



Ethical Evaluation Capacity of Turkish Food and Agricultural Engineers and Veterinary Physicians with Regard to Agriculture and Food System

Sukru Keles^{1,2} · Ayşe Kurtoğlu³ · Özdal Köksal⁴ · Neyyire Yasemin Yalım⁵ · Cemal Taluğ⁶

Accepted: 3 February 2021 / Published online: 27 March 2021
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Abstract

In Turkey, the numbers of studies that deal with agriculture and food as a system and process, and that address the issue with an integrated approach are very limited. Besides, there is no empirical study available in the national literature in which agricultural and food system has been analyzed within the framework of applied ethics. The present study aims to investigate the characteristics of food and agricultural engineers and veterinary physicians in terms of their tendency to carry out ethical evaluations when faced with issues falling under the field of agriculture and food ethics, and detect their capacity to identify ethical problems. A cross-sectional survey was employed in this study. Descriptive statistics like percentages and frequencies based on the scores from the scale were used. Data were collected via survey method from three occupational groups, namely, food and agricultural engineers and veterinary physicians working in 12 regions of Turkey, and analyzed using chi-square and score test. A total of 865 professionals from 55 different cities participated in the study. Data concerning participants' level of ethics awareness regarding the identification and evaluation of ethical problems in the fields of food and agriculture were obtained. While the participating professionals could easily detect the problems in food and agriculture system that carried no ethical dilemma, they had difficulty in identifying issues that involved ethical dilemmas. It was also revealed that there was a significant difference between professionals in terms of their perception of ethical problems, demonstrating the need for a comprehensive ethics education to be imparted during and after under-graduate.

Keywords Bioethics · Applied ethics · Agricultural and food ethics · Food engineer · Agricultural engineer · Veterinary physician

✉ Sukru Keles
kelesukru@gmail.com

Extended author information available on the last page of the article

Introduction

The ethical evaluation of the effect of food and agriculture on human, animal and community health is of vital importance today. Agriculture and food as a system and a process is referred as “from field to fork” (Thompson 2015). Emphasizing the significance of consumer choice, some scientists preferred to call them “from table to field” (Ekşi 2018). All shareholders, be they involved in any stage of the process—from agricultural production of food to its consumption, and even to the disposal of food waste—carry ethical responsibility. This notion is based primarily on the fact that agriculture and food ethics have emerged as a concern to a large section of the society. It is more widely acknowledged now that the responsibility toward the upholding of agricultural and food ethics is not limited to just the professionals and producers in the food and agriculture sectors, the policy-makers, NGOs, and consumers have also become important actors in upholding agricultural and food ethics.

The main stages of agriculture and food process include input supply, soil processing, planting of seeds, maintaining agricultural production activities, harvesting, transferring, grading, processing, packaging, storing, distributing, trading, selling of products, and eventually the consumption of products by consumers. Food and agriculture system not only involves maintaining a safe, adequate, and balanced nutrition, but it also deals with the production and consumption of food in line with the human and community dimensions, and the relationship these dimensions build with natural resources (Primentel 2004; Mephram 2000). The Main controversial issues around food and agriculture system include right to food, fair distribution, sustainable agriculture, protection of family farming, struggle against hunger, working and living conditions of agricultural laborers, food corruption, misuse of agricultural lands, land grabbing, soil erosion, water pollution, biodiversity, climate change, and animal welfare (Ado et al. 2019; Gepts 2004; Mistretta et al. 2019; Müller et al. 2011; Wahlquist 2009). The attitudes and actions adopted toward the evaluation of humanity’s common problems are directly related with how to live and what to do; and they constitute the subject of study in bioethics. Raising awareness about ethics and sensitizing people will help in achieving the common good of humanity.

Addressing the food and agriculture system using conceptual pairs such as good-bad or right-wrong is only possible within a framework wherein values form the basis of ethics. Although these values have universal foundations, the way they are expressed is relative to the society one lives in; it is most often the societal acceptances that determine why an action is defined right or wrong (Kuçuradi 1988).

Individuals with ethics awareness and critical thinking abilities can question societal acceptances and suggest new thinking models for explaining values to their respective societies (Kohlberg 1984). Unless there is a conflict between values, people generally do not realize that they are in an ethical decision-making process. In such cases, one needs to realize that there is an ethical problem and has to distinguish the ethical problem from other interpersonal problems. This

attitude, namely, ethics awareness, involves distinguishment of problems, such as communication problems and conflicts of needs, which are mistakenly considered as ethical problems. Likewise, distinguishing ethics from morals and legislations, and evaluating problems from an ethical perspective, rather than simply relying on moral acceptances and legislations, is considered an important cognitive attitude and choice (Yalım and Taluğ 2017).

The food and agricultural system in Turkey has been affected by depletion of the natural resources, the global climate change, and the political crisis. Agricultural production in our country is determined according to climatic conditions, such as drought, floods, storms, and other disasters. At the same time, unexpected changes in production patterns are effective (Ministry of Development 2018). The current report presents a discussion of topics, such as the food and agricultural system in Turkey not being able to use the natural resources of soil and water effectively, inability to make sustainable agriculture, inefficacy of good agricultural practices, long supply chain, high rate of informality, high rate of unpaid family work, low investment capacity of the sector and structural problems experienced in academia-public-private partnership (Özertan 2020). Additionally, the press releases of non-governmental organizations on the importance of creating local food policies, especially during the coronavirus disease 2019 (COVID-19) pandemic, draw attention (TARGET 2020). In this context, concerns are expressed about the disruption of access to food because of the deficiencies in the agricultural food chain.

Only a few studies in Turkey have approached food and agriculture as a system and process in an integrated manner (Oral 2015; Şahinoğlu 2016; Cakmak and Kasnakoglu 2017; Erdoğan and Burucuoğlu 2017; Pala 2017; Özertan 2020). Moreover, there is hardly any study available in the national literature, which deals with food and agriculture system within the framework of applied ethics. When safe, adequate, and balanced nutrition of people is considered, it is imperative to address the human and societal dimensions of production and consumption within the context of the ethical relationship built with natural resources.

In this regard, the aim of this study is to produce knowledge on food and agricultural ethics in Turkey, and to share this knowledge with the concerned public institutions, private organizations, and NGOs. The study also aims to identify the characteristics of food and agricultural engineers and veterinary physicians working in the fields of food and agriculture based on the following terms: (i) their ability to identify ethical problems and distinguishing them from other interpersonal problems, (ii) the way they relate an ethical problem with moral acceptances and legislations, and (iii) their tendency to carry out ethical evaluations.

Method

A cross-sectional survey was employed in this study. Descriptive statistics like percentages and frequencies based on the scores from the scale were used. All stages of the study are presented in Table 1.

Since agricultural and food ethics is a novel concept in Turkey, a problem analysis workshop was held in order to exchange knowledge on the issue and construct a

Table 1 Stages of the research process

Stage	Step	Function	Aim
A crosssectional survey	IV	Data analysis	Evaluation Chi-square test $p (0 < 0.10)$
	III	Data collection and organization	Neyman distribution according to basic randomly sampling method based on average proportion Conducting the survey via printed forms and internet
	II	Development of data collection tools	Developing the survey and semi-structured questions form Determining a hybrid method that allows the use of qualitative and quantitative methods together
Problem analysis workshop	I	Research preparations	Conducting the workshop and its evaluation Determining the participants Desk research

common language with the shareholders. The shareholders included leading public institutions, such as the Ministry of Agriculture and Forestry (formerly known as the Ministry of Food, Agriculture, and Livestock) and Public Officers Ethics Board, the private sector, academic circles, producer organizations, consumer associations, NGOs, agricultural-food writers and journalists, and radio programmers. Based on the results obtained from this workshop, decision was made to collect data from professionals working in any of the three related occupational groups, namely food engineer, agricultural engineer, and veterinary physician. The main reason for giving priority to these three professions within the scope of the research is that food and agricultural engineers and veterinary physicians have consultancy and supervision duties in the agricultural production. They also play an active role in the provision, storage, distribution, processing, and retailing and marketing of food. Moreover, courses on ethics are taken during training in these professions. To this end, a survey was designed to obtain data on these professionals' attitudes and knowledge regarding agricultural and food ethics. Public officers, academicians, private sector employees, NGOs, and occupational organizations were contacted; and the ones who consented to participate in the survey were included in the study.

The research process for the study comprise the following: (i) research preparations, (ii) development of data collection tools, (iii) data collection and organization, and (iv) data analysis.

- (i) *Research preparations* During desk research, the research team investigated the extent of available knowledge, the type of knowledge needed, and the ways to obtain this knowledge.

To determine the participants' ethical knowledge and attitudes, 23 statements in line with the opinions of the experts were created during the desk

study. Additionally, the quick evaluation application made by the participants during the workshop was used in formulating these statements. Then, the latter created according to the meaning content were clustered over the dimensions of regulations (R), ethics (E) and meta-ethics (ME).

In the present study, universal ethical values reflect the values in the field of applied ethics in “The Principles of Biomedical Ethics” by Beauchamp and Childress (Beauchamp and Childress 2001). Additionally, the statements made by the participants during the workshop were also used to determine the prominent values related to agriculture and food ethics. The common points of these two sources were “justice,” “honesty,” “trustworthiness,” “beneficence/non-maleficence,” and “autonomy,” which determined the axis of the questionnaire.

The opinions of the experts on the research team and the feedback received during the workshop were used. Accordingly, the concepts of “food safety,” “animal welfare,” “sustainability,” “transparency,” “productivity,” “protection of local and cultural values,” and “adequate wage” were determined. It was decided that these concepts were necessary for determining the attitudes of the participants. Additionally, among the prominent ethical problems were “decrease in biodiversity,” “food waste,” “climate change,” “globalization,” “financialization of agriculture,” “water waste,” “monopolization,” “land grabbing,” “misuse of lands,” “overconsumption,” and “corruption.” It is anticipated that considering the opinions of the participants on these topics will guide future studies on agriculture and food ethics.

In addition, through the “problem analysis workshop” based on rapid assessment method, a common language was established, and the expression forms to be used in this study were analyzed. It was predicted that the interpretation of the questionnaire would be more enlightening, given the participants’ acquaintance with, and prioritization among these concepts.

- (ii) *Development of data collection tools* In order to set forth all the dimensions of research topic, a hybrid method, which allows the use of qualitative and quantitative approaches together was utilized in the study. In this respect, a questionnaire that contained semi-structured and structured expressions was developed. The questionnaire was presented as an “Appendix”.
- (iii) *Data collection and organization* The questionnaire forms were given after a pre-interview to 865 participants working in 55 cities across 12 different geographical regions. The response rate to the questionnaire was found to be 98%. Research data were collected via printed question forms and the Internet in the year 2016 (June–September).

A total of 55 regions were chosen to ensure that all regions specified as “Level 1” regions in the Nomenclature of Territorial Units for Statistics (NUTS) would be represented in the study. Selection of the cities was based on the demographic data collected by the Turkish Statistical Institute for the year 2014. In NUTS Level 1 regions, all people aged 15 and older, and who lived in each city was taken into account. The cities wherein this age group comprised more than 50% of the total population were included in the study.

The number of participants was determined using “Neyman Distribution” according to “Basic Randomly Sampling Method Based on Average Proportion”

- (iv) *Data analysis* One reliability measure is the Cronbach’s alpha (α) coefficient. It reveals whether the tests designed accurately measure the variable(s) of interest. In brief, it measures the similarity or closeness of questions. The scales in this study were tested according to the calculated α coefficient of the scales, which was 0.68. This coefficient shows that the scale is highly reliable. (If $\alpha < 0.60$, the scale is insufficiently reliable. If $0.60 < \alpha < 0.80$, the scale is sufficiently reliable. If $0.80 < \alpha < 1.00$, the scale is highly reliable.) Chi-square test was used for data analysis ($p < 0.10$).

We also used weighting scores by scale points for determining the most important ethical problem areas for the participants. In the research, the attitude scores of the participants regarding the issues that caused ethical problems were determined with the index consisting of 11 statements.

Results

The data obtained from the participants were categorized as (i) attitudes toward and knowledge of meta-ethics, ethics, and regulations; (ii) attitudes toward universal and professional ethical values and (iii) attitudes toward prioritizing ethical problems.

Demographic Characteristics of Participants

Of the 865 professionals who participated in the study, 369 (42.7%) were agricultural engineers, 267 (30.9%) were veterinary physicians, and 229 (26.5%) were food engineers.

The average age of the participants was 38.4 years. The youngest participant being 21 years old (a food engineer, Aegean Region, Izmir) and the oldest participant being 74 years old (an agricultural engineer, Istanbul). The average ages of agricultural engineers, veterinary physicians, and food engineers were found to be 41.7, 38.3, and 33.1 years, respectively.

Of all the participants, 57.1% of the participants had under-graduate degree, 31.8% had graduate degree (the Master of Science, (MSc.)), and 11.1% had graduate (the Doctor of Philosophy (PhD.)) degrees. 52% of the participants worked in public institutions, 34% worked in the private sector, 9% worked in universities, 1% worked for NGOs, and 4% were retired, but still working actively.

The distribution of professions by regions is provided in Table 2. The table shows while the food engineers and veterinary physicians were mostly from the Aegean region (40 and 57, respectively), the agricultural engineers were mostly from the Mediterranean region (66). In addition, while the Central East Anatolia Region had the least number of food engineer and veterinary physician participants (1 and 3, respectively), the Central Anatolia region had the least number of food engineer participants (8).

The distribution of education levels and genders by regions are provided in Table 3. More male professionals participated in the study than their female

Table 2 Distribution of professions by regions

Region	Profession			Total n (%)
	Food engineer n (%)	Agricultural engineer n (%)	Veterinary physician n (%)	
Istanbul	39 (62.9)	16 (25.8)	7 (11.3)	62 (100.0)
West Anatolia	33 (29.2)	43 (38.1)	37 (32.7)	113 (100.0)
East Marmara	16 (30.8)	29 (55.8)	7 (13.5)	52 (100.0)
Aegean	40 (26.3)	55 (36.2)	57 (37.5)	152 (100.0)
West Marmara	31 (42.5)	34 (46.6)	8 (11.0)	73 (100.0)
Mediterranean	17 (16.7)	66 (64.7)	19 (18.6)	102 (100.0)
West Black Sea	8 (17.0)	34 (72.3)	5 (10.6)	47 (100.0)
Central Anatolia	5 (10.6)	8 (17.0)	34 (72.3)	47 (100.0)
East Black Sea	10 (29.4)	11 (32.4)	13 (38.2)	34 (100.0)
Southeast Anatolia	6 (13.6)	21 (47.7)	17 (38.6)	44 (100.0)
Central East Anatolia	1 (1.6)	29 (46.0)	3 (52.4)	63 (100.0)
Northeast Anatolia	23 (30.3)	23 (30.3)	30 (39.5)	76 (100.0)
Total n (%)	229 (26.5)	369 (42.7)	267 (30.9)	865 (100.0)

colleagues in all regions, except Istanbul. The ones who pursued higher education and had graduate (MSc. and PhD.) degrees were mostly from West Anatolia region. This rate was lowest in the East Black Sea region.

Distribution of genders by institutions is provided in Table 4. In the respective table, one can see that there were more male professionals than female professionals in all the institutions. Regardless of gender difference, it was found that the largest number of participants worked in public institutions, while the smallest number of participants worked in NGOs.

Participants' Attitudes Toward and Knowledge of Regulations, Ethics, and Meta-ethics

Within the scope of the study, participants' opinions on regulations, ethics, and meta-ethics were sought by providing them 23 statements on the respective subjects, which are presented in Table 5.

Participants' attitudes towards the values that are present in the regulations are shown in Fig. 1. It is seen that the statement number 4 under the Regulations category, namely, "Commercials made for food and agriculture sectors should be evaluated more carefully than for other sectors," was the one the majority of the participants (89%) agreed the most. However, most of them (73%) disagreed with the statement number 3 under the Regulations category, namely, "I am against the state's attempt for agricultural production planning. Farmers should be able to produce any product using any method they desire with their own will." The statement on which the participants neither agreed nor disagreed most (26%) was statement number 7 under the Regulations category, namely, "I think the agricultural policies applied in Turkey support sustainability."

Table 3 Distribution of education levels and genders by regions

Region	Education	Based on participants' biological sex n (%)		Total
		Women	Men	
Istanbul	Under-graduate	24 (72.7)	19 (65.5)	43 (69.4)
	MSc	8 (24.2)	7 (24.1)	15 (24.2)
	PhD	1 (3.0)	3 (10.3)	4 (6.5)
	Total	33 (100.0)	29 (100.0)	62 (100.0)
West Anatolia	Under-graduate	21 (41.2)	30 (48.4)	51 (45.1)
	MSc	19 (37.3)	22 (35.5)	41 (36.3)
	PhD	11 (21.6)	10 (16.1)	21 (18.6)
	Total	51 (100.0)	62 (100.0)	113 (100.0)
East Marmara	Under-graduate	10 (45.5)	14 (46.7)	24 (46.2)
	MSc	11 (50.0)	13 (43.3)	24 (46.2)
	PhD	1 (4.5)	3 (10.0)	4 (7.7)
	Total	22 (100.0)	30 (100.0)	52 (100.0)
Aegean	Under-graduate	38 (65.5)	59 (62.8)	97 (63.8)
	MSc	16 (27.6)	34 (36.2)	50 (32.9)
	PhD	4 (6.9)	1 (1.1)	5 (3.3)
	Total	58 (100.0)	94 (100.0)	152 (100.0)
West Marmara	Under-graduate	20 (64.5)	35 (83.3)	55 (75.3)
	MSc	7 (22.6)	5 (11.9)	12 (16.4)
	PhD	4 (12.9)	2 (4.8)	6 (8.2)
	Total	31 (100.0)	42 (100.0)	73 (100.0)
Mediterranean	Under-graduate	14 (46.7)	39 (54.2)	53 (52.0)
	MSc	12 (40.0)	26 (36.1)	38 (37.3)
	PhD	4 (13.3)	7 (9.7)	11 (10.8)
	Total	30 (100.0)	72 (100.0)	102 (100.0)
West Black Sea	Under-graduate	9 (52.9)	18 (60.0)	27 (57.4)
	MSc	3 (17.6)	12 (40.0)	15 (31.9)
	PhD	5 (29.4)	0 (0.0)	5 (10.6)
	Total	17 (100.0)	30 (100.0)	47 (100.0)
Central Anatolia	Under-graduate	10 (58.8)	16 (53.3)	26 (55.3)
	MSc	6 (35.3)	12 (40.0)	18 (38.3)
	PhD	1 (5.9)	2 (6.7)	3 (6.4)
	Total	17 (100.0)	30 (100.0)	47 (100.0)
East Black Sea	Under-graduate	7 (53.8)	18 (85.7)	25 (73.5)
	MSc	5 (38.5)	3 (14.3)	8 (23.5)
	PhD	1 (7.7)	0 (0.0)	1 (2.9)
	Total	13 (100.0)	21 (100.0)	34 (100.0)
Southeast Anatolia	Under-graduate	5 (62.5)	24 (66.7)	29 (65.9)
	MSc	2 (25.0)	9 (25.0)	11 (25.0)
	PhD	1 (12.5)	3 (8.3)	4 (9.1)
	Total	8 (100.0)	36 (100.0)	44 (100.0)

Table 3 (continued)

Region	Education	Based on participants' biological sex n (%)		Total
		Women	Men	
Central East Anatolia	Under-graduate	7 (43.8)	28 (59.6)	35 (55.6)
	MSc	7 (43.8)	18 (38.3)	25 (39.7)
	PhD	2 (12.5)	1 (2.1)	3 (4.8)
	Total	16 (100.0)	47 (100.0)	63 (100.0)
Northeast Anatolia	Under-graduate	7 (21.2)	22 (51.2)	29 (38.2)
	MSc	11 (33.3)	7 (16.3)	18 (23.7)
	PhD	15 (45.5)	14 (32.6)	29 (38.2)
	Total	33 (100.0)	43 (100.0)	76 (100.0)
Total	Under-graduate	172 (52.3)	322 (60.1)	494 (57.1)
	MSc	107 (32.5)	168 (31.3)	275 (31.8)
	PhD	50 (15.2)	46 (8.6)	96 (11.1)
	Total	329 (100.0)	536 (100.0)	865 (100.0)

Table 4 Distribution of genders by institutions

Institution	Based on participants' biological sex		Total
	Men	Women	
University	37 (11.2)	39 (7.3)	76 (8.8)
Public institution	149 (45.3)	299 (55.8)	448 (51.8)
Private sector	129 (39.2)	166 (31.0)	295 (34.1)
NGO	3 (0.9)	9 (1.7)	12 (1.4)
Retired	11 (3.3)	23 (4.3)	34 (3.9)
Total	329 (100.0)	536 (100.0)	865 (100.0)

Participants' attitudes towards ethical values are presented in Fig. 2. According to this figure, the statement that "agricultural and food producers and merchandisers should give accurate information about their products" (No. 6 under Ethics) was the one that the majority of participants (96%) agreed the most. Most of them (78%) disagreed with the statement "I think agricultural producers and laborers receive the benefit of their efforts" (No. 7 under Ethics). The statement on which the participants neither agreed nor disagreed the most (24%) was the statement number 5 under Ethics category, namely "I believe the information pollution and misinformation in food and agriculture fields is ill intentioned."

Participants' attitudes towards meta-ethical values are presented in Fig. 3. In the respective figure, one can see that the statement number 4 under Meta-ethics category, namely "People should consider the ethical responsibility of the effect of their actions in food and agriculture field on climate and environment" was

Table 5 Distribution of the statements identifying the participants' attitudes toward and knowledge of ethics

Statement	Regulations (R)	Ethics (E)	Meta-ethics (ME)
1	Ethical discussion in food-agriculture system is only possible in areas that are not regulated via laws and legislations	I would like to take part in the educational attempts to be made on agricultural and food ethics	I think ethics and morals are synonyms
2	I think restricting the genetically modified organisms (GMOs) technology is groundless as long as its adverse effects on human health are not verified	Reintroducing young people back into agricultural production is possible only if the value of agricultural activities is increased economically and socially	I think most ethical problems stem from the fact that a cooperative system has not been developed in our country
3	I am against the state's attempt toward agricultural production planning. Farmers should be able to produce any product, using any method they desire, with their own will	Imitation and adulteration cannot be eliminated unless it is fully ensured that people access to adequate, healthy, and quality food with a reasonable price	I think considering animals with respect to only their economic value is not ethically appropriate
4	Commercials made for food and agriculture sectors should be evaluated more carefully than for other sectors	Protection of natural resources and ecosystems is a problem of fairness for future generations	People should consider the ethical responsibility of the effect of their actions in the food and agriculture field on climate and environment
5	I think the state's positive discrimination against agricultural producers is unfair	I believe the information pollution and misinformation in food and agriculture fields is ill intentioned	I think human-centered ethics, which deem animals' valuable only for people is insufficient
6	I think controls in the food and agriculture sectors are satisfactory in terms of their reliability	Agricultural and food producers and merchandisers should give accurate information about their products	I think the developed countries buying or leasing land in poor countries is not fair
7	I think the agricultural policies applied in Turkey support sustainability	I think agricultural producers and laborers receive the benefits of their efforts	–
8	There will not be any problem in food and agriculture system, if appropriate policies and relevant regulations are developed	There is a value conflict between protecting the producer and protecting the consumer	–
9	–	It is ethically right to consume agricultural and food products as soon as possible and at a place, where they are as close as possible to where they are produced	–

the one which the majority of participants (90%) agreed the most. However, the statement they disagreed the most (18%) was “I think ethics and morals are synonyms” (No. 1 under Meta-ethics). The statement on which the participants neither agreed nor disagreed the most (23%) was statement number 2 under the Meta-ethics category, namely “I think most ethical problems stem from the fact that a cooperative system has not been developed in our country.”

The Degree of Importance the Participants Attach to Universal Ethical Values

The participants were asked to rank 5 universal ethical values in order of importance they attach to them, and the obtained results are presented in Fig. 4. It was found that the participants considered justice, honesty, trustworthiness, beneficence/non-maleficence, and respect for autonomy as the most important values, respectively.

The results demonstrate that the ethic deemed as the most important was “justice,” followed by honesty, trustworthiness, respect for autonomy, and beneficence/non-maleficence, respectively.

It was seen that compared to female participants, males showed greater tendency to consider justice as the most important value ($p=0.08$, z score = 3,93). Education level did not have much influence on participants’ ranking justice as the number one value ($p=0.27$, z score = 3,10). The participants working for NGOs and the retired participants tended more to deem justice as the most important value than the ones working in other institutions ($p=0.03$, z score = 4,53). The rate of prioritizing justice varied across regions. The highest rate belonged to East Black Sea region (73.5%), while the lowest rate belonged to West Anatolia ($p=0.01$, z score = 4,54). The average age of the participants ranking justice as the number one value was found to be 39.3 years, and their average professional experience was found to be 14.3 years. It was seen that the higher the participants’ age was, the more likely they prioritized justice ($p=0.04$, z score = 4,43); 56% of agricultural engineers, 54% of food engineers, and 49% of veterinary physicians deemed justice as the most important value ($p=0.09$, z score = 4,05).

Participants’ Attitudes Toward Professional Ethical Values

Within the scope of the study, the participants were asked to rank seven professional ethics in order of importance, and the obtained results are presented in Fig. 5.

The results demonstrate that the professional ethical values ranked the most important by the participants was “food safety” (66%), which was followed by adequate wage (33%), protection of local and cultural values (25%), productivity (22%), sustainability (21%), transparency (20%), and animal welfare (17%), respectively.

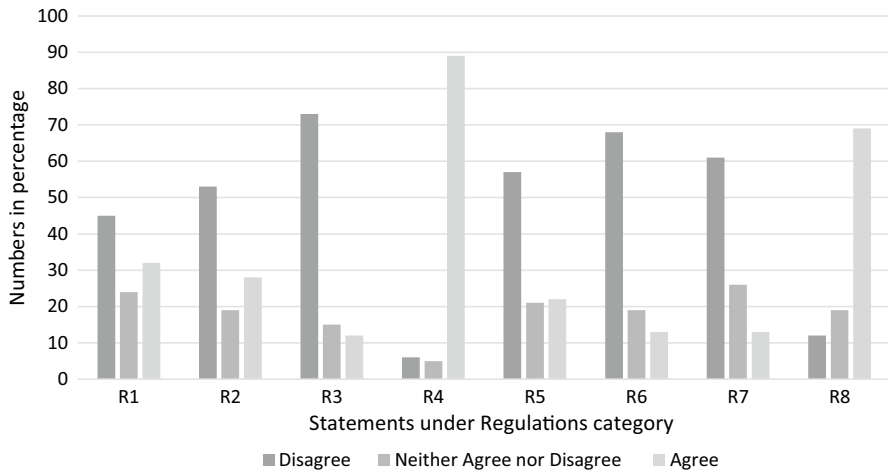


Fig. 1 Participants' attitudes toward the statements regarding regulations (R)

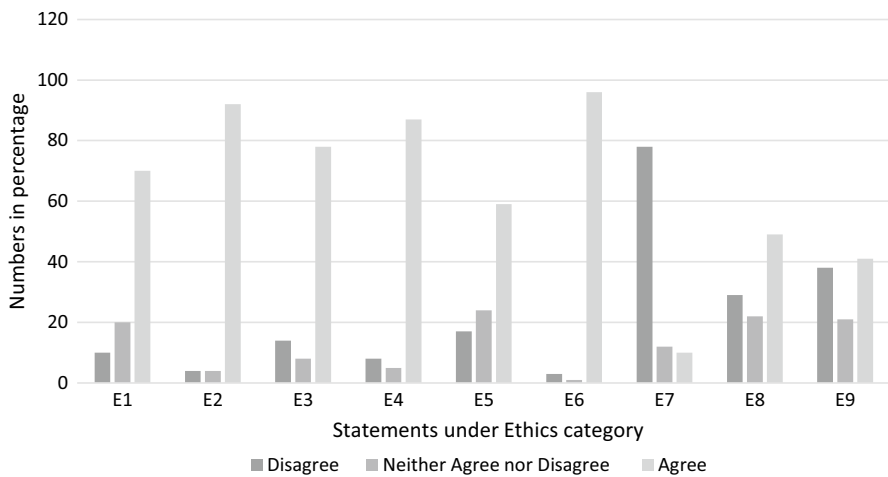


Fig. 2 Participants' attitudes toward the statements regarding ethics (E)

Participants' Attitudes toward Ethical Problem Areas

The participants were asked to sort a number of issues that cause ethical problems in order of importance, and the obtained results are presented in Fig. 6. The participants were given 11 ethical problem clusters and asked to choose the three most important ones, and rate them in order of importance. It was found that the participants deemed the problems of “corruption,” “food waste,” and “monopolization” more important than the others.

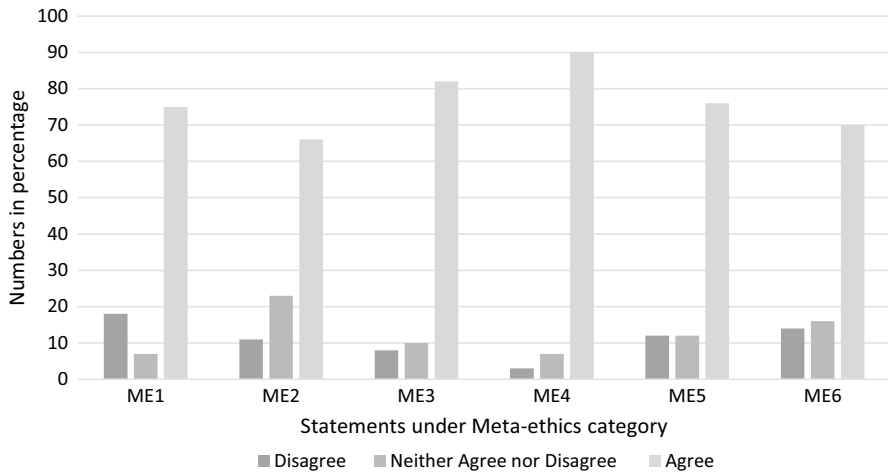


Fig. 3 Participants' attitudes toward the statements regarding meta-ethics (ME)

As the index was derived from 11 statements prepared according to 3 point Likert scale, 1.5 is accepted as medium value, and the issues that cause ethical problems are interpreted as being on the first ranks when they approach an average of 3 (more effective); when they approach an average of 1 (fully disagree) they were interpreted being at the rear. According to the answers given in the weighting scores by scale points, Fig. 6 was formed according to the following formula: Score: Weight * Ratio.

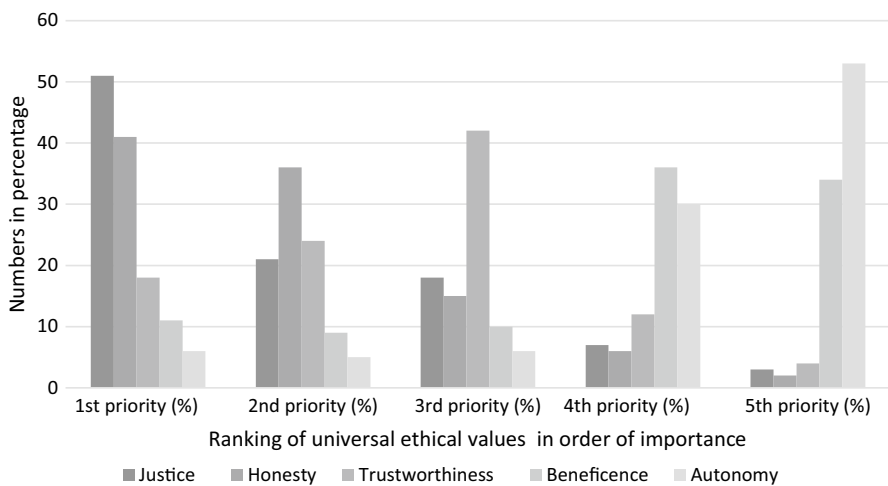


Fig. 4 Participants' ranking of universal ethical values in order of importance

Discussion

In the present study, readiness levels of participating food and agricultural engineers as well as veterinary physicians were investigated in terms of their competency in identifying ethical problems and distinguishing them from other interpersonal problems. In this context, their characteristics, in terms of their tendency to perform ethical evaluation was determined by considering the relationship they build with moral acceptances and legislations. Significant data were obtained in the present study, which examined the participating professionals' ability to distinguish ethical problems and the relationship between their personal characteristics and ethical behaviors.

Attitudes Toward Ethical Dilemmas: Ethics Knowledge and Ethics Education

The results of the study revealed that the participants could easily identify problems that *do not pose any ethical dilemmas*. The responses to the statements that questioned such issues (M4, E6, ME4) were found to be homogenous to a large extent. For instance, the statement commercials made for food and agriculture sectors should be evaluated more carefully than for the other sectors (M4), which were supported by most of the participants. This finding is in line with the studies, which revealed that food commercials appearing on TV and the Internet influence children's eating habits (Boyland and Whalen 2015). Also, the World Health Organization reported that commercial promotion of energy dense nutrient-poor foods increase the prevalence of childhood obesity (World Health Organization 2016). In these works, consumption of healthy food was encouraged, and the need for

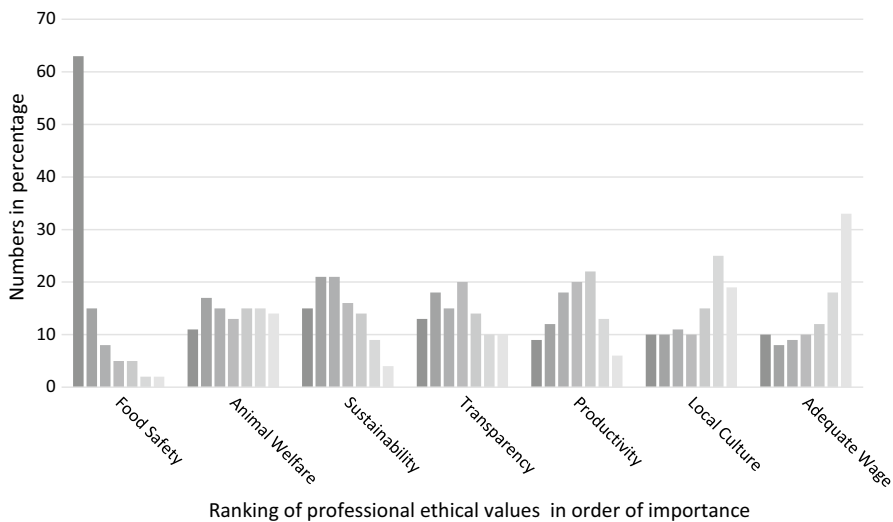


Fig. 5 Participants' ranking of professional ethical values s in order of importance

policy measures to reduce the prevalence of obesity and obesity related diseases was emphasized.

For the problems, which *involve ethical dilemma*, the participants' responses varied, the rate of "neither agree, nor disagree" increased, and the significant differences arising from participants' personal characteristics were observed. The participants' responses to cross-questions, the aim of which was to reveal the attitudes in case of ethical dilemmas, clearly demonstrated this fact as well as the difficulty the participants faced in giving a consistent response. For example, it was seen that the responses given to the statements (R1) "Ethical discussion in food-agriculture system is only possible in the areas that are not regulated via laws and legislations" and (R8) "There won't be any problem in food and agriculture system if appropriate policies and relevant regulations are developed" were highly inconsistent. Although the participants asserted that legislative regulations would not eliminate ethical problems, they (69%) also argued that the problems would be solved with appropriate legislations (Fig. 1). This discrepancy in their opinions could be explained with their lack of knowledge on ethics. In addition, it can also be deduced that the participants believed that regulations and appropriate legislations would still fall short of eliminating society's worries. To give an example, in the U.S., FDA is responsible for the approval of food additives and recognizing them as safe. In a study, which discussed the possible conflict of interest between food controllers and manufacturers, it was argued that independent reviews on the determination of food additives would be more appropriate (Neltner et al. 2013). Participants' views that legislative regulations would not be sufficient in solving ethical problems can be interpreted as though they expect legal regulations to be reflected in practice as well.

Other statements that involved ethical dilemmas are "I believe the information pollution and misinformation in food and agriculture fields is ill intentioned" (E5), "There is a value conflict between protecting the producer and protecting the

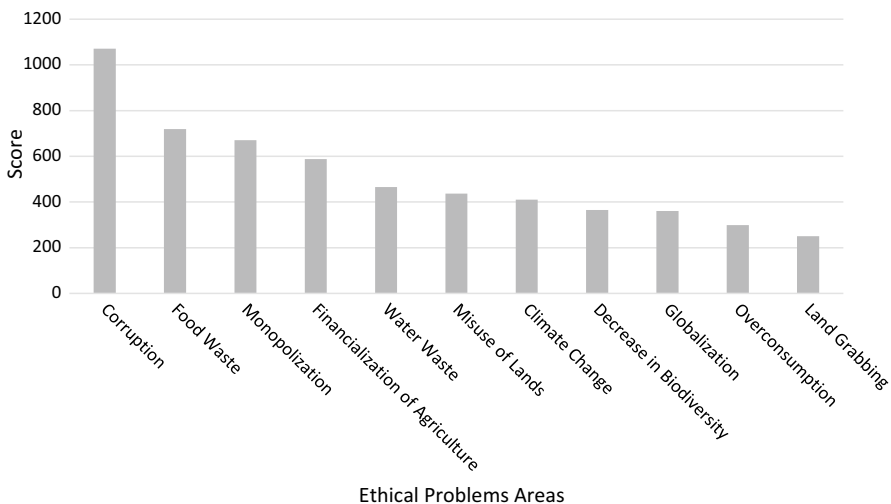


Fig. 6 Participants' the weighting scores by scale points of ethical problem areas

consumer” (E8), and “It is ethically correct to consume agricultural and food products somewhere as close as possible to where they are produced and as soon as possible” (E9). It was seen that the participants could not come to a common agreement on these dilemmatic issues and the rate of “neither agree, nor disagree” increased significantly on these statements (Fig. 2). The rates of “agree” and “disagree” were also found to be significantly close for such kind of statements, which were morally arguable. In addition, the notion that ethics and morals are the same is accepted by a majority of participant professionals (ME1). The difficulty in professionals’ coming to a judgement about situations that involve ethical dilemmas and their lack of knowledge on the basic concepts of ethics suggest that they need to receive education on the issue. In fact, 70% of participants expressed their willingness to take part in educational practices in agricultural and food ethics (E1). Since ethics is a field of knowledge that can be taught, we believe that responding to the participants’ need for education is an ethical responsibility.

Ethics education has a deep-rooted past in health practices (Miles et al. 1989). It is known that academic researches and education on agricultural and food ethics have been encouraged, and international public debates on the issue have been held over the past two decades (Eursafe 1999). More recently, agricultural and food ethics have varied from the current ethics education, and development of relevant curricula has been attempted (Costa 2018). The results obtained in this study confirm that such attempts are necessary and significant, for only by acquiring knowledge of ethics can professionals make a sound evaluation of regulations, ethics, and meta-ethics. The significant difference in professions in terms of their perception of ethical problems can be explained with the lack of a common perspective in ethics education.

Attitude to Ethical Problem Clusters: Developing Food and Agricultural Policies

Most of the participants expressed negative opinion on the sustainability of agricultural policies and effectiveness of controls in ensuring safety in the food and agricultural sector (Fig. 1). For instance, more than half of the participants (53%) did not agree with the statement “I think restricting the GMOs technology is groundless, as long as its adverse effects on human health are not verified,” and argued that the use of GMOs technology should be restricted (M2). Nevertheless, along with the scientific and technological advances in Turkey, “Regulation on Genetically Modified Organisms and Products” was issued in 2010 with the aims of eliminating the risks that arise from genetically modified organisms and products obtained using modern biotechnology, and protect the human, animal and plant health, as well as the environment and biodiversity (Official Gazette 2010). Although such legislative regulations are available to control the production and consumption of GMO products, it was seen that the participants still lacked confidence in the food controls within the sector. It was reported in the literature that participation of local administrations and the society in food assessment and control is significant in eliminating such negative opinions (Maron 2006). In addition, the studies highlighting the importance of developing sustainable policies are centered on how to increase the

safety of food production and distribution, to what degree scientific and technological applications should be used, the labeling of GMO products, and the effect of development and assessment of food guidelines on improving health and its protective effect on community health and environment (Jefferson 2006; Wahlqvist and Kuo 2009; Watanabe et al. 2009; Dizon et al. 2016; Alles et al. 2017; Zaganjor et al. 2018). Like many other countries struggling with unhealthy dietary trends, Turkey is also attempting to develop an effective food and agricultural policy to meet the needs of the country under today's conditions (Recanati et al. 2019). It is stated that these problems can be overcome by trusting the rule of law and adopting ethical principles at the individual and institutional levels (Koç 2020). In this context, it is accepted that the success of food policies is possible with national and international solidarity (Koç 2020).

It can be seen in Fig. 1 that the rate of participants who thought that the government should adopt positive discrimination against agricultural producers—provide them agricultural subsidies—was quite low (57%). This can be explained with the participants' disapproval of the available agricultural subsidies, rather than the premise that they deem agricultural subsidies as an ineffective tool. Therefore, this unexpected finding can be interpreted in a more comprehensive future study.

Participants were asked to rank five universal and seven professional ethics in order of importance, and it was found with a significant difference that justice was deemed the most important universal value (Fig. 4) and food safety was deemed the most important professional value (Fig. 5). Parallel with this finding, it was also seen that the participants put forward corruption as the biggest ethical problem in food and agriculture sector, and expressed their common concern toward this problem (Fig. 6). The data were obtained from the present research, and a policy was adopted in the agricultural and food system in Turkey. The research is concerned with the problems caused by this policy. In this context, there is no justice in production, marketing, or consumption processes. The excessive use of fertilizer-feed (fast growing), tag-content fraud, unconscious use of medication (residue), industrial insemination (hybrid-GD0), pollution of the environment (soil, water, air, pasture), informal transactions (corruption) were reported to be among the factors that led to ethical problems (Uysal 2019). Similar to the findings in literature, the results of this study demonstrated that food waste occurring in the whole process, from production to consumption, was deemed as a big ethical problem by our participants (Gediklioğlu 2017). The characterization of hunger as problems in access to food and an adequate, balanced, and nutritional diet, rather than the lack of food was acknowledged (Mishra 2012). In this respect, our findings showed that the participants ranked various ethical problems with close values to each other.

There is no other problem that affects people's lives as directly as inequality in access to food. The common good, which is good for and shared by every member of the society, is closely related with eliminating the barriers obstructing the access to food, respect of human rights, and ensuring of social justice (Azetsop and Joy 2013). Hence, the notion that organization of food and agriculture system is actually a significant public concern was supported by the ethics that our participants prioritized.

The concept of justice has been handled in a variety of aspects in food and agriculture system. For instance, the issues of fair trade laws and practices, availability and accessibility of affordable food, and sustainability are associated with justice (Tansey 2017). In our study, the issue of justice was addressed in a more comprehensive manner (e.g., the issue of ecosystems was also covered), and most of the participants agreed with the related statement that protection of natural resources and ecosystems is a question of justice for the future generations.

Conclusion and Suggestions

The views of research participants with respect to agricultural and food ethics have contributed toward the identification of ethical problems in these fields and understanding how they are perceived in Turkey. The obtained results suggest that raising professionals' ethics awareness and sensitivity is the prerequisite for development of an effective food and agriculture system. Given that food and agricultural ethics is a recent issue in our country, it is motivating to see the participant professionals' willingness to improve themselves in this area, which was reflected in the data obtained by this study.

The results of the study demonstrated the need for developing comprehensive under-graduate and graduate curriculum, which will include the subjects of professional and research ethics in food and agricultural engineer and veterinary physician education in Turkey. The inadequacy of food and agricultural ethics education is one of the obstacles that prevent professionals working in these fields from developing a common language.

The participants' expressions, which suggested their awareness of the direct influence of food and agriculture on human life, show that they have an ethical awareness of agricultural and food ethics. It is also necessary to ensure acquisition of ethical reasoning skills required for distinguishing ethical problems from other interpersonal problems and solving ethical problems. In this respect, our findings have demonstrated that ethics education should be covered not only in the under-graduate and graduate programs, but also in the continuing professional education programs.

It was seen that the participants were willing to improve their knowledge on ethics. In order to ensure that their motivation would not fade over time, it is an imperative on them, to fulfill their educational needs in a systematic and institutional manner. In this respect, joint works and studies, which deal with ethical issues and aim to reinforce communication between public sector, private sector, universities, and NGOs, should be fostered to eliminate the ethical problems witnessed in the food and agriculture sectors. Developing and maintaining new platforms where professionals share ethical problems and good practices in their professional life might contribute as well.

Finally, it is also important to train the educators who will impart ethics education in the fields of food and agriculture. Another significant concern is the planning and conducting of further qualitative and quantitative studies on agriculture and food ethics with the participation of other partners.

Appendix

You are invited to participate in the country-wide research of the project numbered TR2012/0123.01-02/24 and titled “Promoting Agricultural and Food Ethics in Turkey and Improving the Ethical Decision-making Capacity of the Stakeholders in Agriculture,” which was co-financed by European Union and The Republic of Turkey.

The aim of this project is to obtain information about the ethical value perceptions of agriculture and food professionals. Participation is entirely voluntary. It takes about 10 min to answer the questions. Do not write your name on the survey form. You may decline to answer any of the questions that you do not wish to answer. Further, you may decide to withdraw from this research at any time, without any negative consequences. However, after submitting the form, you will not be able to withdraw from the research as the data will be anonymized. Also, the data obtained from the research will only be used for scientific purposes and will not be shared with third parties outside of the research team.

Please fill out the first part of the questionnaire by writing and marking where indicated. In the second part of the questionnaire, mark the most appropriate of the three options for each sentence. Select only one option for each sentence. In the third part of the questionnaire, score the lists by following the directions in the question.

If you agree to participate in the research, you may begin the questionnaire now.

Thank you for your kind participation and contribution.

1. Age:
2. Sex
 - Female
 - Male
3. Education
 - under-graduate
 - the Master of Science (MSc.)
 - the Doctor of Philosophy (PhD.)
4. Profession
 - Food engineer
 - Agricultural engineer
 - Veterinary physician
 - Other:
5. Years of Professional Experience:
6. Current Institution:
 - Retired
7. Duty:
8. City:

	AGREE	NOT DECIDED	NOT AGREE
Ethical discussion in food-agriculture system is only possible in areas that are not regulated via laws and legislations			
I think restricting the genetically modified organisms (GMOs) technology is groundless as long as its adverse effects on human health are not verified.			
I am against the state's attempt toward agricultural production planning. Farmers should be able to produce any product, using any method they desire, with their own will.			
Commercials made for food and agriculture sectors should be evaluated more carefully than for other sectors.			
I think the state's positive discrimination against agricultural producers is unfair.			
I think controls in the food and agriculture sectors are satisfactory in terms of their reliability.			
I think the agricultural policies applied in Turkey support sustainability.			
There will not be any problem in food and agriculture system, if appropriate policies and relevant regulations are developed.			
I would like to take part in the educational attempts to be made on agricultural and food ethics.			
Reintroducing young people back into agricultural production is possible only if the value of agricultural activities is increased economically and socially.			
Imitation and adulteration cannot be eliminated unless it is fully ensured that people access to adequate, healthy, and quality food with a reasonable price.			
Protection of natural resources and ecosystems is a problem of fairness for future generations.			
I believe the information pollution and misinformation in food and agriculture fields is ill intentioned.			
Agricultural and food producers and merchandisers should give accurate information about their products.			
I think agricultural producers and laborers receive the benefits of their efforts.			
There is a value conflict between protecting the producer and protecting the consumer.			
It is ethically right to consume agricultural and food products as soon as possible and at a place, where they are as close as possible to where they are produced.			
I think ethics and morals are synonyms.			
I think most ethical problems stem from the fact that a cooperative system has not been developed in our country.			
I think considering animals with respect to only their economic value is not ethically appropriate.			
People should consider the ethical responsibility of the effect of their actions in the food and agriculture field on climate and environment.			
I think human-centered ethics, which deem animals' valuable only for people is insufficient.			
I think the developed countries buying or leasing land in poor countries is not fair.			

Determine the order of importance for each group separately (1 high priority, 5-7 less priority).

..... a) Justice b) Honesty c) Truthworthiness d) Autonomy e) Beneficence and Non-maleficence a) Food safety b) Animal welfare c) Sustainability d) Transparency e) Productivity f) Protection of local and cultural values g) Adequate wage
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Determine the order in terms of efficiency lead to ethical problems (1 more effective; 3 least effective).

..... a)	Decrease in biodiversity
..... b)	Food waste
..... c)	Climate change
..... d)	Globalization
..... e)	Financialisation of agriculture
..... f)	Water waste
..... g)	Monopolization
..... h)	Land grabbing
..... i)	Misuse of lands
..... j)	Overconsumption
..... k)	Corruption

Other (Please use the space below for other comments you want to share.)

Acknowledgements The authors thank Chamber of Food Engineers and Chamber of Agricultural Engineers of TMMOB (Union of Chambers of Turkish Engineers and Architects), Turkish Veterinary Medical Association, and the faculties and departments of the universities in the respective research regions for their valuable contribution in the data collection process. We also would like to thank Editage (www.editage.com) for English language editing.

Authors' contributions All of the authors took part in the writing process. Allocation of duties for the other tasks are as follows: SK (the corresponding author) reviewed the literature, performed data analysis and interpretation, and converted the research report into this article; AK coordinated the implementation process; ÖK performed data analysis; and NYY and CT made the research project design, conducted the research, performed data analysis and interpretation, and converted the research report into this article.

Funding This work is based on data developed in the project numbered TR2012/0123.01-02/24 and titled “Promoting Agricultural and Food Ethics in Turkey and Improving the Ethical Decision-making Capacity of the Stakeholders in Agriculture,” which was co-financed by European Union and The Republic of Turkey.

Availability of data and materials <http://www.targetder.org/haber/tarim-ve-gida-etigi-arastirma-sonuc-raporu/1021>

Code availability Not applicable.

Compliance with ethical standards

Conflict of interest The authors declare that there is no conflict of interest regarding the publication of this article.

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Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Sukru Keles^{1,2}  · Ayşe Kurtoğlu³  · Özdal Köksal⁴  ·
Neyyire Yasemin Yalim⁵  · Cemal Taluğ⁶ 

- ¹ Department of Medical History and Ethics, School of Medicine, Karadeniz Technical University, Trabzon, Turkey
- ² Karadeniz Teknik Üniversitesi Tıp Fakültesi, Tıp Tarihi ve Etik Anabilim Dalı, Farabi Caddesi, No.66, 61080 Ortahisar, Trabzon, Turkey
- ³ Department of Medical History and Ethics, School of Medicine, Ankara University, Ankara, Turkey
- ⁴ Department of Agricultural Economics, Faculty of Agriculture, Ankara University, Ankara, Turkey
- ⁵ Turkish Bioethics Association, Ankara, Turkey
- ⁶ Agriculture and Food Ethics Association, Ankara, Turkey