever physical objects are integrated with each other or with larger systems.

The main idea of the Internet of Things is based on the idea of "Anytime Anywhere Computing", which is an eye-opening vision of the technological ubiquity of the future put forward by Mark Weiser at the beginning of the 1990s. Kevin Ashton, who is in the "RFID" research group of Massachusetts Institute of Technology (MIT), who first introduced the concept of IoT, used this concept by describing the emerging global internet-based information service architecture in a presentation he made in 1999 (Aslan and Tosun 2019). He defined a vision in which computers can collect data and turn it into useful information without human assistance, and he put forward the idea that this could be possible with technologies such as sensors and Radio Frequency Identification (RFID), which enable computers to observe, describe and understand the world (Ibarra-Esquer et al. 2017).

The concept of IoT, introduced by Kevin Ashton, primarily included devices that communicate with each other via radio frequency, thanks to RFID technology. However, with the developing technology, IoT has reached a much broader vision (Oral & Çakır, 2017). It is used in a wide range of application areas such as industry, health, consumer and home automation systems, transportation, monitoring and security services, smart infrastructures, smart cities, agriculture and livestock. In order to provide better quality service in these application areas, to increase efficiency, productivity and productivity, big data is created by collecting data about interconnected digital devices. Big data stored with smart applications and necessary algorithms is analyzed and it contributes to make related improvements (Altınpulluk 2018)

3. THE INTERNET OF THINGS IN HEALTH

Intense cost pressure on health systems in recent years; It has increased due to the diversity of diseases, the increase in chronic diseases with the increasing elderly population, the increase in treatments with digitalization and the more costly treatments (Gatouillat et al. 2018). The increase in the rate of elderly population will continue to put heavy burdens on health systems in the coming years. These pressures on health and health systems oblige the administrations to follow the necessary regulations and innovations in order to keep the health systems at an optimal level. For this reason, administrations become open to all kinds of innovations that will ease the burden of health systems (Mitchell and Kan 2019). Internet technologies have proven to be useful solutions to avoid overloading healthcare infrastructures and reduce healthcare costs (Gatouillat et al. 2018). At this point, IoT comes into play and develops various suggestions to detect, intervene and prevent possible burdens on the health system without being involved in the system, and to facilitate health delivery (Kelly et al 2020). IoT-based healthcare delivery has a serious potential to increase the efficiency, quality and effectiveness of the system (Kelly et al. 2020).

3.1. Systemic Structure of the Internet of Things (IoT) in Healthcare

It is necessary to understand and apply the basic architectural structure correctly in order to use IoT technology effectively and efficiently in the delivery of health services and to ensure the development of quality in health care. In the delivery of health services, the architecture of IoT consists of three bases: data collection sensing systems, data communication and storage, and data processing and application (Kelly et al 2020). In this section, three basic structures have been tried to be summarized.

3.1.1. Data Collecting Detection Systems

The core component of IoT is sensing. Identification and detection technologies are devices that contain technologies such as infrared sensors,

RFID technology, GPS, camera, sensors integrated into smart devices, medical sensors that can detect movements and changes in any place. The sensors in question convert the information they obtain with features such as geographical detection, object detection, location detection into digital signals. (Sethi and Sarangi 2017). The main task is to recognize the object, identify it and obtain information using sensors. (Wu et al. 2010).

When these sensors, which are used to detect and identify, are integrated into health technologies, it facilitates the acquisition of multiple information about the patient at the same time and facilitates the rapid follow-up of a quality treatment process. However, there are many IoT sensors that are thought to save lives, but it is not possible to reach a definite conclusion about the safety or effectiveness of these devices yet. (Kelly et al. 2020).

Information and communication technologies not only make our lives easier, but also support and improve the delivery of health services. When ICT technologies are considered as the next step of this process, it is thought to have the potential to further support and improve health service delivery. For this reason, it is important that the first step is to create the detection systems that will enable them to collect information from the patients correctly.

3.1.2. Data Communication and Storage

The perception layer is the (wired-wireless) IoT technology layer that includes the networks that transmit and store the information obtained through network connections established between the institution and central information stores. Increasing communication power between objects, ease of access to IoT applications have paved the way for the increasing potential of IoT applications to come to the fore, this has been the driving force for increasing demand for IoT applications in the healthcare industry where it is important to have hundreds of devices connected reliably at the same time (Sethi and Sarangi 2017).).

The data collected by the detection layer can be stored on cloud servers

or special units of the institution. The importance of having data available anytime and anywhere in health services causes the need for a data management system designed to support this feature of health data. Cloud-based data stores in IoT technologies support healthcare services (flexibly) in this respect (Minh Dang et al 2019). However, it is predicted that the prevalence of cloud technologies within the scope of IoT will increase, as the increasing demand for healthcare services will cause heavy workloads and costs in archiving, data storage and data processing in the future (Mitchell and Kan 2019; Minh Dang et al 2019).

For each patient who comes to receive health care services, the daily diagnosis, diagnosis and treatment services are recorded. In this case, the data recorded in healthcare institutions is increasing day by day. Data communication and storage is important because it provides access to this data as an institution or centrally and provides important information to decision makers in the decision-making process.

3.1.3. Data Processing and Application

The last layer of the IoT architecture is the data processing and application phase. At this stage, the data is processed and interpreted and personalized special services are provided (Sethi and Sarangi 2017). The active use of deep machine learning in IoT-based healthcare delivery will provide physicians with a higher level of insight in diagnosis and treatment, and will provide significant assistance in increasing physicians' diagnostic capabilities. Although diagnosis for the patient and the disease will not reach 100% even if the most advanced technologies are used, supporting physicians with IoT powered machines will reliably increase system performance, quality and effectiveness (Gulshan et al 2016).

The use of artificial intelligence, which has recently been included in our lives with the IoT, in medical applications provides important decision support to the authorities by using it in processes such as the determination of drug efficacy through various scientific applications, gene mutation, disease course, natural language processing and text recognition (Kelly et al 2020). In a study conducted, diagnostic evaluations supported by artificial intelligence applications were found to be more sensitive

than the diagnostic evaluations made only by physicians (Gulshan et al 2016). In addition, the optimization of artificial intelligence applications with e-health applications plays an important role in the analysis and evaluation of data and in the development of health services and will continue to increase its importance (Kelly et al 2020).

To summarize the architectural structure of NI in the delivery of health services, it continuously obtains blood pressure, heart rate, temperature, oxygen saturation and similar data from connected sensors and other medical devices that can operate separately or simultaneously to record the patient's vital information through a network and It transmits this data via network connections and allows for continuous monitoring and decision making of patient information that can be accessed and visualized via a smartphone, computer, tablet etc. (Pradhan et al. 2021). It can process this data and help make decisions about the patient's health status.

3.2. Advantages and Disadvantages of Internet of Things (IoT) in Healthcare

Internet technologies, which have a profound impact on the health sector as they have effects on every sector, change the balance of power between the provider and the patient, enable new care models, and shift the focus of health systems in countries to patient-centered health services, thanks to their unique flexibility and ability to be suitable in any environment. (Mitchell and Kan 2019). While IoT applications bring advantages in the field of health as well as in different fields, they also have disadvantages. These advantages and disadvantages are presented below (Aslan and Tosun 2019).

3.2.1. Advantages

- From the point of view of technology optimization in health services, the use of devices in health care increases with the improvement of diagnosis, diagnosis and treatment processes of patients and helps stronger developments in technology. It provides important functional and field data to be obtained by carrying the delivery of health services out of the hospital with IoT technologies.

• Although current analyzes in the management of resources in health services provide us with a superficial flow of information, they provide more detailed and realistic information that can provide more effective management of resources with ICT technologies. Thus, it is possible to produce more services from the same source.

• IoT can enable the collection of big data across the country as well as providing automation systems with institutions that directly or indirectly contribute to the delivery of health services.

• While IoT reduces the burden on institutions providing health services, it facilitates access to health resources and provides better control over patients' own health, as it provides patient-centered service delivery.

• While establishing networks with smart devices among health institutions' own units, IoT can help the institution to manage it more quickly and effectively by establishing this service with its stakeholders and providing data flows.

• It facilitates access to health services. For example, it makes it possible for healthcare professionals to monitor the health status of elderly people living in rural areas or those with chronic diseases remotely with sensor technologies and improve self-management.

• Thanks to the large amounts of data stored in databases in health systems, it can make it easier for decision makers to make more accurate and more reliable decisions.

• Time is used more effectively and efficiently by providing better monitoring and control systems for IoT patients.

• The financial aspect of IoT is one of the most important advantages for health institutions. With this technology, it can help or replace the people responsible for monitoring and protecting supplies in healthcare. From another point of view, it can help to pass on the importance of waste by making the most appropriate material planning.

• IoT shifts the focus of healthcare systems to patient-centered healthcare. There are benefits for patients such as rapid symptom identification and clinical diagnoses, early intervention, and follow-up of prescribed medications.

3.2.2. Disadvantages

• Security is the biggest problem among the always connected devices communicating on networks, also in healthcare. A lot of data is provided from the people who receive services in health services, and despite the security measures, the system provides little control. For this reason, the health system may cause users to be exposed to various cyber attacks.

• There is a possibility that information systems in healthcare services may be cyber-attacked and your personal information may be misused. Patients may be at risk as a result of changing their prescriptions or making changes to patient information. By deleting all of these data, the problem of preventing decision-making on the data may arise. In order to solve this problem, all data must be encrypted so that the financial status of the institution or the protection of other data can be shaken.

• IoT raises ethical questions that underlie its concerns, such as interconnecting and transferring sensitive private data in healthcare with a high degree of automation, patient privacy.

• In healthcare, too, highly detailed personal data can be provided "without the active participation of the user", its complexity in terms of confidentiality.

• Both healthcare professionals and patients find IoT technologies complex in terms of design, use and maintenance, as they use multiple technologies and many new enabling technologies for some.

• Experts are concerned about the flexibility of ICT technologies to integrate easily with each other. It is thought that the complex

nature of IoT technologies may cause further complexity or system collapse.

• Currently, there is no standard structure for labeling and monitoring IoT in healthcare services with sensors.

• IoT technologies, like other technologies in health systems, must comply with regulations. Compatibility issue is predicted to arise as experts complexity, many consider standard software compatibility a battle.

• Designing, developing and maintaining technologies in health services according to the IoT system can be a very difficult process. In addition, the complexity of health systems increases the possibility of causing failure in the systems. For example, it is possible to place more than one order to the supplier company of the system due to a malfunction in the hospital stock system or a software error. This causes the hospital to increase the costs and waste by purchasing the necessary materials.

3.3. IoT Applications in Healthcare

IoT has a wide range of applications. One of the most innovative applications among these is the health service, where the health data obtained from the patient is collected through some sensors, the data is analyzed, transmitted via a network connection, and the data is shared with healthcare professionals to evaluate the service provided to the patient (Aslan and Tosun 2019).

IoT practices in health are transforming the health sector by offering solutions to various health problems. With the increase in health service demands and the development of technology, more and more services are added every day. These are now becoming an integral part of healthcare system design (Pradhan et al 2021). However, to give an idea about the subject, some of the commonly used IoT applications in health are listed below. These are (Aslan and Tosun 2019, Pradhan et al 2021):

• ***Ambient Assisted Living (AAL):*** The IoT applications used in this field are considered to be more specific. The main purpose of this application is to enable elderly individuals to live independently in their homes in safety. Thanks to this technique, patients are monitored online and emergency situations can be intervened without delay.

• ***Mobile Internet of Things:*** In this technique, systems such as mobile sensors, communication technology, mobile computing systems, cloud technology are used to collect and monitor patient health information. In other words, individual internet networks (4G-5G) and communication interfaces established on these networks are used to provide better quality and effective health services. This mobility enables faster diagnosis, full-time monitoring in healthcare, and enables healthcare professionals to intervene more quickly with patients. For example, the smart watch with the sensor worn on the patient's arm instantly monitors the patient's pulse and sends information to the necessary authorities when the signal cannot be received, is one of the best application examples of these technologies.

• ***Wearable Devices:*** Wearables help healthcare professionals and patients cope with a variety of health problems at a lower cost. These devices can use various sensors such as watches, bracelets, necklaces, shirts, shoes, handbags, hats, etc., used by people. It can be developed by integrating with wearable accessories such as The attached sensor is used to collect environmental and patient health information.

• ***Community Based Health Services:*** A private clinic, a small residential area, a hotel, etc., to monitor the health conditions of people residing in an area. It is the concept of creating a health service network that covers a local community such as Thanks to the common network established especially in remote areas, medical services can be provided to those in need.

• ***Cognitive Computing:*** It refers to the process of analyzing a problem as the human brain does. Recent advances in artificial intelligence IoT devices are now integrated with sensors that can mimic the human brain in problem solving, helping healthcare providers effectively monitor patient data and provide appropriate treatment.

• ***Adverse Drug Reaction (ADR):*** The patients' past drug experiences or the drugs they use at the same time are analyzed by means of IoT technology, and an optimal drug use plan is created for the patient.

• ***Blockchain:*** Blockchain technology ensures the most accurate and complete use of common data between organizations. It helps health centers within the system to establish an uninterrupted connection between data pools in the common network. While doing this, it also ensures the security and privacy of the data.

IoT application in health is not limited to the functions mentioned above. In addition to these, other examples of the use of the Internet of Things in the field of health; Child Health Information (CHI), ECG Monitoring, Glucose Level Monitoring, Medication Management, Rehabilitation Systems. As technology develops, health technology develops and this situation paves the way for the opening of different IoT areas in health. With the rapid growth of technology, the number of applications of a wide variety of IoT in healthcare, such as cancer treatment, remote surgery, abnormal cellular growth, hemoglobin detection, etc., is increasing significantly. In the future, it will help to take important steps in the delivery of quality service with the IQ practices of health services.

4. THE CURRENT STATUS OF THE INTERNET OF THINGS IN HEALTH IN TURKEY

Turkey has started to redesign its health system within the scope of the Health Transformation Program (SDP), which has been implemented by the Ministry of Health since 2003 (Özçelik & Yiğit, 2020). Within the scope of the Health Transformation Program, it is aimed to provide health services in an effective, efficient and equitable manner and to provide financing and presentation of health services (İleri et al 2016)

As far as the content of the SDP is included, the establishment of a health information system that provides effective access to information in the decision process by activating digitalization in the services provided within the scope of health services constitutes an important component for the Ministry of Health. In 2004, with the e-health project, fifteen he-

alth goals were set. The objectives listed in terms of the development of health information systems were ultimately ensured to form and operate the "National Health System"(Avaner and Fedai 2017). In this way, it provides a fast, flexible and integrated health information system to the Ministry of Health and its affiliates, enabling decision makers to make more accurate and reliable decisions and create a stronger health system. Within the scope of the SDP, steps have been taken to digitize the Turkish health system. It also includes applications such as integrating with the processes inside and outside the hospitals, transferring them to the internet, transferring the data previously obtained through traditional processes to computer environments, together with the digitalization in health. Some of these applications used in Turkey are presented below. These are (Akalın and Veranyurt 2020, Avaner and Fedai 2017):

• ***E-Pulse (Personal Health System***): With this application, health professionals and people can receive analysis reports, examination information, historical prescription information, etc., recorded in various data centers in the country. It is an application where they can access health information such as People can access this application via different internet technologies. Through e-Pulse, physicians can access the analysis, examination and treatment data obtained in various places with the permission of the patient. Thanks to the application, it reduces the time spent in healthcare institutions, reduces costs by reducing unnecessary test requests, and also strengthens the relationship between the doctor and the patient.

• ***Family Physician Information System (AHBS):*** With this application, examination information, analysis reports, retrospective prescription information, etc. applied to individuals registered with the family physician. It is a system that facilitates the recording and monitoring of primary health care services such as centralized digital media. It is mandatory to use this application by family physicians. Examination, analysis reports, prescription, etc. related to the patient. The data obtained in the primary level, such as information, helps in making decisions in the secondary and tertiary levels.

• ***Decision Support System (DDS***): Interactive computer systems that enable decision makers to identify and solve problems, complete the decision-making process, and make decisions using data, documents, in-

formation and communication technologies and/or models. Today, KDSs are used in administrative decisions in an integrated manner with the systems of the Ministry of Health. KDS, which is used by the Ministry of Health, works integrated with the "e-Health" application and can provide reports at different levels.

• ***Central Physician Appointment System (MHRS):*** It is an application that allows citizens to make an appointment with the hospital and doctor of their choice from the 2nd and 3rd level Hospitals and Oral and Dental Health Centers affiliated to the Ministry of Health, via the internet, by calling the mobile application or by calling Alo 182. It is aimed to plan better resources in health institutions, to increase patient satisfaction by providing more effective and efficient use of available workforce and equipment, and to reduce waiting times in hospitals. In addition, it is aimed to assist in the development of health policies by using MHRS data. Since the application is integrated with e-Nabız and e-Government applications, it can be accessed via the internet, mobile application or calling Alo 182.

• ***MEDULA***: It is a project realized by the Social Security Institution. It is an integrated system created between general health insurance and health institutions to digitally collect billing information and pay for the services provided, without interfering with the internal processes of health institutions. It has been made compulsory to be used in all health institutions within the framework of Law No. 5510. With the application, it is used in transactions such as invoicing, prescription, referral and report in all hospitals.

• ***Core Resource Management System (ÇKYS):*** It is a system in which almost every job of the Ministry of Health is carried out. All personnel within the Ministry of Health; assignment and transfer procedures, personnel rights, material entry and exit, private health assignments, physical structure and information of buildings and various reporting processes are carried out with the ÇKYS system. It was implemented with the aim of ensuring that the personnel, drugs, materials, devices and financial resources within the Central Organization of the Ministry of Health and 81 Provincial Health Directorates are used in the most effective and efficient way by using information technology.

• ***Basic Health Statistics Module (TSIM):*** It is a system that includes information about the activities carried out within the scope of preventive health services, the activities carried out in hospitals and the necessary resources while performing these activities. It is used to produce correct information in terms of managing decision processes in the light of the information created by processing the information obtained digitally with TSIM.

Some of the applications used with digitalization in health in Turkey are listed above. The development of applications is carried out by or with the encouragement of the Ministry of Health, and state-supported studies continue in Turkey's digital transformation journey (Akalın and Veranyurt 2020).

Undoubtedly, steps are being taken towards this in Turkey as well as in the world. Of course, it can be seen as important developments that health organizations develop their own mobile applications and offer some services online. In addition, to be evaluated in general, it can be said that the opportunities offered by these technologies should be taken advantage of. He argued that for more modern health services, the opportunities offered by modern technologies should be taken advantage of. In realizing this, health service IoT practices are not ignored. There are steps taken in IoT practices in health in Turkey; but it is not enough. By providing a fast, flexible and integrated health information system, the application of IoT in health shows promise in providing a stronger health system by making more accurate and reliable decisions for decision makers. It is thought that the Turkish health system will make an important contribution to providing quality health services that are constantly improving. It should be considered important because of following the technological developments in the world and potential collaborations to be developed, and benefiting from the potential opportunities that Turkey will offer by integrating these technologies into the health system and significant gains will be achieved (Demir and Şahin 2019).

5. CONCLUSION

Adopting technology-focused policies to enable healthcare systems to offer more flexible treatment and diagnostic methods will bring more support for traditional healthcare delivery by IoT, enabling IoT technologies to be more intertwined with healthcare. IoT is an emerging technology that provides improvement and better solutions in the medical field such as proper medical record keeping, sampling, integration of devices and causes of diseases. Sensor and technological network-based applications using IIT have the potential to improve the way doctors deliver healthcare, too. IoT's sensor-based technology provides an excellent ability to reduce the risk of surgery during complex cases. It makes the surgeon's job easier by minimizing risks and increasing overall performance. In this way, confidence in health services is also increased.

Health institutions with IoT; It has removed the limitation of space, can deliver its service wherever it is needed, has a command of the latest technologies, and can offer personalized diagnosis and treatment. These developments offer crucial opportunities for healthcare systems to proactively anticipate health problems and diagnose, treat and monitor patients both inside and outside the hospital. With the connection of electronic devices to the Internet, health personnel can offer the potential to intervene immediately to the patient in line with the need.

As IIT technologies become connected with technologies in health services, they not only make work more effective and efficient, but also provide much better service for patients. IoT-supported devices enable remote monitoring in healthcare services and offer the opportunity to keep patients safe and healthy. In addition, remote monitoring of patient health not only helps to reduce the length of stay in health institutions, but also significantly reduces health care costs and has a great effect on obtaining more effective results of treatments. As interactions with doctors become easier and more efficient through these systems, it increases patient participation and satisfaction.

Implementation of IoT in healthcare needs to be based on a clear and robust code of practice for the management of privacy, confidentiality and cybersecurity of data regarding the supply and use of IoT devices. Future specific research on IoT technology needs to address how Io devices can

be designed to interoperate with standardized protocols, national and international healthcare systems.

With the effect of IoT potential, many conveniences are provided in hospitals. The preference of IoT applications in health services provides a high level of contribution to health personnel, especially patients, and other affiliated institutions. Medical students can now be better trained for disease detection and better guided for future action plan. In this process, the correct use of IoT applications in the health sector helps to solve different medical challenges such as speed, price and complexity, while gaining importance for hospital managers.

To summarize, IoT-based applications of health services can offer the potential to provide patient-centered services and improve care, increase patient safety, reduce health care costs, increase the accessibility of health services, ensure the continuous development of health personnel and the technology used, and increase health services operational efficiency. This reveals the importance of IQ-based practices in increasing the quality of health services.

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FACTORS DETERMİNİNG CONSUMERS' WİLLİNGNESS TO PAY FOR ORGANİC MİLK İN TURKEY

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1. INTRODUCTION

Agricultural production in the world is changing and developing in a way that does not harm natural resources and ensures sustainability in agriculture. Considering the environment and animal welfare, serious and positive developments in agricultural production results are obtained. Sustainable practices that can contribute to food and nutrition security in agriculture are considered within the scope of organic agriculture (Maggie and Ajuruchukwu , 2014: 24). With the increase in global demand, the demand for organic food has also increased in recent years. The main reason for this is that individuals want to protect both their health and their environment due to increased awareness (Eti et al., 2016: 93). Consumer and environment-oriented approaches lead con-

sumers to consume more organic food and producers to produce more organic food (Ustaahmetoğlu and Toklu, 2015: 17). Organic agriculture and organic product trade are developing rapidly in the world. According to the preliminary data for the last 20 years, organic farming is carried out in 179 countries in the world in 2015. Demand for organic products is increasing in Europe, North America and, Japan. According to 2015 data; organic agriculture has been carried out in an area of 50.9 million hectares with an increase of 15% compared to 2014 in the world (TOB, 2018: 15; Boran, 2018: 340).

Many initiatives are implemented to promote organic production in Turkey. These are actually integrated efforts of the production, research and policy. Here, the keys to successful organic production are: using chemical inputs, producing on clean lands, not using drugs in the fight against diseases, making plant and animal products and using resources economically. With the start of environmentally friendly production in the world in the 1980s, demand-oriented organic production started for the first time in Turkey (Demiryürek , 2011: 28). Milk is an essential nutrient that provides essential macronutrients such as protein, fat, carbohydrates, and many other valuable micronutrients. Although these nutrients are important in purchasing decisions, many other factors can be effective in the decision-making process (Osman, 2018: 9).

Organic production is done without the use of chemical inputs. The main reason-why organic milk production is so low is that there is not enough investment in this sector due to reasons such as insufficient belief and awareness of the producer in organic production. Also the unwillingness of the producer because organic production is a controlled production method can be added to this list. One more thing is high input costs in organic production. This absolutely leads to conclude that efficiency cannot be achieved. In this context, the increase in organic milk production depends on the investments to be made in this field (Doğan and Kızıloğlu, 2015: 276).

The respective milk processing plants in Turkey's total milk consumption are 27% modern dairy plants, 33% medium-sized establishments, and dairies, 20% uncontrolled producers, and 20% self-consumption by producers (Pazarlioglu et al. 2007: 416). In Turkey, 7,100,000 Mt of 8.160.000 Mt total milk production is cow milk, 780,000 Mt is sheep

milk, and 207,000 Mt is goat milk (Anonymous, 2004b).

In the organic product market in Turkey, producers are experiencing serious problems. It is important to investigate whether there is a potential demand due to reasons such as insufficient awareness of organic product consumption and the lack of organic product market, low product diversity and certificate costs, that is, the reflection of these costs on the product. It is about consumers agreeing to buy products produced by organic methods at a certain price, that is, whether there is a potential demand or not. The number of products produced according to the principles, and procedures of the organic method in Turkey and certified as organic by the certification bodies affiliated with the Ministry of Agriculture and Forestry is quite limited. This research is about organic milk consumption. The research aims to examine the willingness of consumers to pay for organic milk in Turkey.

2. **METHODOLOGY**

It was held among 134 consumers in different provinces, including Aksaray, Bitlis, Elazig , Karaman, Konya, Kütahya, Muğla, Muş, and Van. In this study, socio-demographic and economic factors affecting the willingness of households to pay for organic milk consumption in Turkey were obtained in detail by using cross-sectional data. Logistic regression analysis of the collected data was performed with SPSS software. Statistical and econometric analysis methods were used. Socio-economic characteristics of consumers (mean, minimum value, maximum value, standard deviation) were analyzed with descriptive statistics. Logistic regression is a binary analysis method widely used in adoption studies (Adesina et al., 2000:11; Pattanayak et al., 2003: 12; Conteh et al., 2015: 8). Logistic regression is based on logistical probabilities where a household decides whether or not to buy organic milk. The intention to purchase organic milk is defined as a function of the demographic variables that follow their work (Gulseven and Wohlgenant, 2017: 271). In this study, the Logistics model was used to analyze consumers' willingness to pay for organic milk in Turkey.

Logistic regression equation :

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots\cdots + \beta_k X_k + u_t$$

Y * = 1 = Consumer willingness to pay for organic milk
0 = Otherwise
β_0= Continuous intersection
$\beta_1 - \beta_k$= coefficient parameters of the independent variables
X_1= marital status
X_2= Share of Expenditure
u_t= Error term

Table 1: Variables description and measurement

Variables	Explanation	Measurement
Dependent variable (Y)		
	Consumer willingness to pay for organic milk	1 = Yes, 0= otherwise
Arguments (X)		
x_1 **Marital status**	Marital status of the producer	1= Yes, 0= otherwise
x_2 **Expenditure Share**	Expenditure Share	1= Yes , 0= otherwise

3. RESULTS AND DISCUSSION

The average age of consumers is 38.7 (Table 2). For the sample as a whole, approximately 19.4% of household heads were in the active and productive age range. The gender of the respondents shows that 60.4% of the household heads are female and 39.6% are male. The education

level of the respondents shows that the majority have college and higher education qualifications. The percentage is 69.4% and 20.9% respectively. Education level can determine the level of opportunities available to increase consumers' willingness to pay for organic milk and increase food security. This finding is consistent with the results found by Osman (2018:9). The study shows that consumers with higher education levels are more likely to buy organic milk. Similar results were also found by Yin et al. (2016: 1769). They found a strong correlation between education level and willingness to pay for organic milk in China. It is also supported by results found among Taiwanese consumers by Huang and Lee (2014:17). Again, the study conducted by Escobar et al. (2017: 558) show that higher educational attainment is a common factor among all organic consumer clusters in Mexico. The high level of education of consumers will enable them to gain knowledge and skills in making a budget, saving money, adopting innovations, and using resources (Estürk and Ören, 2014: 5).

The marital status of the respondents indicates that a high percentage of respondents (60.4%) are single, while 39.6% are married. This is because marriage between farmhouses in Nigeria not only requires children and continuation of the family but also in some regions women and children constitute a vital source of unpaid family labor.

The household size of the respondents showed that the average household size in the study area was about 6 people. The household is not large, which may indicate a low labor supply for the family business. Household size is important because a decrease or increase in household size reduces or increases the number of consumers, thereby reducing or putting pressure on household resources, especially food. Also, households with high dependency rates are particularly prone to food insecurity (Ibok, 2012: 185).

Table 2: Socio-economic characteristics of consumers

Variables		%	N	Mean
Age	19-30	69.4	93	22.6
	31-50	19.4	26	38.7
	51+	11.2	15	58.1
Gender	Female	60.4	81	-
	Male	39.6	53	-
Education	primary / lower	9.7	13	-
	medium/high	20.9	28	-
	University	69.4	93	-
Marital status	married	39.6	53	-
	single	60.4	81	-
Household income	0-2500	69.4	93	-
	2501-5400	22.4	30	-
	5400+	8.2	11th	-
Household size	1-4	59.7	80	3.2
	5-6	31.3	42	5.5
	7-12	9	12	8.1

Source: Field research result, 2021

According to consumer responses, consumers are willing to consume organic milk. Figure 1 shows us that the majority of respondents consume 2-3 times a week (51%). This is followed by those who consume it 2-3 times a month. The percentage of people consuming milk 2-3 times a month is 18%, while 14% consume milk daily. The percentage of people consuming milk once a month, however, is only 8%. 66% of these consumers drink milk every day and 21.5% recommend drinking milk at

least once a week. This finding is not consistent with the results found by Osman (2018:9). According to Rahnama and Rajabpour (2017), dairy consumers are highly fragmented and therefore cluster analysis can help differentiate between different consumer segments in the dairy market, and finally, 9% do not even consume milk in our study area.

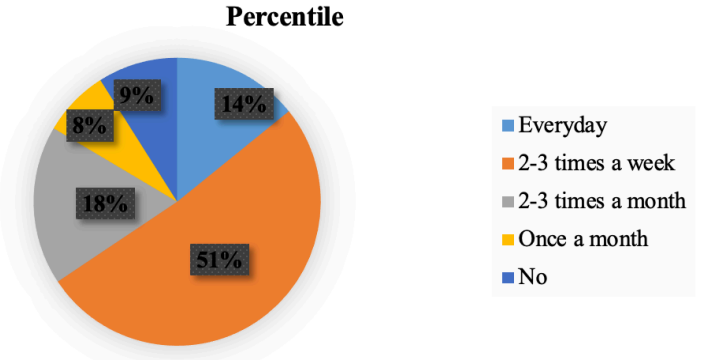


Figure 1: Frequency of organic milk consumption

The share of organic milk expenditures in all your expenditures, according to the percentage of respondents, is shown in Figure 2. The vast majority of the respondents allocate 10% to 20% of their total budget for food.

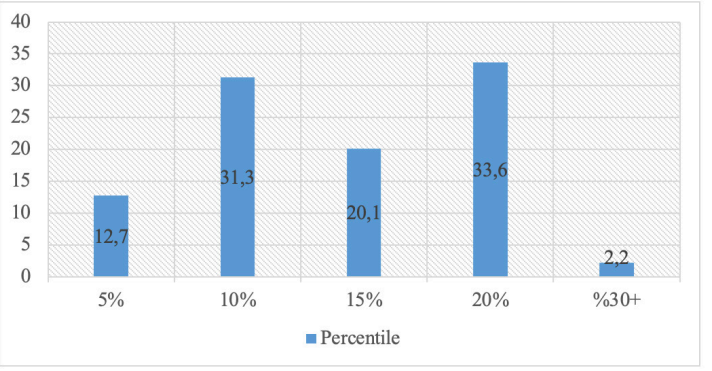


Figure 2: Organic milk expenditure share in all your expenditures

Logit model, socio-demographic factors; especially spending share, and marital status and Consumer willingness to pay for organic milk in Turkey. The variables described in Table 2 represent the expenditure share and marital status factors included in the estimation procedure. According to Winkelman and Boes (2005), perfect estimation problems arise when there is no variation in the dependent variable for a particular category of the binary explanatory variable. The model accurately predicts consumer willingness to overpay for organic milk with 94.8% accuracy. The result of a model stated in equation (1) revealed that marital status and expenditure share variables were significant in the model, and it is understood that singles (4.38 times) and those who want to spend more (2 times) agreed. They pay more for organic milk than married people. However, this finding is not consistent with some studies in the literature (e.g. Wendy, 2008: 23). Here, the negative effect of being married can be attributed to the need-focused food consumption expenditures of married couples, especially among married couples with children. The study in the literature (Wang and Sun, 2003: 27) showed that there is a niche market for organic milk and apples, and people are willing to pay more for locally produced and certified organic milk and apples.

Table 2: Logistic regression results

Variables	coefficient	Standard error	Wald statistic	SD	P value	Expert (B) Rates
Marital status	1,478	0.609	5,883	1	0.015**	4,382
Expenditure Share	0.711	0.292	5,946	1	0.015**	2,036

Note: *** 1% ** 5% * 10%

Source: Field research 2021

4. CONCLUSION

Today, the increasing need for food in parallel with the rapid population growth in the world brings with it an important problem such as hunger. Increasing production ensures the sustainability of natural resources with organic production, which is an alternative product. The gender of the study area shows that 60.4% of the household heads are female and 39.6% are male. The model accurately predicts consumer willingness to overpay for organic milk with 94.8% accuracy. In the model, it is understood that the variables of marital status and expenditure share are significant and that singles and those who want to spend more agree to pay more for organic milk than married ones. Looking at this parameter can contribute to milk consumption in Turkey and around the world.

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EXAMINATION OF PRODUCERS FOR GROWING RADISH: CASE OF KADIRLI DISTRICT IN TURKEY

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1. INTRODUCTION

Radish is a good partner when it comes to agriculture. It acts positively in several ways: it has a great variation, spreading area and production in the world, especially such as China, Japan, Korea, and Southeast Asia, and it is a vegetable rich in nutrients and important for meeting people's need for fresh vegetables. (Mutegi et al. 2013: 191; Chen and Weil, 2010: 31). Apart from these, several plants including radish are used by the public against many diseases due to their functional structure (İbrahim et al. 2022: 1596). Radish production occupies a very important place among the products produced as a second output in the Kadirli district of the city of Osmaniye. About 71% of the radish production carried out in Turkey is provided by the companies operating in Kadirli (Nermin, 2019: 10). Among the winter vegetables, radish is a profitable product that can be grown in almost all seasons during the shorter planting period and is well-dispersed in light, nutritious, rich, and moist soils according to Saeed et al. (2015: 147). Radish grows in a wide geographic area in temperate climates around the world. Terrestrial climatic conditions are not suitable for radishes. Areas, where the annual temperature is between 12 and 20 degrees, are ideal. In extremely hot and cold climates, root development is damaged. Sudden temperature increases and early and

late frosts negatively affect root development. Another critical factor affecting radish development is day length (Anonymous, 2018: 40). The total production amount of radishes in Turkey is 178 344 tons in 2017 according to TUIK, (2018: 178). The reason for the high temperature and humidity requirements, in the Mediterranean region, including the Aegean, is that radish is grown in the coastal areas of Marmara and the Black Sea (Anonymous, 2018: 40). The advantages of planting radish can be listed as follow: it is produced in all seasons of the year, although its calorie level is low, it is rich in vitamins and minerals, it is consumed fresh and cooked, it is among the first vegetables produced in human history, and also there are different kinds of radish (e.g. red radish, white radish, horseradish, etc.). For these reasons, radish has an important place among vegetables (Anonymous, 2019). It is estimated that the world radish production is about 7 million tons/year and approximately 200 thousand tons of radishes are produced annually in Turkey. Turkey's radish cultivation area, production, and yield development by years are given in table 1.

Table 1. Turkey radish sowing, yield, production

Year	Cultivation Area (da)	Index	Yield (ton/da)	Index	Production (tons)	Index
2009	64,121	100.00	2.46	100.00	158.029	100.00
2010	62,696	97.78	2.48	100.81	155,673	98.51
2011	62,182	96.98	2.53	102.85	157,588	99.72
2012	58,262	90.86	2.51	102.03	146,442	92.67
2013	66,855	104.26	2.67	108.54	178,250	112.80
2014	64,738	100.96	2.98	121.14	192,988	122.12
2015	64,621	100.78	3.10	126.02	200,249	126.72
2016	63,949	99.73	3.12	126.83	199,288	126.11
2017	63,406	98.88	3.13	127.24	198,701	125.74
2018	62,931	98.14	3.13	127.24	196,984	124.65

Source: TURKSTAT, 2019

Radish cultivation area in Turkey fluctuated between 2009 and 2013. It has been in a decreasing trend since 2013. The average annual cultivation area of radish for the last 5 years is 64 thousand da. Despite this development in the cultivation area, the yield of radish has increased over the years. As a matter of fact, the yield, which was 2.46 tons/da in 2009, reached 3.13 tons/da in 2018 with an increase of 27%. The amount of production, on the other hand, developed in parallel with the increase in productivity and increased by 25% compared to 2009, and the average production for the last 5 years was 197,642 tons.

Turkey's radish production, foreign trade and consumption situation are examined in table 2.

Table 2. Development of Turkey's radish production, import and export by years

Year	Usable production (Tonnes)	Import (Ton)	Domestic use (Tons)	Consumption (Tons)	Losses (Tons)	Export (Ton)	Consumption per capita (kg)	Qualification degree (%)
2009	156,350	-	155,554	139,998	15,555	796	1.93	100.51
2010	160.142	-	159,340	143,406	15,934	802	2.01	100.5
2011	154,150	4	153,482	138,134	15,348	672	1.96	100.44
2012	166,788	-	166.064	149,457	16,606	724	...	100.44
2013	168,192	-	167,177	150,459	16,718	1,015	...	100.61
2014	168,672	1	167,865	151.079	16,787	808	2.14	100.48
2015	171,150	-	170.242	153,218	17,024	908	2.2	100.53
2016	173,130	-	172,377	155,139	17,238	753	2.25	100.44
2017	166,182	-	165,609	149,048	16,561	573	2.2	100.35
2018	165,690	99	165,044	148,540	16,504	745	2.22	100.39

Source: TÜİKb, 2019

Radish foreign trade in our country is at a very low level and the amount of imports is almost non-existent. Although the annual radish export amount fluctuates over the years, it is an average of 780 tons per year. Most of the production is used for domestic consumption. Turkey is self-sufficient in radish production. Turkey's radish production is concentrated in certain provinces. Radish production amounts and productivity status of these provinces are examined in Table 3 and Figure 1.

Table 3. Provinces with intense radish production

Provinces	Cultivation Area (da)	Share (%)	Yield (kg)	Production (tons)	Share %
Osmaniye	39,800	61.45	3,52	140,225	71.19
Samsun	3.890	6.01	3.38	13,167	6.68
Ankara	2.116	3.27	3.36	7.103	3.61
Karaman	1,820	2.81	1.79	3,260	1.65
Kahraman-maras	1.795	2.77	1.01	1,820	0.92
Konya	1.751	2.7	2.62	4,585	2.33
Adana	1.630	2.52	2.63	4.290	2.18
Other	11,965	18.47	-	22,534	11.44
Turkey	64,767	100.00	3.04	196,984	100.00

Source: TURKSTAT, 2019

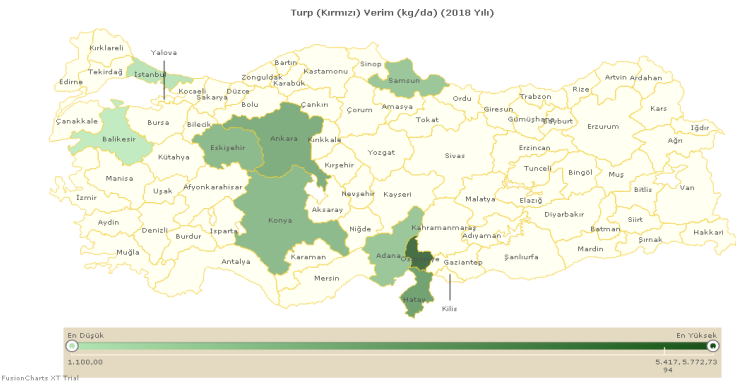


Figure 1. Radish yield by provinces in Turkey

Osmaniye province ranks first in radish production in Turkey both in terms of cultivation area and production. The other provinces where the cultivation area is dense are Samsun (6.01%), Ankara (3.27%), Karaman (2.81%), and Kahramanmaraş (2.77%). 71.19% of Turkey's radish production is met from Osmaniye. In terms of radish yield, it is seen that Osmaniye has a productivity above the Turkey average. The developments in the cultivation area, yield, and production of radish in Osmaniye province are examined in table 4.

Table 4. The development of radish cultivation area and production in Osmaniye province over the years

Year	Cultivation Area (da)	Index	Yield (kg/da)	Index	Production (tons)	Index
2009	37,500	100.00	3.00	100.00	112,500	100.00
2010	37,500	100.00	3.00	100.00	112,500	100.00
2011	38,305	102.15	3.00	100.00	114,915	102.15
2012	34,950	93.20	2.98	99.44	104,260	92.68
2013	40,550	108.13	3.08	102.75	125,000	111.11
2014	38,800	103.47	3,52	117.46	136,725	121.53
2015	39,800	106.13	3,52	117.44	140,225	124.64
2016	39,800	106.13	3,52	117.44	140,225	124.64
2017	39,850	106.27	3,52	117.46	140,425	124.82
2018	39,800	106.13	3,52	117.44	140,225	124.64

Source: TURKSTAT, 2019

Although the cultivation area in Osmaniye, which meets 71.19% of Turkey's radish production, remained stable between 2009 and 2018, the production increased from 112,500 tons to 140,225 tons with an increase of 24.64%. The increase in yield was effective in this increase. Radish yield increased from 3.00kg/da to 3.52kg/da in the specified period. Radish production in Osmaniye is concentrated in the Kadirli district.

Table 5. Distribution of radish cultivation area, yield, and production by districts in Osmaniye province

Districts	October (da)	Share (%)	Yield (kg)	Production	Share (%)
Kadirli	36000	90.45	3,5	126000	89.86
Sumbas	2500	6.28	4	10000	7.13
Centre	1300	3.27	3.25	4225	3.01
TOTAL	39800	100	10.75	140225	100

Source: TURKSTAT, 2019

Kadirli district provides 90.45% of the radish cultivation area and 89.86% of the radish production in Osmaniye province. Radish is one of the most important sources of income for the producers of the district. When the profitability of the products grown in the district according to the records of the Ministry of Agriculture and Forestry is examined, it is seen that radish is in the first place. Radish in the district is called "Red Gold" and "Smokeless Industry". For this reason, the objective of the study is to investigate the variables that change the field area allocated by the producers for growing radishes.

2. METHODOLOGY

The present study was carried out in Turkey, with 149 producers in Kadirli. Collected data were analyzed using descriptive statistics and econometric analysis method using ANOVA analysis with the help of SPSS. ANOVA is a test if two or more populations have the same mean. ANOVA to test for differences in the population involves an examination of the sample variances; hence the term analysis of variance. More specifically, the procedure can be used to examine whether a "treatment" when applied to a population will have an impact on its average (Haruna et al. 2013: 9). The factor refers to the force whose impact on the dependent variable is determined. ANOVA is not the only test that can be used to test for differences in population means. ANOVA, on the other hand,

can handle analysis where the independent variables have more than two categories (Hair et al. 2006) Sometimes, to correct for the inherent flaw in t-testing, separate t-tests for the difference between each pair of means are made. However, these multiple t-tests inflate the Type I error rate. The use of ANOVA avoids this Type I error inflation due to making multiple comparisons between treatment groups by determining in a single test if the set of sample means suggests that the samples were drawn from the same general population (Hair et al. 2006: 11). Based on the above reasons, this study uses the ANOVA approach. In the ANOVA test, the F-ratio is the ratio of the variation between samples to the variation within samples. The ANOVA of the F-ratio for a test of mean is given by:

$$F = \frac{MSTR}{MSE} \qquad (1)$$

Where MSTR is the mean squares treatment and is given by:

$$MSTR = \frac{SSTR}{C-1} \qquad (2)$$

Where c is the number of treatments, SSTR is the sum of squares treatment and is given by:

$$SSTR = \sum r_j (\bar{X}_j - \bar{\bar{X}})^2 \qquad (3)$$

Where $\bar{\bar{X}}$ is the grand mean of all observations, $\bar{X}_j$ refers to each treatment mean and rj is the number of rows in each treatment.

MSE is the mean squares error and is expressed as:

$$MSE = \frac{SSE}{n-c} \qquad (4)$$

n is the total number of observations and SSE is a sum of squares error algebraically written as:

$$SSE = \sum_{i=1}^{r} \sum_{j=1}^{c} (X_{ij} - X_j)^2 \qquad (5)$$

X_{ij} is the i^{th} observation in the j^{th} sample. The hypothesis to be tested is that all treatment means are equal against the alternate hypothesis that not all treatment means are equal. That is:

Ho=$\mu_1=\mu_2=\ldots=\mu_n$

H1= not all means are equal

RESULTS AND DISCUSSION

Table 6 shows us the basic profile of the household heads that could have a potential implication on land allocated by the producers for growing radish was analyzed. The education status profile of the respondents revealed that about 63.10% were in Middle school-high school. This could imply growing radishes and practices in agriculture. This is not similar to the Adisu, (2020: 10) that the education status profile of the respondents revealed that about 53.5% were unable to read and write. The majority, age of the household head was more than 60 with a mean of 66.24 years in the study area. This finding is not consistent with Miassi and Sinasi's (2022: 7) study. According to the study, the average age of producers is 47 years old. The family size was found to be 4-6 on average. Household size is a great implication on how much, when, and how to produce crops with 71.10%. This result is similar to Miassi and Sinasi, (2022: 7) those with an average are the most dominant (53.7%). The non-farm income share is almost the same compared to respondents who answered yes and no, implying that farmers with a lower non-farm income share tend to rent land to increase total household income (Kung, 2002: 395). The majority, (89.90%) of producers own tractors. Owning a tractor reduces the need for external labor according to Kormawa et al. (2019). A tractor is much more profitable when it is deployed over a large area and also facilitates the execution of activities and reduces the need for external labor (Miassi and Sinasi, 2022: 7). Respondents have reported that they own the land. The average land ownership of the households was 42.90%. Most of the respondents have an average rental land with 53.30%. These findings are close to the results found by Nermin (2019: 11) that 58.2% of the land on which the radish production is made is owned by the operators themselves and the rest is rented. FAO, (2001: 21) The land is the primary source of wealth and livelihood in rural Bangladesh, as in other South Asian countries, although the land ratio is one of the lowest in the world, estimated at 0.12 hectares. 90.60 % of respondents do have no livestock against 9.40%. This result is not consistent with Adisu, (2020: 12). According to the study, the households in the study area are better at livestock ownership.

Table 6: Socio-demographic profile of the respondent households

Variables	N	%	Mean
Age			
20-40	31.00	20.80	35.39
41-60	89.00	59.70	51.29
More than 60	29.00	19.50	66.24
Experience (years)			
1-15	30.00	20.10	11.73
16-35	77.00	51.70	26.99
More than 35	42.00	28.20	44.55
Household size			
1-3	20.00	13.40	2.35
4-6	106.00	71.10	4.87
More than 6	23.00	15.40	9.48
Education			
Primary school or lower	25.00	16.80	_
Middle school-high school	94.00	63.10	_
University	30.00	20.10	_
Non-agricultural income			
Yes	75.00	50.30	_
No	74.00	49.70	_
Tractor asset			_
Yes	134.00	89.90	_
No	15.00	10.10	_
Livestock			
Yes	14.00	9.40	_
No	135.00	90.60	_
Owned land			
1-50 da	33.00	27.70	_
51-199 da	51.00	42.90	_
More than 200 da	35.00	29.40	_
Rental Land			
0-75 da	17.00	22.70	_
76-330 da	40.00	53.30	_
331-3000 da	18.00	24.00	_

Source: Field Survey, 2019

It is seen that radish growers will not try to reduce or expand their production by keeping their situation stable in radish growing in the future. It is seen that those who have been growing radishes for 1-7 years are planning to reduce production compared to others (Table 7). The finding is similar to the results reported by Nermin, (2019: 11) that the means radish yield in Kadirli is very low compared to the other studies. The radish yield varies according to the characteristics of the radish used and also to the area.

Table 7: Radish growing year

Radish by year	Expand	Keep constant	Reduce	Total
1-7 years	15.4	59	25.6	100
8-20 years	6.8	78.4	14.9	100
More than 20 years	19.4	61.1	19.4	100

It is seen that those who grow radishes grow more corn than other crops. Next comes peanuts. It is also seen that those who have been growing radishes for more than 20 years tend to plant wheat. This result is corroborated by the results found in the literature by Nermin, (2019: 12). The study found that producers plant cereal crops such as maize, wheat, groundnut, and sunflower and produce such as fresh vegetables and fruits are some of the commodities grown mainly in the study area (Kadirli) illustrated below in Table 8.

Table 8: Other products with radish growing year (%)

Radish growing year	Wheat	Cotton	Corn	Peanut	Total
1-7 year	9.52	9.52	66.67	14.29	100
8-20 year	0.00	0.00	73.33	26.67	100
More than 20 years	18.18	4.55	59.09	18.18	100
Total	8.22	4.11	67.12	20.55	100

The model is significant because the p-value corresponding to the F test value in the analysis of the variance table is less than 0.05.

Table 9: Model Summary

	R	R Square	standard error
Model	0.95	0.90	0.66

Table 10: Analysis of Variance (ANOVA)

Model	Total Squares	SD	Average Squares	F	p value
Regression	16.322	6	2.72	6.794	0
Error	51.649	129	0.4		
Total	67.971	135			

Since the p values used for the significance test of the coefficients of the variables in (table 11) given below are less than 0.05, these variables are significant in the model. It is seen that as the age of the producers in Kadirli increases, they tend to produce more radishes. This result corroborates with certain results obtained in the literature (Miassi and Şinasi, 2022: 6). According to the profession variable with a negative coefficient in the model, it has been revealed that those whose main occupation is a farmer give more importance to radish production than those who do not. In addition, it is understood that those who reside in the village, district or province, or both places, are more radish growers than those in the village. In terms of credit, it is seen that those who do not use agricultural credits try to grow more radishes than those who do, that is, the growers do not get credit for radishes. It is understood that the increase in the sales price of radishes also directs the producers to grow radish-

es. This finding is again consistent with Sneha and Priyanka's (2022) finding. They reported that only 12% of respondents are satisfied with the unit prices of radish. The study further revealed that most of them comprises farmers selling their products directly to customers. About 88% were quite disappointed with their unit prices. According to Kumar et al. (2018), market monitoring and frequent guidance to vegetable growers could be one of the solutions to protect farmers from marketing exploitation by the middleman. But again these results were consistent with those of Shrestha et al., (2014: 59). They reported that price instability and higher middleman margins were the most critical constraints in vegetable farming. Nermin's (2019: 9) study also reached almost similar findings. According to the study, excess supply in the marketing process, price instability, market constraints, monopolization of large producers, and problems caused by disrupted producers in the organization were among the problems often expressed by farmers in the marketing of radish. Since the VIF (variance inflation factor) values are less than 10, it is understood that there is no multi-collinearity problem between the independent variables.

Table 11: Estimation of Model Coefficients

Variables in the Model	Coefficient	Standard error	T	p value	VIF
Constant Term	1.55	0.44	3.55	0.00	-
Age	0.02	0.01	3.60	0.00	1.05
Profession	-0.26	0.08	-3.31	0.00	1.10
Residence	0.12	0.06	1.96	0.05	1.22
Agricultural credit	0.31	0.11	2.70	0.01	1.04
Radish selling price	0.53	0.21	2.52	0.01	5.04

NB: *** 1% ** 5% * 10%

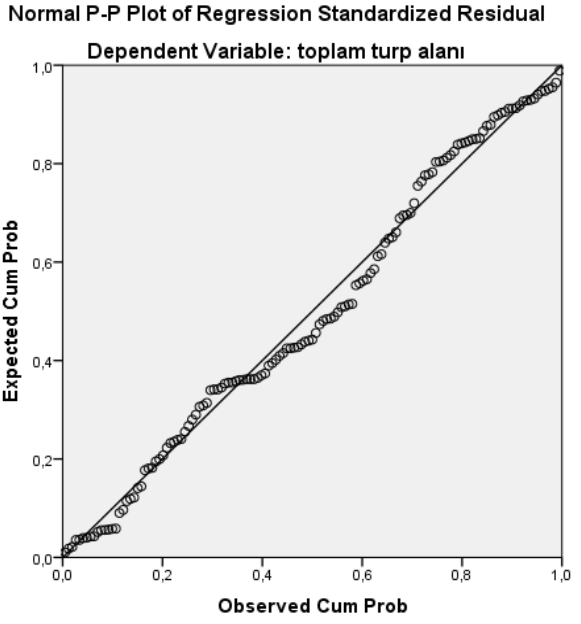


Figure 2: Normal pp plot regression standardized residual

3. CONCLUSION

Vegetable crops are much needed due to their higher yield, lower cost of production, and higher nutritional value. Vegetables are rich sources of vitamins and minerals, essential for the maintenance of good health and resistance to disease. Among winter vegetables radish is a highly profitable crop that can be grown in almost every season and all soil types. This study concluded that growing radish is a profitable crop that can help improve the economy of farmers in the Kadirli district. The model in the study revealed that such variables as age, profession, residence, use of agricultural credit and radish selling price are significant. It also proves that with the support of the government, farming can become more profitable and if the problems are solved, it will help the farmers to be more secure and get a good economy for their products.

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IMPACT OF FARM ASSETS ON THE WILLINGNESS TO UPTAKE AGRICULTURAL INSURANCE IN TOGO

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INTRODUCTION

Togo's economy, like that of most countries in the sub-region, has long been based on the agricultural sector. Even if the contribution of the sector to the formation of the GDP is reduced over the years, agriculture still plays a preponderant role in the economy and the development of the country with increasingly increasing added values. It represents 19% of the GDP (World Bank, 2021a), an absorption of 32% of the active population in 2019 (World Bank, 2021c); strategies for eradicating hunger and achieving sustainable development goals are largely based on the growth and development of the agricultural sector. However, despite the efforts and progress made in the sector, there is still a state of deficit. For example, the needs for rice, meat, fish, not to include agro-food products, cannot be met by national production, leading to import expenses amounting to $284,536,742 US in 2015 (for 13.38% of total imports) (World Bank, 2021b). To reverse the trend, many actions have been un-

dertaken, both at the national and sub-regional levels. We, thus, note the support, investment and productivity programs for the agricultural sector, and even support funds for entrepreneurs, many of which go to agro-food transformation projects. These projects have certainly allowed considerable progress in production but allow us to realize the dependent nature of structures and agricultural contractors for financing from the projects. Although the agricultural sector contributes enormously to the country's growth, although it shows even more promising growth potential in response to the projects carried out, the growing population, the needs for agro-food processing, the agricultural trade balance in deficit, there is a shortage of financial solutions. Public expenditure allocated to the agricultural sector was 2.5% of GDP in 2004, and 3.9% in 2010 (World Bank, 2012). Concerning the credits granted by the banks, the agricultural sector is the last beneficiary of bank financing with 0.2% of the total credits granted in 2019 (Togopresse, 2020). The role of financing in productivity, development, and innovation is no longer demonstrated (D'Souza, 2020). Agricultural credit has enabled the industrialization of agriculture in many economies (D'Souza, 2020). When we look at the explanatory causes of the underfunding of agriculture in Togo, apart from the family character of many farms in Togo, one of the essential reasons for the underfunding of the agricultural sector is the very nature riskiness of the sector compared to other sectors.

It is true that agriculture in Togo, like that in several countries in Africa, is very dependent on the seasons, increasing the level of risk of agriculture, which is to some extent dependent on nature.

Natural disasters are very costly for agriculture. According to an FAO report between 2005 and 2015, 96 billion dollars of agricultural and animal losses were caused by natural disasters in developing countries (FAO, 2021). In general, the drought is the most costly over this same period (29 billion US dollars). In Africa, the second (the most affected of the continents), just like Latin America and the Caribbean, drought and animal losses are the most costly disasters with respectively 10.7 and 13 billion dollars between 2005 and 2015 (FAO, 2021). Agricultural risks are among those factors that strongly influence decisions about input use, investment and technology adoption. Uncontrolled production risks and their cost are major impediments to investing in land improvement, irrigation, agricultural equipment and inputs, including fertilizers

and seeds. Agricultural risks are among the main reasons for poverty traps, as they can influence smallholders' decisions in favor of low-risk but also low-return subsistence farming, rather than increasing investment in enterprises high-yielding agricultural crops (FAO, 2021). For instance, in Turkey, the low risk reward offered by agricultural sector makes youth quitting farming resulting in a reduction of farm assets and an ageing population (Akdemir et al., 2021)in a context marked in recent years by a rural exodus of young people, marks the vagueness of the current state of the agricultural sector and its future. It is with this in mind that this research was carried out, based on a questionnaire survey of 312 producers in 5 provinces of Turkey, to assess the impact of the ageing of the rural population on the agricultural sector. The results of this study show that with age, producers invest less in agricultural activity, altogether abandoning productions requiring more labour. The possibility of taking over the family farm by descendants plays an important role in the degree of involvement of producers. Through these findings, this study makes it possible to address targeted agricultural policies according to age stages.","container-title":"New Medit","DOI":"10.30682/nm2104d","ISSN":"2611-1128, 15945685","issue":"4","journalAbbreviation":"New Medit","language":"en","page":"49-62","source":"DOI.org (Crossref. This impact on production can easily affect the chain at the level of processors, agro-food companies (…) in their planning, decision-making and development of activities. Considering the consequences on farmers, consumers, actors present throughout the value chains, and even on the national economy, the importance of risk management mechanisms is irrefutable. In sub-Saharan Africa, risk management operates more through the depletion of savings, production assets, crop diversification, diversification into non-agricultural activities, which could reduce agricultural production capacity, in terms of time, labor and other physical and financial resources. These methods of risk management and adaptation are not the most appropriate since they are not sustainable; they will lead families and farms to a precarious situation, a reduction in production capacity, or abandonment of agricultural activity (Demeke et al., 2016). Allowing the sustainability of agricultural activity therefore requires the establishment of an appropriate risk management mechanism that would allow agricultural producers to continue their agricultural activities without seeing their savings and production assets eroded. The agricultural insurance mechanism (conventional as index) has the

advantage of protecting farms or agricultural families without inducing them into difficult socio-economic situations or situations of reduction of agricultural capital. However, despite these benefits conferred by insurance mechanisms, the level of enthusiasm is not always up to expectations. Indeed, Africa has the lowest rates of insurance coverage and these agricultural insurance practices were only introduced from the 1990s. Increasing the adoption of insurance requires understanding the motivations and the determinants by analyzing from the point of view of the producers. Although agricultural insurance is young in Africa, there are scientific studies on the issue; most being post-project evaluation studies. However, studies on agricultural insurance in Togo are not yet available, nor is the insurance itself. Understanding the socio-economic motivations and expectations of Togolese producers would make it possible to set up a more suitable insurance service, and a massive adoption of it. It is in this context that based on the Contingent Evaluation Method, on comparison and regression analyses, this study analyzes the probability of adoption and the factors supporting or preventing this adoption by agricultural producers in Togo.

The results of this study will serve as a guide in understanding the factors of adoption or rejection of agricultural insurance - which is a new technology - in the agricultural world in Togo, and will make it possible to put in place the conditions necessary for an effective implementation of the agricultural insurance mechanism in Togo. The aspects taken in consideration for this research are the socio economical characteristics of the farmers, their assets and finance and their correlation with the will to subscribe to agricultural insurance.

1. RESEARCH METHODOLOGY

1.1 Research Design

The nature of the study is a descriptive cross sectional research. This study process collects information on a particular population pattern or events. The study used descriptive research designs to collect data through questionnaires to respond to awareness-raising questions, people's perception of insurance premium costs, and social-economic factors that decide the

use of farm insurance in enriching food safety. Kerlinger, (1983) says that using descriptive approaches, the relative frequency, distribution and interrelations of sociologically and psychologically variable can be analyzed by choosing a small population sample. The data collection method consisted of an open-ended and closed-ended questionnaire to obtain sectional and comparative data.

1.2 Sample Size and Sampling Technique

The population of the research study consisted of farmers and breeders in Togo. The target population was split into 3 groups, farmers involved in export oriented crops (soya, cashew…), farmers in food-producing cultures (maize, rice…), and breeders of poultry. The breeders of poultry were mostly chosen in Maritime region, since it is the place of high concentration of big breeders; concerning the soya and maize farmers, the target regions were all the 5 regions of the country in order to have a representative sample.

In line with the above and to ensure good representation in both categories, both probability and non-probability sampling techniques were applied. The reason for using stratified sampling method is that the study aims at capturing information from all the diverse groups of people; those with a certain form of professionalization (contractual agriculture, constant income) and those without. The study cross related these different aspects to see if there was any influence of them in the use of agriculture insurance as a means of enhancing food security. In order to achieve this, the population was divided into three sub-populations that is individually more homogeneous than the total population, each sub-population was called a strata. Items from each stratum constituted a sample. Simple random sampling technique was adopted for the strata of those without (or with very low) professionalization (food-crop producers). However, for the strata of those with a certain level of professionalization, the snowballing sampling method was used. This is because the subjects in this category are unknown as there was no sampling frame or available data to show where they are located. These sampling methods could give the desired representation for the subgroups. The identification of the participants was assured by technical advisers from support institutions that

were present during the interview or provided a data about some farmers.

The recent data of the population of farmers in Togo is from 2013, stating a number of 3,738,430 as farmer population, with 1,311,659 as the active farmers' population. Assuming this data, we can use the formula proposed by Yamane (1967).

$$n = \frac{N}{(1 + Ne^2)}$$

Where n is the sample size, N is the population size, and e is the level of precision; we chose 95% as interval of confidence.

When this formula is applied to our total farmers' population or active farmers' population the sample is 400.

In case, we suppose we don't know the size of the populations since the available data is not up to date, we can use this following formula proposed by Daniel (1999):

$$n = \frac{Z^2pq}{e^2}$$

Assuming we chose a 95% confidence level, 0.5 standard deviation (p), and a margin of error (confidence interval) of +/- 5%, q=1-p 95% – Z Score = 1.96

The sample size from this formula is therefore 385.

The size of the sample is selected as representatively as possible to minimize sampling error. Pre-testing the Instruments was done in the Savannah Region while the remaining regions were included in the actual study. A total sample size of 486 farmers was therefore targeted by the study, and 456 answers were validated. Sampling of farmers will be done as presented in table.

Table 3.1. Sample size for the farmers

Region	Sample per region	Vegetal Producers	Breeders
Maritime region	92	43	49
Plateau region	128	92	36
Central region	31	27	4
Region of Kara	120	95	25
Savannah region	85	55	30
Total	**456**	**312**	**144**

Source: Survey results, 2021

1.3 Data Collection Procedure

The study used primary data. Primary data was collected using questionnaires administered by competent people experienced with rural and agricultural life and technical support to farmers. The tool was used to explore not only the opinion of stakeholders but also evaluate the response of insurance perception. In order to improve the response rate and quality of data gathered, the questionnaires to the respondents in the study was administered and the respondents interviewed accordingly.

Questionnaires were filled out at the same time as the interview. The main reasons for using the interview method of collecting data is to ensure that the questions would not be misunderstood, to assist illiterate respondents and to minimize the risk of collecting incomplete information as it is with self-filling questionnaires types, particularly when people are unable to understand the questions properly. This data collection method appeared to be the most appropriate in providing a safe basis for generalization and high accuracy.

1.4 Data Analysis

After data collection, the questionnaires were edited and coded for completeness and accuracy to avoid errors. Descriptive statistics tools of analysis that were used included tables, and Mean ratings to represent the response rate and information on the variables under study. The closed ended questions were analyzed using correlation analysis. The broad purpose of Pearson correlation analysis was to summarize data so that relationships and patterns can be easily interpreted and understood. The SPSS statistical software was used for that purpose.

A Logit model helped to estimate the factors that influence adoption or uptake of the new technology, because the dependent variable evokes a yes or no answer (Gujarati, 1998). It was however observed that, although there is statistical similarity between Logit and Probit models, which makes choice between them difficult, Logit model is computationally easier (Amemiya, 1981), hence its choice for this study. Following Gujarati (1998), the logit model is specified as follows:

$$\text{Ln}(Pi / (1-Pi)) = \beta\, 0 + \beta\, 1X1 + \ldots.. + \beta\, 13X13 + ei$$

Where:

Pi = probability of farmer accepting agricultural insurance

1-Pi = probability of not accepting agricultural insurance

$\beta\, 0$ = Intercept

βi (1, 2, 3…13) = Regression coefficients

Xi (1, 2, 3…13) = Independent variables and

ei = error term.

The open questions was analyzed and summarized in a content analysis.

1 FINDINGS AND RESULTS

1.1 Socio-economic characteristics of producers

The study took place with agricultural producers in the 5 regions of Togo.

The participants in our study are on average 38.13 years old; women constitute 15.79% of respondents. With 78.51% of respondents married, 52.85% as a rate of belonging to a cooperative, the level of illiteracy is 33.99%, the vast majority of literates having a primary level (33.99%). 86.72% of producers recognize a beneficial role of cooperatives. Most producers (62.5%) are not supported by an agricultural advisory or research institution; when they are, the ICAT is the institution that is most represented (33.77%). Production is more for marketing purposes (more than half of production) for 79.07% of producers.

With an average of 5.81 years of years of existence of the agricultural structure, the average farm size is 4.18ha with 18% of the land coming from rentals, for a general irrigation rate of 15% of the agricultural land total. As for the workforce, there are on average 1.6 permanent workers and 2.24 in high season. The average representation rate of family labour among the permanent workforce is 80.34%.

The distribution of agricultural land varies by region. The plateau region has 58.97% of farms over 5 ha, 30.12% of farms between 1 and 5 ha; the maritime region is in 2nd position with 17.09% and 24.10% respectively for farms of more than 5 ha and those between 1 and 5 ha. According to the cross tab analysis, membership of a cooperative, the proportion of harvests sold, the possession of savings in financial institutions (…) are variables that are positively correlated with the size of the farm.

Given the selection of the types of producers during the sampling, the dominant productions of the population studied are corn (30.92%), poultry (25.88%) and soybeans (25.66%). 54.50% of producers associate livestock with crop production; exclusive vegetable production is the case of 29.89%.

Table 4.1. Income distribution

INCOME (FCFA)	N	Percent
0-499999	149	32.68%
500000-999999	89	19.52%
1000000-1999999	113	24.78%
>2000000	105	23.03%

Source: Survey results, 2021

The average annual agricultural income is 1748894.74 FCFA, with a gross margin of 1388675.44 FCFA. However, a large proportion (32.68%) of the population records an income of between 40000 FCFA and 499999 FCFA.

Having an income outside of agriculture is the case for 59.21% of producers, with an average value of 832,411.81 FCFA.

The value of assets is evaluated on average at 1078701.98 FCFA (land excluded) for 354 producers.

33.11% of the producers revealed that they had no savings, and 33.99% claimed not to have a savings account in any financial institution whatsoever; it turns out that those without a savings account represent 96% of producers without savings. In addition, when asked to identify the barriers to savings, after insufficient income (47.59%), the lack of a financial institution is the second most cited cause (30.34%) as that primordial barrier.

Table 4.2. Desired insurance premium distribution

Amount (FCFA)	N	Percent
0-2499	64	14.04%
2500-4999	20	4.39%
5000-7499	260	57.02%
>10000	112	24.56%

Source: Survey results, 2021

The predisposition to subscribe to the insurance is noticed in 67.76% of the producers surveyed, with 57.02% of the participants in favour of paying an amount between 5000 FCA and 7499 FCFA. The motivations for subscription are essentially for risk management (95.15% of members) and easy financing (94.17%).

2.2 Farm size and capital

2.3 Farm assets

Linear regression analysis was applied to determine which factors are correlated to total assets held by operations. As independent variables, the gender of the producer, the marital status, the age, the membership of a cooperative , the number of years of activity of the farm, the number of seasonal and permanent workers, the place of business registration, share of production sold, profit during the year, status of keeping financial records, amount of debt, family and personal expenses, amount of foreign funds , income, expenses, off-farm income, business profitability over the past 24 months, farm insurance status, and land assets. The R-squared of the model was found to be 98.6%. Thus, the independent variables remaining significant in the model explain 98.6% of the variance (variability) of the dependent variable. Based on the F-test of the ANOVA table, the model is significant (p-value = 0 <0.05, table 4.3).

Table 4.3. Factors related to farm assets- ANOVA (a)

Anova						
		Total square	**Df**	**Mean Square**	**F**	**P-value**
Model	**Regression**	20913257616745700.0	13	1608712124365050.0	2406.491	0.000
	Error	295472036355875.0	442	668488770035.917		
	Total	21208729653101600.0	455			

Source: Survey results, 2021

Table 4.4 Factors correlated to farm assets – Model Summary (b)

Model summary				
	R	**R-Square**	**Adjusted R Square**	**Standard. Error of the Estimate**
Model	0.993	0.986	0.986	817611.625

Source: Survey results, 2021

According to the model table obtained, the variables of location, the gender of the producer, the number of children, age, education, membership in the cooperative, the profitability status of the farm throughout the Year, debt, total margin, household expenses, insurance status, and land area are significant in the model (p-values < 0.05, table 4.3). Since the VIF values are much less than 10, there is no multicollinearity problem between the dependent variables.

Table 4.5. Factors Correlated to Farm Assets – Logistic Regression (c)

	B	Standard. Error	T	P-value	VIF
(Constant)	-1393326.600	150935.322	-9.231	0.000	
Location (1=rural; 2=city)	414460.937	71459.416	5.800	0.000	1.217
Gender (1=male; 2=female)	247359.319	62203.350	3.977	0.000	1.061
Number of Children	-24443.672	10425.536	-2.345	0.019	2.234
Age	15969.728	2774.095	5.757	0.000	2.344
Educational level	91922.929	24937.080	3.686	0.000	1.391
Membership to a cooperative (1=Yes; 2=No)	130272.413	45170.833	2.884	0.004	1.449
Profitability all the year(1=Yes; 2=No)	207788.670	53941.285	3.852	0.000	1.758
Debt	-0.479	0.049	-9.845	0.000	1.635
Spending for family	-0.719	0.076	-9.400	0.000	1.363
Total margin	0.016	0.007	2.291	0.022	1.342
Would you get an insurance? (1=Yes; 2=No)	-163225.560	52666.167	-3.099	0.002	1.727
Land assets of the farm	0.491	0.003	156.076	0.000	1.953

Source: Survey results, 2021

From the table above, it is observed that farm businesses in the urban area have 1.27 times more assets, women farms are 6% more valuable in term of asset. The asset of the farms gets smaller (2.23 times) as the number of children increases, but it is positively correlated with age (2.34 times), with the membership to a cooperative (44.9%), with the profitability expressed through the margin (34.2%), and as well as with education level

(39.1%). The resources of the farm is however negatively correlated with the amount of debt (63.5%) and the spending for the family (36.3%). It is observed that the farmers that don't want to uptake the agricultural insurance own 72.7% less assets than the others.

2.3.1 Factors impacting gross margin

A linear regression analysis was applied to determine the factors correlated to the agricultural gross margin achieved by the producers surveyed. As independent variables, the gender of the producer, the marital status, the age, the membership of a cooperative, the number of years of activity of the farm, the number of seasonal and permanent workers, the place of business registration, share of production sold, profit during the year, status of keeping financial records, amount of debt, family and personal expenses, amount of foreign funds , income, expenses, off-farm income, business profitability over the past 24 months, farm insurance status, and land assets. The R-squared of the model was found to be 68.4% (table 4.4). Thus, the independent variables remaining significant in the model explain 68.4% of the variance of the dependent variable. According to the F test of the ANOVA table, the model is significant (P-value = 0 < 0.05, table 4.3).

Table 4.6. Factors correlated to gross margin (a)

	R	R-Square
Model	0.827	0.684

Source: Survey results, 2021

Table 4.7. Factors correlated to gross margin – ANOVA (b)

Anova						
		Total Squares	Df	Mean Squares	F	P-value
Model	Regression	380960746569979,000	15	25397383104665.300	21.338	0.000
	Error	176158464186119,000	148	1190259893149.450		
	Total	557119210756098.000	163			

Source: Survey results, 2021

Table 4.8. Factors Correlated to Gross Margin – Logistic Regression (c)

	B	Standard. Error	T	P-value	VIF
(Constant)	539190.310	695763.048	0.775	0.440	
Location (1=rural; 2=urban)	-910570.753	344573.582	-2.643	0.009	1.194
Age	66075.929	13124.659	5.034	0.000	2.443
Level of education 1 = None 2 = Primary school 3 = Middle school 4 = University	287434.114	120851.440	2.378	0.019	1.299
Foreign fund amount	0.740	0.139	5.307	0.000	1.039
Land assets of the enterprise	7350.281	2246.755	3.272	0.001	1.053
Would you get an insurance? (1=yes; 2=no)	-837178.417	324464.457	-2.580	0.011	1.133
Fruit income	310681.617	79260.948	3.920	0.000	1.547
Peanut income	47409.591	24958.890	1.900	0.050	1.054
Cattle income	96603.519	20417.368	4.731	0.000	1.025

Source: Survey results, 2021

According to the model obtained, the variables such as location, age of the producer, education, amount of funds from abroad, land assets of the farms, income from fruits, income from peanuts and Livestock incomes

are significant in the model (P-values <0.05, table 4.8). The VIF values being well below 10, there is no problem of multi-collinearity between dependent variables.

According to table 4.8, farms located in rural areas make more profit; similarly, the profit of the producers increases with their advancing age; profitability is found to be positively correlated with the amount of funds received from the diaspora, the area of the farm, the income from fruit, vegetable, groundnut and cattle farms (when there are any) . However, it is reduced among those who do not intend to take out insurance.

2.3.1.1 Age and economic performance of farms

Is the performance of agricultural farms linked to the age of producers? In order to verify this idea, a mean comparison was performed. Beforehand, a normal distribution test of agricultural income, non-agricultural income, and farm assets according to age shows that the distributions are not normal, thus requiring a Kruskal-Wallis test due to the fact of the categorization of ages into 3 groups.

Table 4.9. Normal distribution test of farm income, off-farm income, and farm assets by producers' age

Age		Kolmogorov - Smirnov [a]			Shapiro Wilk		
	Statistics	Df	P-value	Statistics	Df	P-value	
Income from farming	19-30	0.191	75	0.000	0.722	75	0.000
	31-45	0.232	106	0.000	0.651	106	0.000
	46-72	0.293	43	0.000	0.393	43	0.000
Non-farm income	19-30	0.185	75	0.000	0.706	75	0.000
	31-45	0.444	106	0.000	0.139	106	0.000
	46-72	0.414	43	0.000	0.196	43	0.000
Asset	19-30	0.301	75	0.000	0.591	75	0.000
	31-45	0.380	106	0.000	0.277	106	0.000
	46-72	0.368	43	0.000	0.342	43	0.000

Source: Survey results, 2021

Normality tests of the Kolmogorov-Smirnov distribution as well as that of Shapiro-Wilk confirm abnormal distributions of farm income, off-farm income, and farm assets as a function of producer age (table 4.9).

Table 4.10. Kruskal - Wallis analysis (a) – Rank table / Age and farms' economic performance

Rank table			
Age		**N**	**Mean-rank**
Income from farming	19-30	123	213.99
	31-45	222	211.27
	46-72	111	279.03
	Total	456	
Non-farm income	19-30	90	134.46
	31-45	121	142.20
	46-72	59	123.35
	Total	270	
Asset	19-30	103	192.19
	31-45	187	165.89
	46-72	64	187.80
	Total	354	

Source: Survey results, 2021

Table 4.11. Kruskal - Wallis analysis (b) – Test Table / Age and economic performance of farms

Test table			
	Income from farming	**Non-farm income**	**Asset**
Kruskal -wallis h	21.611	2.341	5.180
Df	2	2	2
P-value	0.000	0.310	0.075

Source: Survey results, 2021

Farm income differs by age group (p-value = 0.000 <0.05, table 4.11). There is no significant statistical difference for off-farm income or assets by age. It can be seen that producers aged between 46 and 72 have higher agricultural incomes than the others. The averages are given below.

Table 4.12. Kruskal - Wallis analysis (c) / Age and economic performance of farms

Age		**Income from farming**	**Non-farm income**	**Asset**
19-30	Average	1601219.51	260200.00	860519.42
	N	123	90	103
31-45	Average	1368846.85	1283000.00	1234919.79
	N	222	121	187
46-72	Average	2672630.63	781203.39	973390.63
	N	111	59	64
Total	Average	1748894.74	832414.81	1078701.98
	N	456	270	354

Source: Survey results, 2021

However, it is not yet possible to confirm a difference between the other 2 remaining age categories. Thus, a Whitney Mann test is necessary to check if there is a difference between the 2 remaining age groups.

Table 4.13. Mann-Whitney analysis (a) - Rank table / Age and farm income

Ranks				
Age		**N**	**Average Rank**	**Sum of Ranks**
Income from farming	19-30	123	174.54	21468.50
	31-45	222	172.15	38216.50
	Total	345		

Source: Survey results, 2021

Table 4.14. Mann-Whitney analysis (b) – Test table / Age and farm income

Test	
	Income from farming
Mann-whitney u	13463.500
P-value	0.831

Source: Survey results, 2021

The P-value being greater than 0.05, it appears that the agricultural incomes of producers aged between 19 and 30, and those of producers aged between 31 and 45, are not significantly different, but are significantly lower than producers whose age is between 46 and 72 years old.

2.3.1.2 Types of production and economic health of farms

In addition to the possibility of a correlation between the age and the economic performance of the structures, the analysis looked at the possible relationships between the types of crops and the economic performance of the farms studied.

The study of the distribution of agricultural income, non-agricultural income, and farm assets according to the types of production is necessary beforehand.

Table 4.15. Normal distribution test of farm income, non-farm income, and farm assets by type of production

Type of production / Statistics		Kolmogorov - Smirnov [a]			Shapiro Wilk		
		Df	P-value	Statistics	Df	P-value	
Income from farming	Plant and animal production	0.240	172	0.000	0.545	172	0.000
	Plant production (alone)	0.176	22	0.074	0.904	22	0.036
	Animal production (alone)	0.182	29	0.015	0.752	29	0.000
Non-farm income	Plant and animal production	0.445	172	0.000	0.139	172	0.000
	Plant production (alone)	0.326	22	0.000	0.543	22	0.000
	Animal production (alone)	0.347	29	0.000	0.437	29	0.000
Asset	Plant and animal production	0.390	172	0.000	0.236	172	0.000
	Plant production (alone)	0.375	22	0.000	0.407	22	0.000
	Animal production (alone)	0.321	29	0.000	0.611	29	0.000

Source: Survey results, 2021

Wilk normality tests all confirm the abnormal distribution of farm income, off-farm income, and farm assets across production types (the P-values are less than 0.005, table 4.15).

Table 4.16. Kruskal - Wallis analysis (a) – Rank Table / Economic performance and type of production

Rank			
Type of production		**N**	**Average Rank**
Income from farming	Plant and animal production	248	255.06
	Plant production (alone)	136	155.52
	Animal production (alone)	71	272.32
	Total	455	
Non-farm income	Plant and animal production	191	145.24
	Plant production (alone)	43	131.73
	Animal production (alone)	35	83.14
	Total	269	
Asset	Plant and animal production	211	212.29
	Plant production (alone)	88	92.91
	Animal production (alone)	54	176.16
	Total	353	

Source: Survey results, 2021

Table 4.17. Kruskal - Wallis analysis (b) – Test Table / Economic performance and type of production

	Income from farming	Non-farm income	Asset
Kruskal -wallis	59.92	18.97	85.01
Df	2	2	2
P-value	0.000	0.000	0.000

Source: Survey results, 2021

According to the production model, there is a difference between the variables of farm income, non-farm income and business assets (P-value<0.05). Consequently, the group standing out must be excluded and the difference must be studied for the 2 remaining groups; the averages are given below.

Table 4.18. Kruskal - Wallis analysis (c) / Economic performance and type of production

Type of production		Income from farming	Non-farm income	Asset
Plant and animal production	Average	2019967.74	804769.63	1393739.34
	N	248	191	211
Plant production (alone)	Average	1091095.59	1527069.77	411170.45
	N	136	43	88
Animal production (alone)	Average	2084154.93	152485.71	844416.67
	N	71	35	54
Total	Average	1752342.86	835360.59	1064760.62
	N	455	269	353

Source: Survey results, 2021

2.3.1.3 Farm income and production

In terms of agricultural income, we see that those doing only crop production earn less income. If this group is deleted, we have the following.

Table 4.19. Mann-Whitney analysis (a) – Rank Table / Farm income and type of production

Rank				
Type of production		**N**	**Average Rank**	**Sum of Ranks**
Income from farming	Plant and animal production	248	156.85	38900.00
	Animal production (alone)	71	170.99	12140.00
	Total	**319**		

Source: Survey results, 2021

Table 4.20. Mann-Whitney analysis (b) – Test Table / Farm income and type of production

Test Statistics [a]	
	Income from farming
Mann-whitney U	8024.000
P-value	0.255

Source: Survey results, 2021

Since P-value > 0.05, there is no difference between the agricultural production income of those who combine livestock and crops and those who only have livestock. We therefore retain that producers who only cultivate crops earn less agricultural income than all the others.

2.3.1.4 Production and Non-Farm Income

In terms of non-agricultural income, according to the Kruskal-wallis test (table 4.18), we find that only those who only raise livestock have low incomes. We then proceed to the analysis by removing this group from it in order to test the evolution between the remaining groups.

Table 4.21. Mann-Whitney analysis (a) – Rank Table / Off-farm income and type of production

Rank				
Type of production		**N**	**Average Rank**	**Sum of Ranks**
Non-farm income	Plant and animal production	191	119.59	22841.50
	Plant production (alone)	43	108.22	4653.50
	Total	**234**		

Source: Survey results, 2021

Table 4.22. Mann-Whitney analysis (b) – Test Table / Off-farm income and type of production

Test Statistics [a]	
	Non-farm income
Mann-whitney U	3707.500
P-value	0.319

Source: Survey results, 2021

Since P-value > 0.05, there is no difference in terms of off-farm income between those who do mixed production (vegetation and livestock) and those who only do vegetable crops. That said, the farms that just raise livestock have the least income from non-agricultural activities, the others groups having their non-agricultural incomes significantly not different.

2.3.1.5 Production and assets

In terms of total assets, according to the result of the Kruskal Wallis test, we find that only those who exclusively grow crops have fewer assets (table 4.18). Let's then proceed with the analysis by removing this group in order to compare the assets between the remaining groups.

Table 4.23. Mann-Whitney analysis (a) – Rank Table / production assets and type of production

Rank				
Type of production		**N**	**Average Rank**	**Sum of Ranks**
Asset	Plant and animal production	211	138.80	29287.50
	Animal production (alone)	54	110.32	5957.50
	Total	**265**		

Source: Survey results, 2021

Table 4.24. Mann-Whitney analysis (b) – Test Table / production assets and type of production

Test statistics	
	Asset
Mann-whitney U	4472.500
P-value	0.015

Source: Survey results, 2021

Since the p-value is < 0.05, there is a significant difference between those who produce crops and livestock, and those who only deal with livestock in terms of farm assets. People engaged in both crop production and higher livestock are found to have more assets than those engaged in livestock only; the latter having more assets than those doing crop production only.

2.3.2 Insurance and economic characteristics of the farm.

2.3.2.1 Insurance and margin

The analysis and the comparisons of means have made it possible to realize that the characteristics inherent in the size and the proper functioning of the farm are positively correlated with the desire for agricultural insurance. This leads to verifying whether the subscription to agricultural insurance is in any way affected by the farm's gross margin. To do this, we compared averages with the gross margin achieved as the dependent variable, and the independent variable whether or not you wanted to subscribe.

Table 4.40. Test of normal distribution of gross margin according to insurance subscription

Subscription to agricultural insurance / Statistics		Kolmogorov - Smirnov [a]			Shapiro Wilk		
		Df	Sig.	Statistics	Df	Sig.	
Margin	No	0.409	147	0.000	0.182	147	0.000
	Yes	0.274	309	0.000	0.514	309	0.000

Source: Survey results, 2021

The P-value being less than 0.05 (table above), the Kolmogorov-Smirnov and Shapiro-Wilk normality test reveal that the gross margin does not follow a normal distribution. The mean comparison analyses will then be done with the Mann-Whitney test.

Table 4.41. Mann-Whitney test (a) - Rank Table / Correlation between willingness to subscribe and gross margin

Rank table				
Subscription to agricultural insurance		**N**	**Mean-rank**	**Total rank**
Margin	No	147	150.41	22111.00
	Yes	309	265.65	82085.00
	Total	456		

Source: Survey results, 2021

Table 4.42. Mann-Whitney test (b) - Test Table / Correlation between willingness to subscribe and gross margin

Test Statistics [a]	
	Margin
Mann-whitney U	11233
P-value	0.000

Source: Survey results, 2021

Given that the P-Value < 0.05, it can therefore be concluded that there is a difference between the average gross margins of farms that wish to take out insurance and those that do not.

Table 4.43. Mann-Whitney test (c) / Correlation between willingness to subscribe and gross margin

Subscription to agricultural insurance	**Average**	**N**	**Standard. Deviation**
No	979156.463	147	4196693.042
Yes	1583495.146	309	2579494.062
Total	1388675.439	456	3199290.410

Source: Survey results, 2021

Since the average rank and the averages are higher for those who want to have insurance (we notice, in the table above, that they have more profit), it can be concluded that farms favourable to insurance generate more total profit than those who do not.

2.3.2.2 Insurance and agreed subscription amount

Still in the logic of determining the variables related to the adoption of agricultural insurance, a comparison test was performed by taking as an independent variable the amount of insurance premiums that farmers are willing to pay. The Mann-Whitney test was conducted for this purpose.

Table 4.44. Mann-Whitney test (a) - Rank table / Correlation between the amount of the insurance premium and the willingness to insure

Rank table				
Subscription to agricultural insurance		**N**	**Mean-rank**	**Total rank**
How much would you pay?	No	147	204.40	30047.50
	Yes	309	239.96	74148.50
	Total	456		

Source: Survey results, 2021

Table 4.45. Mann-Whitney test (b) - Test table / Correlation between the amount of the insurance premium and the willingness to insure

Test statistics	
	How much would you pay?
Mann-Whitney U	19169.500
P-value	0.003

Source: Survey results, 2021

Given that the P-value is 0.003 (less than 0.05), there is therefore a significant difference between the average premiums of farms that wish to purchase insurance and that of farms that do not. Given that the average rank is higher for those in favour of agricultural insurance (Table 4.43), it is observed that when farms are favourable to agricultural insurance, they are ready to pay on average more to insure themselves than those who do not want to get an insurance.

Table 4.46. Mann-Whitney test (c) / Correlation between the amount of the insurance premium and the willingness to insure

Subscription to agricultural insurance	Average	N	Standard. Deviation
No	5074.830	147	2625.190
Yes	6454.693	309	3984.901
Total	6009.868	456	3657.510

Source: Survey results, 2021

The amount of the agreed insurance premium proving to be an important independent variable, the question of the bearable threshold amount arises.

With the amount desired to be paid for the insurance as the independent variable, and the willingness to take out insurance (0 = no, 1= yes) as the dependent variable, the ANOVA table obtained when a linear regression is performed is available below. The model is in the form of "amount willing to be paid = 5074.83 + 1379.863* insurance willing". It is observed that the constant term and the insurance willingness variable are significant in the model (p-values < 0.05).

Table 4.47. Correlation between the amount of the insurance premium and the willingness to insure - ANOVA

Anova table							
B		Unstandardized Coefficients		T	P-value	Collinearity Statistics	
		Standard. Error			Tolerance	VIF	
Model	(Constant)	5074.830	297.256	17.072	0.000		
	Insurance	1379.863	361.105	3.821	0.000	1.000	1.000

Source: Survey results, 2021

It is observed that those who do not want to take out insurance (if the insurance willing variable is zero) want to pay at most 5074.83 (0.3% the mean annual income, and 1.28% of the mean of the annual income of the first 52.19% incomes) CFA for insurance. It is seen that the amount that those who want to purchase insurance want to pay for the insurance is 5074.83 + 1379.863 = 6454.693 CFA (0.37% of the mean annual income, and 1.63% of the mean of the annual income of the first 52.19% incomes). It can be said that the payments larger than this value are too much even for those who want to have an insurance. The reason for the large amount that those who do not want to buy insurance are ready to pay is to avoid risks despite their reluctance.

2.3.3 Other Insurance Factors

Table 4.26. Mean comparison test according to willingness to subscribe

Insurance subscription	Yes		No		Total		
	Average	N	Average	N	Average	N	P-value.
Number of children	2.98	309	3.43	147	3.12	456	0.09
Number of years of exercise or installation of the farm or the organization	6.45	309	4.48	147	5.81	456	0.001
How many permanent employees does your farm employ in total?	1.73	309	1.32	147	1.60	456	0.146
How many seasonal workers does your farm employ during peak season?	2.55	309	1.52	147	2.21	456	0.004
How many of your permanent employees are family members (other than yourself)?	1.42	309	1.18	147	1.34	456	0.326
How many of your seasonal employees are family members (other than yourself)?	0.73	309	0.35	147	0.60	456	0.004
Land situation/How much agricultural land do you own? (Ha)	4.9200	290	2.6800	141	4.1900	431	0.369
Land situation/area of agricultural land leased? (Ha)	1.400	266	0.580	120	1.140	386	0.003
Percentage of land possessed	80.00%	261	92.00%	141	85.00%	402	0.001
Percentage of land rented	20.00%	261	8.00%	141	15.00%	402	0.001
Total income	2038108.74	309	1140863.95	147	1748865.36	456	0.013
Total expenses	454911.72	309	162133.17	147	360529.16	456	0.001
Total margin	1583197.02	309	978730.79	147	1388336.20	456	0.06
Total value of assets	1415152.59	232	438577.87	122	1078592.94	354	0.018
External revenue sources	961607.15	224	202217.40	46	832229.64	270	0.314
Amount consent for insurance	6454.70	309	5074.83	147	6009.87	456	0.001
How much have you got savings ?	319040.52	232	212186.67	30	306805.35	262	0.548

Source: Survey results, 2021

This table shows that certain groups of producers are more inclined to take out agricultural insurance than others. The difference between these groups is statistically significant.

Thus, the farms most suitable for subscription are established relatively longer (6.45 years against 4.48 years), employ 1.68 times more seasonal workers, have, in number, twice as many seasonal family work (in proportion to the total number of seasonal workers, this represents 28.34% against 22.52% within the group not in favour of agricultural insurance). In terms of exploited agricultural area, the area leased is on average 2.4 times higher (1.39 ha) among those for agricultural insurance.

Excluding leased acres, Supporters of agricultural insurance have significantly 3.23 times more assets than others, 1.79 times more farm income, and 2.81 times more farm expenses.

3 DISCUSSION

3.1 Poverty and Adoption

From this study, we find that those with more assets, and achieving more margins are more favourable to taking out insurance. The level of wealth of producers is therefore a factor that favours the adoption of insurance.

Tsikirayi et al., (2013) argue that for many poor farmers agricultural insurance is not a priority in the sense that they also face competing demands with scarce or small cash surpluses from agriculture. This explains why most poor farmers prefer to manage their production risks through diversified farming systems, low-input strategies and off-farm incomes. Thus, according to the authors, the priorities of farmers are first to ensure that they have timely access to inputs of seeds, fertilizers and, often, credit to buy these inputs. Only then can they consider purchasing crop insurance. This finding agrees with that of Meijer et al., (2015) in the analysis of the reasons for the adoption and non-adoption of new technologies (agroforestry, more specifically).

Their results showed that agroforestry is not adopted by the "poorest of the poor", whose main priority is to have food on the table and who cannot afford to take risks by investing money, time and labour in new technologies that have uncertain long-term benefits. In contrast, as argued by Jerneck & Olsson (2014), farmers who enjoy higher levels of food security are more likely to be "opportunity seekers" and may be more inclined to venture into this newness, which is agroforestry.

3.1.1 Insurance and cultivated area

In Table 4.26, the leased areas of producers in favour of agricultural insurance are twice as high as those of producers who are not in favour (P-value < 0.05). Such a result suggests that producers who have rented land for their production are more in a logic of maximizing yields and profit and therefore welcome any means of minimizing risk in order to make their exploitation beneficial. Jin et al., (2016) find similar results with land owned by Chinese producers and explain this by the fact that a larger sown area also means more climate risks and potential damage due to climate change and hazards, thus pushing these actors to seek protection.

Njue et al., (2018) share the same results (positive correlation between area allocated to maize and crop insurance subscription) in a study involving Kenyan maize smallholders. The authors comment on these results by the fact that the increase in a rented area implies a particular importance attached to the speculation concerned, hence the necessary measures to protect the farm against these risks.

3.1.2 Family size

Results show that family size matters in insurance uptake at the household level. Coefficient of the household size was statistically significant at 10 percent and negatively influenced the probability of a household to take up crop insurance. The findings correspond with Okoffo et al., (2016) who find similar result among cocoa farmers in Ghana. In Nepal,

household with one more member was also found to undermine uptake of weather-index insurance by 0.8 – 1.1% (Guo & Bohara, 2015). Large households are often faced with complex expenditure priorities hence low disposable incomes hinders households with high number of dependents to adopt agricultural insurance as a risk management instrument. Furthermore, Rahut & Micevska Scharf (2012) argues that farm households with large families and small farms are disposed towards non-farm diversification strategies.

CONCLUSION

In this context of climate change causing the disruption of the seasons, multiplying bad weather and damage, added to unprecedented competition favoured by free trade, it is no longer possible to continue agriculture almost totally dependent on nature without provide effective protection and damage limitation measures for a developing country that relies heavily on the agricultural and agro-food sector to initiate its industrial revolution. This study focused on identifying the need for agricultural insurance and the willingness of Togolese farmers to subscribe to an agricultural insurance mechanism that still does not exist in the rural world. 67.67% of the participants are favourable to insurance.

Being able to be considered as a socio-economic feasibility study of an agricultural insurance project, it will be necessary to retain from this study that the number of years of establishment of the farm (P-value: 0.001), level of education (with 0.01 P-value, 25% increase of chance of purchase when the level increase), number of seasonal workers (favourable farmers employed averagely 1.68 time more than the others, P-value 0.004), income and expenses from these agricultural activities as well as other sources of income are some key factors that have been highlighted as correlated with the desire to subscribe.

The study made it possible, among other things, to realize that the financial means of operators can prove to be a factor hindering their subscription. The chi-square test confirmed that farmers saying yes have signifi-

cantly (P-value= 0.000) more gross margin. A study on the impact of the usage and familiarisation of financial services on agricultural insurance would be complementary to this research.

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