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Farm Safety Behaviors of Farmers in Izmir and Manisa Provinces in Turkey

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ABSTRACT

Due to natural structure, production systems, and farmer behaviors, agriculture is one of the most dangerous sectors. This research has aimed at determining the safety behaviors of farmers in the production process. The research data was collected from 282 farmers in 18 villages of six counties in Izmir and Manisa Provinces via the questionnaire form in 2016. The farmers are averagely 54 years old, 6.8 yearly educated and cultivating 10.3-hectare lands. The farmers have limited knowledge about farm safety applications and the subject has low priority in the region. The common health problems exposed by the farmers are back and muscle pains, and sunstrokes during the production activities. While 10% of the farmers had tractor accidents and poisoning cases, 6.4% of farmers have encountered with injury or disability during agricultural activities. The safety objectives must take place in the extension programs for the adoption of farm safety practices in agriculture. The experts on safety must be employed in extension services for preparing and conducting the programs. The demonstrative farms can be set up in the rural areas for introducing the correct applications to the farmers. At the local level, crop/livestock-oriented courses on farm safety principles can behold and the adopter farms can be declared as "safety" by giving a certificate. It is thought that the adoption of safety practices in agriculture will lead to an increase in awareness in rural areas and will have a positive impact on product quality, consumer health, and environment-friendly sensitivity as well as farmer health in the production process.

1. Introduction

There are 6.143 million farmers in approximately three million farms that create 21.0% of employment, 7.5% of national income, and 4.0% of export value in the Turkish economy (TUIK, 2015). Farm safety in agriculture has a multidimensional aspect for farmers, farmworkers, and consumers, besides economic, sociological, cultural, and environmental. According to the Labor Organization (ILO) agriculture is one of the most dangerous sectors after construction. ILO records show that 1.7 million farmers and farm workers annually die during agricultural production in the world (ILO, 2015). The ILO lists the causes of accidents in agriculture as machinery (cutting, drilling tools, etc.), chemicals (fertilizers, pesticides, antibiotics, etc.), toxic and allergic agents (plants, flowers, animal feces, oils, etc.), carcinogenic agents (arsenic-containing pesticides, herbicides, etc.), animal diseases (Brucella, etc.), parasites (malaria, etc.), indoor/undercover areas (tanks, cellars, greenhouses, etc.), noise and vibration, weather conditions, wild and poisonous animals (attacks, insect/snake bites, etc.) (ILO, 2010; Berk, 2012; Taştekin et al., 2012).

Farmers' attitudes, economic conditions, shortcomings in education and training, age, poor design of farm machinery and equipment, characteristics of the workforce, insufficiency of related institutions are identified as the barrier to farm safety (Day et al., 1999).

The accident numbers have increased from 370 to 1863 in the last decade (SGK, 2018). It is thought that the actual accident numbers are higher than SGK records. Generally, in Turkey, the accidents and poisoning cases accept as the nature of agricultural production by the farmers for that reason they only apply for receiving the medical treatment to the hospitals in serious cases. The inadequacy and deficiency of figures cause the neglect of the farm safety problems in Turkey.

Agricultural extension activities mainly focus on the increases of production, yield, and quality, but farm safety issues are not sufficiently considering in Turkey. The farmers' knowledge and behaviors, applications on safety, and factors affecting adoption were examined by the study. The research findings are also hoped to contribute to the extension services, policymakers, and rural people's health and to international trade via sensitivity to human health.

2. Material and Methods

The data were obtained from 282 farmers by using the questionnaire form in Izmir and Manisa Provinces in 2016. The counties (Bergama, Tire, Bayindir) from Izmir and (Salihli, Saruhanli, Akhisar) Manisa Provinces were selected as a research area. The surveys were conducted in a total of 18 villages by selecting three villages to form each county. These counties and villages represent the Provinces in terms of socio-economic, ecological, and production patterns. The numbers of interviewing were calculated as 282 farmers by using the proportional sampling method with a 90% confidence interval and a 12% error margin (Box 1). The farmers were proportionally distributed according to their numbers in each village (Table 1).

Box 1: Sample Size Formula

$$n = \frac{Np(1-p)}{(N-1)\sigma_{\hat{p}_x}^2 + p(1-p)}$$

n=Sample size, N=Population, p= Proportion

Sources: Newbold, 1995; Miran, 2003

Five-point Likert Scale used to measure farmer's attitudes and behaviors that should be chanced for safety problems in agricultural production (Malhotra, 2010). Cronbach's Alpha was used for internal consistency reliability (Pallant, 2010). Mann Whitney U Test, Factor Analysis, Logit were employed for data analysis.

Table 1. Distribution of farmers interviewed by provinces, counties and villages

Province	Counties	Villages	Number of Farmers	Percent (%)
IZMIR	Bayindir	Furunlu	21	7.4
		Pinarli	17	6.0
		Balcilar	9	3.2
		Bayindir Total	**47**	
	Bergama	Zeytindag	20	7.1
		Asagikiriklar	14	5.0
		Bolcek	13	4.6
		Bergama Total	**47**	
	Tire	Boynuyogun	8	2.9
		Kireli	21	7.4
		Yeniciftlik	18	6.4
		Tire Total	**47**	
		IZMIR TOTAL	**141**	
MANISA	Salihli	Taytan	20	7.1
		Capakli	15	5.3
		Durasilli	12	4.3
		Salihli Total	**47**	
	Saruhanli	Hacirahmanli	14	5.0
		Koldere	23	8.2
		Mutevelli	10	3.5
		Saruhanli Total	**47**	
	Akhisar	Akcesme	11	3.9
		Sazoba	15	5.3
		Zeytindag	21	7.4
		Akhisar Total	**47**	
		MANISA TOTAL	**141**	
		GENERAL TOTAL	282	100.0

3. Findings

3.1. Some characteristics of farmers

Averagely the farmers are 54 years old and 6.8 yearly educated. The education levels are grouped as primary (63.2%); the secondary (18.9%); high school (17.9%) and over (Table 2). The averagely farmers have 29.8 years of farming experience and household numbers are 4.1 persons in the region. The job satisfaction levels of farmers are comparatively good (3.96). About 70% of farmers employ temporary workers and 28.1% of them stated that they employ younger than 16 years old. Workers usually come as families and charge for all family members. People under the age of 16 usually work in light jobs for a fee. Otherwise, workers prefer to go to other farms with their families. In addition, family members under the age of 16 also assist in production activities in 14% of farms.

Table 2. Education levels of farmers

Education Levels	Izmir		Manisa		General	
	N	%	N	%	N	%
Primary	94	67.1	83	59.3	177	63.2
Secondary	24	17.1	29	20.7	53	18.9
High school and more	22	15.7	28	20.0	50	17.9
Total	140	100.0	140	100.0	280	100.0

Almost all farmers (96.8%) have at least one member of the cooperative/union and/or chamber. Because of compulsory membership for providing the government supports, the majority of farmers (94%) are members of agricultural chambers. The other membership levels of farmers differ as Agricultural Credit Cooperatives (59.9%), irrigation cooperatives (33.0%), agricultural sales and rural development cooperatives (31.9%), and cattle breeders association (22.0%). Some farmers have memberships of political parties, associations, and non-governmental organizations, too (Table 3).

Table 3. Memberships of agricultural cooperatives of the farmers

Cooperatives	Izmir		Manisa		General	
	N	%	N	%	N	%
Chamber of Agriculture	130	92.2	135	95.7	265	94.0
Agricultural Credit Cooperative	71	50.4	98	69.5	169	59.9
Irrigation Association / Cooperative	28	19.9	65	46.1	93	33.0
Agriculture Sales, Rural Development Cooperative	59	41.8	31	22.0	90	31.9
Breeding Cattle Breeders Association	50	35.5	12	8.5	62	22.0
Others (NGO, Associations, Political Parties, etc.)	20	14.2	10	7.1	30	10.6

The average farmland is 10.3 hectares and parcel numbers of farms are 5.6 in the region. Fruits (57.1%); grains (41.1%), vegetables (33.7%), forage plans (25.2%), and industrial plants (17.4%) are grown in order by region farmers (Table 4). Animal husbandry for market and/or own family consumptions are engaged by

39.7% of farmers. There are averagely 38.5 cattle, 26.3 sheep/goats, 19.9 poultries in the farms.

Table 4. Grown crops

Grown Crops	Number of Farmers	Percentage	Average (hectare)
Fruit	161	57.1	5.0
Grain	116	41.1	9.4
Vegetable	95	33.7	3.8
Forage plants	71	25.2	5.4
Industrial plants	49	17.4	11.6

Farmers' Behaviors on Farm Safety

The safety behaviors/applications of farmers were evaluated by using a Likert scale in the study, 17 different. The farm safety behaviors were categorized into four groups as pesticides and fertilizers (chemicals) usage information, the weather conditions during the field works, disposal of chemicals' waste (after chemicals' usage), and the precautions (Table 5).

Table 5. Farmers attitudes and behaviors about farm safety

Factor Groups	Statements	Factor loads	Total variance explained (%)	Reliability
Chemicals usage information	I read the prospectuses of chemicals	0.909	31.977	0.929***
	I understand the instructions of pesticides /fertilizers	0.884		
	I know which chemical will apply to why.	0.869		
	I follow the instructions of chemicals during the applications	0.835		
	I pay attention to the expiration date when buying pesticides and fertilizers.	0.750		
	I take into account the mixing instructions	0.657		
	The information on the labels of chemicals are sufficient	0.649		
Attention to weather	I do not apply pesticides If the temperature is above 30 degrees,	0.894	19.806	0.857***
	I do not apply pesticides if the wind speed is 5m / hour	0.836		
	I do not apply pesticides, If the humidity is less than 50%.	0.799		
	I follow the weather reports	0.716		
After chemical usage	I cannot burn, bury or put in the water resources of pesticide cans.	0.837	11.855	.744
	I rinse the pesticide cans 3-4 times with water and pour them in the tank.	0.834		
Chemical precautions	I keep the pesticides locked cabins	0.855	10.850	0.697*
	I take care of the protective clothing instructions	0.829		
Total			74.490	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.852	Bartlett's Test of Sphericity	Approx. Chi-Square	***2664,113
Degree of freedom	325		Sig.	0,00

The farmers' reactions to weather conditions are statistically different from the provinces. The farmers in Izmir Province are more sensitive to the meteorological events during agricultural applications (Table 6).

Table 6. Farmer's behavior on meteorological events (Mann Whitney U)

Statements; **I do not apply pesticides** "…"	Provinces	Number	Mean Rank	Sum of Ranks	Mann Whitney U Value	Z Value	P Value
if the wind speed is 5m /hour	Izmir	140	160.61	22485.00	6985.000***	-4.622	0.000
	Manisa	140	120.39	16855.00			
If the temperature is above 30 degrees	Izmir	140	156.47	21906.00	7704.000***	-3.512	0.000
	Manisa	141	125.64	17715.00			
If the humidity is less than 50%	Izmir	140	154.34	21608.00	7862.000**	-3.030	0.002
	Manisa	140	126.66	17732.00			

*** $\alpha<0.01$ ** $\alpha<0.05$

3.2. Precautions taken by farmers

The majority of the farmer (79.8%) examines the risks in their farms. Separately storing of the fuels and pesticides with flammable items are considered by 69.9% of the farmers. The farmers (68.5%) fence the area around the water wells and pits in the farmyards for preventing the fallings. For fire prevention, 54.3% of farmers store up the straw away from the house and 66.0% of farmers do not keep the flammable items in the barns and houses. The emergency intervention equipment such as the first aid kits (27.0%) and the fire extinguishers (26.6%) are improperly kept at the farms in the region (Table 7). Keeping the emergency intervention equipment, storing the straw away from the barns and houses, and the fencing areas around wells/pits are common behaviors in Manisa Province (Table 8).

Table 7. Farmers' applications for farms safety

Statements	Izmir		Manisa		General	
	N	%	N	%	N	%
I look over what can be dangerous in my farm	113	50.2	112	49.8	225	79.8
I store fuels and pesticides separate from flammable materials	94	47.7	103	52.3	197	69.9
I fence the area around the water wells and pits	78	43.8	100	56.2	178	68.5
I store up all flammable items far from the barns and houses	94	50.5	92	49.5	186	66.0
I store up the straw 20 meters away from the barns and houses	65	43.3	85	56.7	150	54.3
I have a first aid kit in my farm	24	31.6	52	68.4	76	27.0
I have a fire extinguisher in my farm	29	38.7	46	61.3	75	26.6

Cronbach's Alpha: 0.734

Table 8. Precautions taken by farmers on their farms according to the provinces (Mann W. U)

Statements	Provinces	Number	Mean Rank	Sum of Ranks	Mann Whitney U	Z Value	P Value
I have a fire extinguisher in my farm	Izmir	141	133.0	18753.0	8742.0**	-2.29	0.02
	Manisa	141	150.0	21150.0			
I have a first aid kit in my farm	Izmir	141	127.5	17977.5	7966.5***	-3.75	0.00
	Manisa	141	155.5	21925.5			
I store up the straw 20m. away from the barns and houses	Izmir	136	129.5	17606.0	8290.0**	-2.15	0.03
	Manisa	140	147.3	20620.0			
I fence the area around the water/pits	Izmir	125	122.6	15327.5	7452.5**	-2.02	0.04
	Manisa	135	137.8	18602.5			

*** $\alpha<0.01$ ** $\alpha<0.05$

3.3. The Poisoning Cases and Accidents

The poisoning cases and accidents have found the dependent on the sizes and parcel numbers of farms, contact frequency with extension workers, and job satisfaction of the farmers. While increasing farmlands and parcel numbers augment the occurrences of poisoning and accident in the farms, but higher job satisfaction and frequent contact with extension workers decrease (Table 9).

Table 9. Occurrences of poisoning and accident by some characteristics (Logit)

Variables	*Coefficient*	*Std Error*	*Z*	*P-Value*
Const	-0.048271	0.617337	-0.0782	0.93768
Age	-0.001841	0.004648	-0.3960	0.69213
Education	0.001771	0.010547	0.1679	0.86662
Experience	-0.004345	0.007492	-0.5800	0.56193
Farm size (ha)	**0.002225**	**0.001231**	**1.8079**	**0.07061***
Parcel numbers of the farm	**0.001313**	**0.000615**	**2.1347**	**0.03278****
Job satisfaction	**-0.203152**	**0.121633**	**-1.6702**	**0.09488***
Workers younger than 16 years old.	0.000743	0.001258	0.5904	0.55490
Contact with extension workers	**-0.199328**	**0.114013**	**-1.7483**	**0.08041***
Log-likelihood: -131.6869		Akaike Criterion: 283.3738		
Likelihood Ratio Test: Chi-square(9) = 14.9279 [0.0929]		Number of cases 'correctly predicted' = 228 (80.9%)		

** $\alpha<0.05$ * $\alpha<0.10$

The poisoning cases and accidents on farms indicate the behaviors and sensitiveness of safety applications in the farms. Considering 26 safety precautions in the farms and understanding the warning pictures on chemical packages affect the poisonings and accidents on the farms. Understanding of warns on the package is decreasing the number of poisonings and accidents. Knowing sustainable practices, applying cultural practices, and controlling farm risks do not have any effect on the poisonings and accidents in the region (Table 10). It is understood that precautions to be taken during agricultural production activities are prioritized for farm safety, picture literacy is important especially for considering the cautions in agricultural chemical packages.

Table 10. Poisonings and accidents by farmer's applications (Logit)

Variables	*Coefficient*	*Std Error*	*Z*	*P-Value*
Const	-0.875314	0.614942	-1.4234	0.15462
Safety precautions	0.044367	0.065630	0.6760	0.49903
Taking safety precautions during the farm works	**-0.061413**	**0.031295**	**-1.9624**	**0.04972****
Understanding level of pictures	**-0.148705**	**0.064003**	**-2.3234**	**0.02016****
Knowledge on sustainable practices	0.029429	0.020848	1.4116	0.15807
Cultural applications	-0.087148	0.178541	-0.4881	0.62547
Log-likelihood: -133.2914	Akaike Criterion: 278.5827			
Likelihood Ratio Test: Chi-square (5) = 11.7189 [0.0388]	Number of cases 'correctly predicted' = 227 (80.5%)			

** $\alpha<0.05$

3.4. Precautions taken for pesticides

During the pesticide applications some behaviors determined are to take into account the wind and its intensity (81.9%), do not eating/drinking something (73.4%) and do not smoke (64.8%); to wear glasses (62.1%) and masks (46.1%) for protecting eyes and skin, and to alert people around (57.0%), (Table 11).

The farmers carry sufficient drinking water with them (91.0%), keep the foods appropriately (81.3%); provide shadow places for resting (67.4%), have the first aid kits (29.4%) during the field works. As an employer, 47.9% of the farmers advise their workers to wear protective materials such as masks, hats, gloves. The presence of a toilet in the field is not common in the region. Limited numbers of farms (18.3%) have a toilet in the field (Table 11).

The farmers know to adjust the equipment for spraying (68.0%) and take frequent breaks during spraying (48.4%). Most farmers wash their hands and face (91.0%), takes shower (82.0%), cleans gloves and boots (77.3%), washes clothes by using soap (76.3%) after spraying. The chemical contaminated clothes are separately washed from the daily ones (75.7%). The farmers also keep spraying clothes in water for about three hours before washing them (44.4%) (Table 11).

Table 11. Precautions taken during spraying

	Statements	Izmir		Manisa		General	
		N	%	N	%	N	%
Before spraying pesticides	I don’t use pesticides against the wind	113	49.8	114	50.2	227	81.9
	I don’t eat or drink during the spraying	98	48.0	106	52.0	204	73.4
	I don’t smoke during the spraying	89	48.9	93	51.1	182	64.8
	I protect my eyes while spreading chemicals	86	50.0	86	50.0	172	62.1
	I warn my surround before the spraying	77	48.7	81	51.3	158	57.0
	I use mask for inhalation during the spraying	58	45.0	71	55.0	129	46.1
During spraying pesticides	I had sufficient drinking water in the field	127	50.2	126	49.8	253	91.0
	I provide a shadow place for the workers in the field	92	48.9	96	51.1	188	67.4
	Workers use masks, hats, gloves.	62	46.3	72	53.7	134	47.9
	I get a first-aid kit when I work in the field	33	40.2	49	59.8	82	29.4
After spraying pesticides	I wash my hands and face after spraying	128	94.1	124	87.9	252	91.0
	I take a shower after spraying	107	78.1	121	85.8	228	82.0
	I wash my gloves and boots after spraying/fertilizing	103	75.7	112	79.4	215	77.3
	I wash my clothes with soap and water	106	77.4	106	75.2	212	76.3
	My clothes used for spraying are washed separately from other laundry	105	77.2	104	74.3	209	75.7
	I adjust the equipment for every application	87	64.0	102	72.3	189	68.0
	I often take a break during spraying	65	47.8	69	48.9	134	48.4
	After spraying I put my clothes used in water for three hours before washing	55	40.1	67	48.6	122	44.4

Cronbach’s Alpha: 0.840

3.5. Preferred field clothes by farmers

Although protective equipment (PE) is suggested for preventing farmers' exposure to health hazards in the field, the usage of EP among farmers is inadequate in the developing countries (Kearney et al., 2015; Yuantari et al., 2015; Sharifzadeh et al., 2017, Bondori et al., 2018). During the field works, the farmers wear and use protective items such as the hats or poshu (a kind of local headcover), (83.8%), long-sleeved shirts (%82.7), boots (%73.3), protective clothes (%58.6), mask against to dusts (%46.4), sunglasses (%46.1) in the region (Table 12).

3.6. Measures taken by farmers in machinery use

Because of using a wide variety of hazardous machinery and equipment, farmers and farmworkers face many risks that result in injuries during agricultural production. The tractors as the most common hazardous machinery in agriculture (Jawa et al., 2013; Caffaro et al., 2018) are the reasons behind the mentioned accidents as operator's carelessness, neglected tractor maintenance, inexperienced operators, and non-compliance with the safety rules of people (Yıldırım and Altuntaş, 2015; Baydaş and Altuntaş 2017).

Table 12. Protective clothes and equipment used by farmers

Statements	Izmir		Manisa		General	
	N	%	N	%	N	%
I use a hat protecting my forehead and neck	114	49.1	118	50.9	232	83.8
I wear a long-sleeved shirt	116	50.4	114	49.6	230	82.7
I wear boots	96	47.3	107	52.7	203	73.3
I wear protective, not abundant clothing	76	46.6	87	53.4	163	58.6
I wear a mask to protect from dust and dirt	68	52.3	62	47.7	130	46.4
I wear sunglasses on sunny days	56	43.4	73	56.6	129	46.1

Cronbach's Alpha: 0.732

In general, the farmers believe they follow the safety rules during the machinery usage by not allowing the below 18 years old ones to drive tractors (86.9%), not transporting any passengers (47.9%) and any children (71.8%) by the tractor. They also fasten the seat belt (74.7%) and keep the driver's cabin clean (82.6%). When driving the tractor and trailer 90.7% of the farmers follow the security requirements. Besides, the regular maintenance of tractors (93.8%), the mirrors (88.0%), the signal/headlights (94.0%), air pressure of tires (93.4%) and the braking system (38.6%) are regularly checking by farmers. The first aid kits exist only 38.6% of the tractors in the region. Half of the farmers (49.4%) leave the tractor keys on the starter (Table 13).

Table 13. Measures taken in the use of tractors and tools

Statements	Izmir		Manisa		General	
	N	%	N	%	N	%
Person must be older than 18 years for driving my tractor	100	82.6	125	90.6	225	86.9
I pick up the passengers on my tractor	55	45.5	80	58.0	135	52.1
I carry the children on the tractor	25	20.7	48	34.8	73	28.2
I fasten the seat belt during driving the tractor	15	12.5	50	36.5	65	25.3
The driver's cabin is clean	92	76.0	122	88.4	214	82.6
The security requirements are provided while I drive the tractors, trailer, etc.	109	90.1	126	91.3	235	90.7
I regularly maintain to my tractor	111	91.7	132	95.7	243	93.8
The tractor's mirrors are intact	108	90.0	119	86.2	227	88.0
The signals/head lights of the tractors are in working conditions	112	93.3	132	95.7	244	94.6
I often check the air pressure of the tires	111	92.5	130	94.2	241	93.4
The brake system works well	112	93.3	134	97.1	246	95.3
There is a first aid kit on my tractor	43	35.5	57	41.3	100	38.6
I leave the tractor key on the starter even I do not drive	56	46.3	75	54.3	131	50.6
I regularly check and maintain the tractor and equipment	100	83.3	124	89.9	224	86.8

3.7. Encountered Health Problems in Farming

The wide-ranging production process and ecological conditions have occupational risks to human health in farming. The most common health problems in farming are mentioned as musculoskeletal conditions, skin and respiratory diseases, and loss of hearing (Griffin, 2013; ILO, 2011). According to the different researches, some cancer types such as leukemia, non-Hodgkin's lymphoma, multiple myeloma, soft-tissue sarcoma, skin, lip, stomach, brain, and prostate are seen the elevated rates among farmers (Blair and Zahm, 1995; Alavanja et al., 2005). In the study, approximately 13% of farmers mentioned the existing cancer cases in their families in the last decade. The common cancer types are listed by farmers as lung (47.1%), larynx (23.5%), skin (8.8%), colon (8.8%), and others (11.8%) in the region.

By using the Likert scale that consisting in-between “never (1) and always (5)” the farmers have identified their health issues and frequencies during agricultural production activities. The muscle and back pains (2.4), sunstrokes (2.1), cough (1.7), contact of chemicals to eyes and skin (1.7), allergy (1.5), skin problems (acne, etc.) (1.5), respiratory problems (1.4), chemical inhalation and swallowing (1.4), cramps (1.4), tachycardia (1.3), pyrexia (1.3) are more or less encountered health issues in the region (Table 14).

Table 14. Health problems

Subjects	Izmir		Manisa		General	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Muscle and back pains	2.17	1.652	2.58	1.474	2.37	1.577
Sunstrokes	2.09	1.432	2.20	1.284	2.14	1.359
Cough	1.57	1.151	1.90	1.108	1.74	1.140
Contact of chemicals to eyes and skin	1.34	0.752	1.98	1.142	1.65	1.015
Allergy	1.33	0.816	1.73	1.053	1.53	0.961
Skin problems (acne, etc.)	1.31	0.846	1.71	1.003	1.51	0.946
Respiratory problems	1.16	0.557	1.72	1.007	1.44	0.858
Chemical inhalation and swallowing	1.15	0.547	1.69	0.877	1.42	0.776
Cramps	1.13	0.519	1.67	1.044	1.40	0.863
Tachycardia	1.13	0.546	1.55	0.939	1.33	0.792
Pyrexia	1.06	0.287	1.54	0.939	1.29	0.730

Although the health problems in Table 14 are relatively low, the poisoning cases and accidents rates in agriculture are higher than expected in the region. The farmers perceive injuries as a natural consequence of their works. Nearly 10% of farmers faced poisoning and accident in the last decade. According to the observations, farmers usually prefer traditional treatments at home and are reluctant to go to the hospital for medical treatments after poisoning or (simple) accidents. Although the higher rates on poisoning cases because of spraying chemicals (9.6%) and tractor related accidents (9.9%) the tendency on home treatments decreases the importance of the subject because of insufficiently recorded in the region. Some farmers (6.4%) experienced injuries, disabilities after agricultural accidents in the last decade (Table 15).

Participating in courses such as first aids (16.7%) and farm safety (3.2%) are not at intended levels in the region. Furthermore, keeping and recording emergency phone numbers are not common habits in the region. Only 3.9% of farmers know The National Poison Center's (UZEM) phone number (114) (Table 16). Poisoning cases are decreasing in who love farming (job satisfaction), while the number of land sizes and parcels increases, the number of poisonings rises in the region (Table 17).

Table 15. Accidents and poisonings faced by farmers

Accidents and poisonings	Izmir		Manisa		General	
	N	%	N	%	N	%
Poisoning cases	16	8.8	11	6.1	27	9.6
Injury / disability / accident	8	4.4	10	5.5	18	6.4
Tractor Accident	13	7.2	15	8.3	28	9.9

Table 16. The precautions for emergency

Training and precautions	Izmir		Manisa		General	
	N	%	N	%	N	%
Attending a first aid course	35	74.5	12	25.5	47	16.7
Attending farm safety training	5	55.6	4	44.4	9	3.2
Writing the emergency phone numbers somewhere at home/barn that everyone able to see it.	30	60.0	20	40.0	50	17.7
Recording the emergency numbers on their phones	21	45.7	25	54.3	46	16.4
Knowing UZEM's phone number	6	54.5	5	45.5	11	3.9

Table 17. Encountering poisoning and some personal characteristics (Logit)

Variables	Coefficient	Std Error	Z	P-Value
Const	0.085946	1.38727	0.0620	0.95060
Age	-0.022224	0.02401	-0.9257	0.35462
Education	-0.092179	0.08369	-1.1015	0.27070
Experience	-0.004425	0.01707	-0.2592	0.79548
Processed area (ha)	**0.004246**	**0.00144**	**2.9446**	**0.00323*** **
Fragmentation of the land	**0.001480**	**0.00073**	**2.0334**	**0.04202** **
Livestock breeding	0.555299	0.42778	1.2981	0.19425
Job satisfaction (loving the farming)	**-0.344295**	**0.15927**	**-2.1616**	**0.03065** **
Log-likelihood: -80.05013		Akaike Criterion: 176.1003		
Likelihood Ratio Test: Chi-squ (7) = 17.92 [0.012]		Number of cases correctly predicted=256 (90.8%)		

*** $\alpha<0.01$ ** $\alpha<0.05$

Furthermore, the farmers' behaviors such as not carrying children on the tractor, cleaning the driver cabin, taking precautions for pulling a trailer, regular maintaining of the machines, and controlling the air pressure of the tires effect the accident numbers. As shown in Table 18 the farmer's sensitiveness to safety decreases the accident numbers.

Table 18. Tractor accidents and some personal characteristics (Logit)

Variables	*Coefficient*	*Std Error*	*Z*	*P-Value*
Const	-2.225	0.46292	-4.8070	<0.00001
Only 18 years old persons can drive my tractor	-0.2164	0.86597	-0.2499	0.80263
I take passengers on the tractor	-0.0136	0.76505	-0.0177	0.98585
I carry the children on the tractor	**1.2292**	**0.70260**	**1.7495**	***0.08021**
I fasten the seat belt	-0.0033	0.02886	-0.1153	0.90822
The driver's cabin is clean	**-2.6815**	**1.24597**	**-2.1521**	****0.03139**
I take precautions for pulling trailer with tractor	**-1.6502**	**0.82663**	**-1.9962**	****0.04591**
I make regular maintenance my tractor	**-1.9747**	**0.96391**	**-2.0487**	****0.04049**
The tractor's mirrors are intact	0.0321	0.84966	0.0378	0.96987
The signs of the tractor work well	2.6167	3.06549	0.8537	0.39325
I often check the air pressure of the tires	**-2.6738**	**0.98076**	**-2.7262**	****0.00641**
The brake system of the tractor works well	0.0375	2.9591	0.0127	0.98990
There is a first aid kit on my tractor	0.1565	0.62515	0.2503	0.80237
I leave the tractor key on the starter when I don't use	-0.2256	0.59246	-0.3808	0.70336
I regularly make the equipment maintenance	-0.0045	0.02591	-0.1739	0.86193
Log-likelihood: -50.56580	Akaike Criterion: 131.1316			
Likelihood Ratio T., Chi-square (14) = 38.0623 [0.0005]	Number of cases 'correctly predicted' = 267 (94.7%)			

** $\alpha<0.05$ * $\alpha<0.10$

4. Conclusion and Recommendations

Gaining the skills and behaviors about farm safety will contribute to health and happiness in rural communities and the economy. Following the farm safety rules will also provide a prestige in international trade due to decent and humanitarian farming circumstances. Considering the research findings, the below recommendations have developed for the region:

- Most extension activities focus on production, yield, and quality in the region. Farm safety studies and advice should take a room in agricultural extension services.
- The local causes and production branches must be considering for planning farm safety advices.
- The database should be prepared by identifying the reasons, social and economic effects of accidents, poisoning cases in the region. Extension services and health organizations collect and keep records as reliable about accidents and poising cases on the regional bases. A standard form can be developed

for the reporting process that contains information on who, what, where, when, how, why, effects, and results.

- Local and regional commissions or advisory committees must be built by participating of different actors such as the Ministry of Agriculture and Forestry, the Ministry of Health, universities, Chambers of Agriculture, municipalities, security institutions, trade unions, input producers, and product chain.
- The guide of extension and health services must prepare the strategic plan on regional farm safety.
- The researches should be encouraged to improve agricultural working conditions for developing policies. The safety applications, risks, and risk perceptions of farmers must take place in the research agenda.
- Courses on farm safety principles and practices should be organized by extension services with the coordination of health organizations. The farmers who participate in the courses and adopt the practices should be rewarded with a marketing advantage, premium support, etc. The adopters of safety precautions must have a certificate of "safe farm" and the priority for government support such as subsidies, premiums, etc.
- The model/demonstrative farms should be established about safety practices in the villages.
- The field days about farm safety should be arranged by considering the local priorities.
- The mass media and campaigns should be employed to reach a wide audience and social awareness. Especially, effective information transfer and warning announcements must be organized by utilizing the different extension aids and methods during the periods of intensive usage of chemicals.
- Agricultural accidents and their consequences should be shared with the rural communities via local media for attracting public attention.
- Farmers must be informed about the short and long terms economic and social costs of the accidents. Understanding these costs can motivate the farmers to take steps on the security precautions. Furthermore, tax deductions and incentives can be useful for the security equipment, renewal of the equipment (such as seat belts or cabins).
- Vehicle/tractor inspections should be seriously considered as in other motor vehicles.
- The courses must be organized on the use and maintenance of tractors and trailers in the region.
- The phone numbers of the centers as poisoning, the emergency response must be more visible and known in rural communities.
- First aid courses should be organized in the villages for increasing the farmers' intervention skills in case of poisonings and accidents.

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