Uluslararası Tarım Araştırmalarında Yenilikçi Yaklaşımlar Dergisi
International Journal of Innovative Approaches in Agricultural Research 2025, Vol. 9 (4), 354-374
https://doi.org/10.29329/ijiaar.2025.1375.7

Original article

Turkish Agricultural Sector Labour Force Change and Work Accident Analysis: 2015–2024

Ecehan Kazancı Yabanova *

Department of Labour Economics and Industrial Relations, Instıtute of Social Science, Süleyman Demirel University, Isparta, Türkiye

Abstract

Due to global warming, climate crises, changes in water regimes, etc., the agricultural sector has become a sector of unprecedented strategic importance. According to data from the second quarter of 2023, the agricultural sector in Türkiye accounted for a significant 4.4% share of Gross Domestic Product. Export data shows that the export volume, which stood at $16.7 billion in 2015, reached approximately $30 billion in 2022. One of the important indicators for responding to the increasing food supply and export pressure at the sectoral level is, of course, sectoral labour force changes and accident data. The aim of this study is to analyse the labour force changes and accident data in the agricultural sector between 2015 and 2024. The study was conducted using the document analysis technique, one of the qualitative analysis methods. The annual statistical bulletins published by the Ministry of Labour and Social Security were analysed under the Agriculture Sector (Agriculture, Forestry and Fishery). In this context, work accidents, fatal work accidents, periods of incapacity for work, and changes in labour force, work accidents and periods of incapacity for work were examined. The analysis revealed that between 2015 and 2024, the number of work accidents in the agricultural sector increased by 150%, fatal work accidents by 76%, and incapacity periods (days) by 37%. It was concluded that the ratio of work accidents to the labour force increased from 1.1% to 3.7%, and the ratio of incapacity period to the labour force increased from 0.15 to 0.29.

Keywords: Agricultural Sector, Labour Force, Work Accident, Incapacity Period.

Received: 17 September 2025 * **Accepted:** 14 December 2025 * **DOI:** https://doi.org/10.29329/ijiaar.2025.1375.7

* **Corresponding author:**

Ecehan Kazancı Yabanova, completed her doctorate in Isparta Süleyman Demirel University, Department of Labor Economics and Industrial Relations. She works in the fields of labor law, Employee training and occupational health and safety.
Email: ecehankazanci@gmail.com

INTRODUCTION

Meeting people's demand for food and agricultural products, supporting the livelihoods of the rural population, and contributing to the overall economy, as well as meeting the daily food needs of the rapidly growing world population, are among the fundamental objectives of the agricultural sector (Büyükkantarcı-Tolgay & Saygı, 2025). When referring to the agricultural workforce, it generally means the workforce employed in areas such as gardening, planting, sowing, animal husbandry, harvesting, irrigation, fishing, and forestry. Concepts such as mechanisation, seasonal changes, technological developments, and migration are factors that shape the demand for agricultural labour (Koç & Çelik, 2025). In this context, agricultural seasons in particular cause significant labour changes, and this labour force tends to fluctuate seasonally.

According to the Agricultural Law No. 5488, agricultural work covers a wide range of activities, from the planting and harvesting of agricultural products to the care of animals and the production of animal products (Koç & Çelik, 2025). The scope of the agricultural sector includes not only agriculture but also livestock farming, fishing, forestry and logging activities. When the occupational health and safety dimension of the agricultural sector is evaluated, it is seen that a large part of agriculture, forestry, and fishing activities are classified as 'hazardous' according to the 'List of Workplace Hazard Classes' (Ceylan et al., 2020; İTST, 2025). In general terms, the concept of an accident is 'an event that occurs unintentionally and has undesirable consequences.' According to the World Health Organisation, the definition of an occupational accident is 'an event that is not planned in advance and often leads to injuries, damage to machinery and equipment, or a temporary halt in production.' According to the International Labour Organisation (ILO), an occupational accident is 'an unplanned, unforeseeable event that causes specific harm or injury' (Akdağ & Mungan, 2024). The concept of occupational health and safety, one of the fundamental elements of working life, aims to ensure the health and safety of workers in all sectors of working life, as well as to prevent accidents at work and occupational diseases. The scale of accidents at work that occur every year, both globally and in Turkey, and the resulting injuries and deaths, highlight the importance of the concept of occupational health and safety. In this regard, the preventable nature of occupational accidents necessitates the development and implementation of policies in this area (Koçali, 2025).

Agricultural workers are constantly exposed to danger due to unstable working conditions. For example, changing weather conditions and the resulting changes in ground structure, changes in terrain conditions, excessive work due to tasks requiring excessive strength, and exposure to hazards due to workers being scattered across the field make this sector inherently risky (Menemencioğlu, 2012). One of the significant causes of occupational accidents in the agricultural sector is the risks associated with the machinery used in agricultural activities. Commonly used machinery in this group includes tractors, soil cultivation machinery, fertiliser spreaders, hoeing and sowing machines, balers, mowers, harvesters

and grinders, mixers and vehicles. Workplace accidents can occur both during the use of machinery and during the repair, maintenance, adjustment, and cleaning of such machinery (Yurtlu et al., 2012). Seasonal uncertainties in agricultural work, the failure to use modern and safe agricultural techniques, and the negative effects of agricultural pesticides and chemicals used in agriculture on the workforce necessitate a different perspective on occupational health and safety in the agricultural sector (Donham & Thelin, 2016; Turgut et al., 2025). Labour markets are among the least understood markets within the agricultural economy. The presence of self-employed workers, seasonal workers, temporary workers, and unpaid family helpers in the agricultural labour market contributes to the increase in informal employment. One of the most significant reasons for the uncertainty of these markets is the scale of informal employment. This uncertainty is most prevalent in the agricultural sector (Akbıyık, 2008). In the agricultural sector, production activities carried out by the labour force take place in open areas, involve long working hours, and require physical strength, with agricultural activities taking place in both hot and cold weather conditions. These adverse working conditions bring with them chemical and infection problems, problems caused by exposure to heat and high levels of sunlight, noise and vibration problems caused by the equipment used in agricultural activities, and the potential risks of physical work. therefore, the workforce's working conditions in these harsh conditions also lead to an increase in the risk of accidents at work and occupational diseases (Koç & Çelik, 2025). Agricultural activities constitute a sector classified as hazardous according to the 'Communication on Workplace Hazard Classes Related to Occupational Health and Safety'. Only 'plant production support spraying and agricultural pest control activities' and 'plant production support fertilisation, spraying and agricultural pest control activities carried out by air' are classified as highly hazardous. However, despite only these activities being classified as highly hazardous, the specific conditions of the agricultural sector, where female and child labour predominate, cause activities classified as hazardous to be classified as highly hazardous (Kanvermez & Sümer, 2020). The prevalence of unregistered work, the high proportion of child and female workers, long working hours, and low-wage working conditions constitute important problems that need to be solved in this sector in order to ensure the welfare and safety of workers and eliminate unsafe conditions that lead to work accidents (İlikçioğlu & Batmaz, 2022).

The agricultural sector encompasses a broad range of activities, including field cultivation, animal husbandry (cattle farming, sheep and goat farming, fattening, dairy farming, poultry farming), fishing (sea and lake fishing, fish farming in ponds and farms), and forestry and logging. Therefore, in addition to the risks encountered in arable farming, it also includes biological, chemical and physical risks that constitute a risk factor when carrying out livestock activities, zoonotic diseases and accidents and injuries that may occur in connection with animal production (Gürler & Şimşek, 2015). The main causes of risk factors during agricultural activities include accidents and injuries caused by agricultural machinery such as tractors and harvesters, risks posed by chemical pesticides and fertilisers, non-

ergonomic working conditions, bites from insects, snakes, etc., risks arising from climatic conditions, and non-ergonomic working conditions (Yurtlu et al., 2012).

Given that the agricultural sector is a labour-intensive sector with high protection requirements and intense hazards and risks, it is extremely important that legislation and practices are comprehensive and sustainable. At this point, it is also necessary for the parties in the sector to have a high level of occupational health and safety awareness. Under the Occupational Health and Safety Law No. 6331, enacted in 2012, agricultural workers are also guaranteed their legal rights. The fundamental objective in this regard is to protect workers from the risks of occupational accidents and diseases or prevent them through a protective and preventive approach, minimise risks, and enhance well-being (İSGGM, 2025). Within this scope, the aim of this study is to analyse the agricultural sector workforce and accident data for the ten-year statistical period between 2015 and 2024 to reveal the current state of occupational health and safety practices in the sector.

MATERIALS and METHODS

This study employed a quantitative descriptive analysis approach to examine the temporal changes in agricultural sector labour force and workplace accident data for the period 2015–2024. The primary objective of quantitative descriptive research is to numerically define the current state of variables and systematically reveal patterns in the data (Creswell, 2022; Trochim et al., 2016). The research seeks to answer the following questions:

RQ1. What is the change in the number of occupational accidents, fatal occupational accidents, and incapacity days (person-days) in the agricultural sector between 2015 and 2024?

RQ2. What is the change in the agricultural sector workforce and workplace accidents between 2015 and 2024?

Data Collection

The report titled ‘Agricultural Sector’ published by the General Directorate of Occupational Health and Safety of the Ministry of Labour and Social Security of the Republic of Turkey defines the sector as follows: NACE codes 01-Crop and animal production, hunting and related service activities (Agriculture), 02-Forestry and industrial and fuel wood production (Forestry), 03-Fishing and aquaculture (Fisheries) (ISGGM, 2025). Within this scope, the three NACE areas were combined and evaluated in the analysis of the Agricultural Sector.

Within the scope of the study, the Insured and Workplace Statistics (4/1-a) and Work Accident and Occupational Disease Statistics (4/1-a) reports published by the Ministry of Labour and Social Security between 2015 and 2024 were used as data sources (ÇSGB, 2025). The data obtained were compiled in Excel according to the scope of the study and reported.

Data Analysis

Within the scope of the study, the numerical values were first converted into percentages using Excel, and the proportional changes in certain critical data over the years were calculated. Subsequently, Linear Regression Analysis was used to determine whether there was an upward trend in workplace accidents over the years, while Bayesian Correlation Analysis was used to analyse the relationship between workforce size and workplace accidents. These analyses were performed using the JASP programme.

Validity and Reliability

The data used in the study is based on a standardised report format from the Turkish Ministry of Labour and Social Security, ensuring a high level of measurement consistency and data reliability. The fact that the data set has been produced using the same reporting methods over the years has strengthened the internal validity of quantitative comparisons.

RESULTS and DISCUSSION

Within the scope of this study, the Insured Persons and Workplace Statistics (4/1-a) and Work Accident and Occupational Disease Statistics (4/1-a) reports published by the Ministry of Labour and Social Security between 2015 and 2024 were analysed.

RQ1. What is the change in the number of occupational accidents, fatal occupational accidents, and incapacity days (person-days) in the agricultural sector between 2015 and 2024?

Firstly, gender-based occupational accident figures for the agricultural sector have been reported. The agriculture, forestry and fisheries sectors, and their combined total, have been calculated separately.

Table 1. Number of insured persons who suffered gender-based occupational accidents between 2015 and 2024

	Year	Female		Male		Total	Rate*
		%	N	%	N		
Agriculture	2015	31,7	545	68,3	1.174	1.719	-
	2016	29,2	544	70,8	1.319	1.863	8,4
	2017	28,5	582	71,5	1.459	2.041	9,6
	2018	31,9	832	68,1	1.777	2.609	27,8
	2019	30,1	829	69,9	1.929	2.758	5,7
	2020	28,6	701	71,4	1.751	2.452	-11,1
	2021	31,9	977	68,1	2.082	3.059	24,8
	2022	33,7	1.049	66,3	2.064	3.113	1,8
	2023	34,4	1.282	65,6	2.450	3.732	19,9
	2024	36,3	1.505	63,7	2.638	4.143	11,0
Forestry	2015	26,3	114	73,7	320	434	-
	2016	11,3	39	88,7	306	345	-20,5
	2017	13,0	58	87,0	389	447	29,6
	2018	14,2	69	85,8	417	486	8,7
	2019	9,4	48	90,6	460	508	4,5
	2020	4,3	22	95,7	485	507	-0,2
	2021	4,4	31	95,6	672	703	38,7
	2022	7,0	60	93,0	800	860	22,3
	2023	10,7	85	89,3	707	792	-7,9
	2024	16,7	177	83,3	880	1057	33,5
Fishery	2015	36,3	109	63,7	191	300	-
	2016	50,0	291	50,0	291	582	94,0
	2017	8,8	24	91,2	249	273	-53,1
	2018	7,6	26	92,4	318	344	26,0
	2019	10,4	39	89,6	336	375	9,0
	2020	5,4	20	94,6	352	372	-0,8
	2021	11,1	55	88,9	441	496	33,3
	2022	12,2	78	87,8	559	637	28,4
	2023	14,0	114	86,0	699	813	27,6
	2024	11,9	111	88,1	823	934	14,9
TOTAL	2015	31,3	768	68,7	1.685	2.453	-
	2016	31,3	874	68,7	1.916	2.790	13,7
	2017	24,0	664	76,0	2.097	2.761	-1,0
	2018	27,0	927	73,0	2.512	3.439	24,6
	2019	25,2	916	74,8	2.725	3.641	5,9
	2020	22,3	743	77,7	2.588	3.331	-8,5
	2021	25,0	1.063	75,0	3.195	4.258	27,8
	2022	25,7	1.187	74,3	3.423	4.610	8,3
	2023	27,7	1.481	72,3	3.856	5.337	15,8
	2024	29,2	1.793	70,8	4.341	6.134	14,9

* Change rate compared to the previous year

When examining gender-based workplace accident figures, it is observed that the proportional change in workplace accidents in the total category ranges from 22% to 31% for women and from 69% to 78% for men. In the analysis of the agricultural sector, it would not be incorrect to state that 3 out of every 4 workplace accidents occur among male employees and 1 among female employees. There appear to be no significant changes in the gender-based rates of workplace accidents over the years.

When examining the proportional change in the number of workplace accidents in the total category, it can be seen that the number of workplace accidents increased every year except between 2017 and 2020. The -8.5% decline in 2020 is thought to be due to Covid-19. The highest proportional increase occurred in 2021, which is seen as a rebound following the proportional decline during the COVID-19 period.

Table 2. Number of fatalities resulting from workplace accidents between 2015 and 2024

	Year	Female		Male		Total
		%	N	%	N	
Agriculture	2015	7,7	1	92,3	12	13
	2016	15,8	3	84,2	16	19
	2017	4,8	1	95,2	20	21
	2018	20	5	80	20	25
	2019	0	0	100	18	18
	2020	0	0	100	15	15
	2021	0	0	100	19	19
	2022	21,1	4	78,9	15	19
	2023	6,3	1	93,8	15	16
	2024	4,5	1	95,5	21	22
Forestry	2015	14,3	1	85,7	6	7
	2016	0,0	0	100,0	7	7
	2017	0,0	0	100,0	8	8
	2018	0,0	0	100,0	9	9
	2019	0,0	0	100,0	9	9
	2020	0,0	0	100,0	13	13
	2021	0,0	0	100,0	12	12
	2022	6,7	1	93,3	14	15
	2023	0,0	0	100,0	12	12
	2024	0,0	0	100,0	9	9
Fishery	2015	100,0	1	0,0	0	1
	2016	0,0	0	0,0	0	0
	2017	0,0	0	100,0	2	2
	2018	0,0	0	100,0	1	1
	2019	0,0	0	100,0	4	4
	2020	0,0	0	100,0	6	6
	2021	0,0	0	100,0	2	2
	2022	0,0	0	100,0	2	2
	2023	14,3	1	85,7	6	7
	2024	0,0	0	100,0	6	6
TOTAL	2015	14,3	3	85,7	18	21
	2016	11,5	3	88,5	23	26
	2017	3,2	1	96,8	30	31
	2018	14,3	5	85,7	30	35
	2019	0,0	0	100,0	31	31
	2020	0,0	0	100,0	34	34
	2021	0,0	0	100,0	33	33
	2022	13,9	5	86,1	31	36
	2023	5,7	2	94,3	33	35
	2024	2,7	1	97,3	36	37

When examining fatal workplace accidents in the overall category, although proportional increases are observed, it is quite difficult to speak of a significant increase over the years due to the low numerical value. Fatal workplace accidents have fluctuated between 31 and 37 as of 2017. As shown in

Table 1, although there was a 150% increase in the number of accidents in the agricultural sector over a 10-year period, there was a 76% increase in fatal accidents. While the accident/death ratio was 86 per thousand in 2015, there were 60 deaths per thousand in 2024.

Table 3. Number of insured persons who suffered an accident at work, according to the duration of incapacity for work between 2015 and 2024

	Year	Accident day (at work)		Accident day (incapacity)		2 days		3 days		4 days		5+ days	
		F	M	F	M	F	M	F	M	F	M	F	M
Agriculture	2015	281	552	12	24	25	56	41	65	10	9	176	468
	2016	328	663	5	15	23	42	25	60	7	12	156	527
	2017	326	752	14	31	27	54	40	76	6	16	169	530
	2018	682	1363	5	22	20	49	23	42	3	9	99	292
	2019	511	1134	18	44	46	81	57	125	8	23	189	522
	2020	419	934	17	46	34	74	61	132	12	29	158	536
	2021	557	1.068	25	59	67	113	78	167	17	46	233	629
	2022	592	1.090	39	54	52	114	94	147	15	30	257	629
	2023	754	1.392	30	85	61	104	107	185	35	56	295	628
	2024	882	1.525	51	66	73	129	104	202	29	45	366	671
Forestry	2015	66	152	1	6	2	8	5	17	0	3	40	134
	2016	21	168	1	3	1	16	4	8	0	5	12	106
	2017	45	215	0	2	0	10	2	15	0	5	11	142
	2018	62	349	1	1	0	5	0	1	0	0	6	61
	2019	30	287	0	9	2	14	6	24	0	6	10	120
	2020	13	299	0	4	2	13	0	19	0	5	7	145
	2021	20	415	0	11	2	20	1	35	1	7	7	184
	2022	36	480	1	15	0	17	6	35	2	9	15	244
	2023	64	466	3	5	2	22	2	29	2	11	12	174
	2024	156	573	4	7	3	35	5	47	2	20	7	198
Fishery	2015	76	104	2	1	4	9	9	8	2	2	16	67
	2016	248	177	2	4	8	8	5	12	1	2	27	88
	2017	14	117	0	3	1	10	1	22	0	3	8	94
	2018	22	251	1	2	0	6	0	5	0	3	3	51
	2019	16	159	0	7	1	9	2	19	3	11	17	131
	2020	13	165	0	5	0	15	2	25	1	5	4	137
	2021	25	203	3	6	2	14	7	41	1	8	17	169
	2022	40	257	6	16	6	32	8	66	0	11	18	177
	2023	51	375	4	6	8	28	17	58	1	14	33	218
	2024	65	444	6	8	8	39	12	63	1	8	19	261
TOTAL	2015	423	808	15	31	31	73	55	90	12	14	232	669
	2016	597	1.008	8	22	32	66	34	80	8	19	195	721
	2017	385	1.084	14	36	28	74	43	113	6	24	188	766
	2018	766	1.963	7	25	20	60	23	48	3	12	108	404
	2019	557	1.580	18	60	49	104	65	168	11	40	216	773
	2020	445	1.398	17	55	36	102	63	176	13	39	169	818
	2021	602	1.686	28	76	71	147	86	243	19	61	257	982
	2022	668	1.827	46	85	58	163	108	248	17	50	290	1.050
	2023	869	2.233	37	96	71	154	126	272	38	81	340	1.020
	2024	1.103	2.542	61	81	84	203	121	312	32	73	392	1.130

* F: Female – M:Male

When the total number of work accidents is examined according to the duration of incapacity for work, the highest rates are seen in the areas of incapacity for work on the day of the accident and 5+ days. The areas of incapacity for work on the day of the accident and 2, 3 and 4 days of incapacity for work are relatively low compared to the other two areas.

Table 4. Temporary incapacity period due to work-related accidents between 2015 and 2024 (Days)

	Year	Days of Temporary Incapacity (Outpatient)										Days of Temporary Incapacity (Inpatient)										Total Days of Temporary Incapacity			Rate
		1 days		2 days		3 days		4 days		5 days		1 days		2 days		3 days		4 days		5 days		Female	Male	Total	(%)
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M				
Agriculture	2015	12	24	49	112	123	195	40	36	6.160	15.781	0	0	1	0	0	0	0	0	248	915	6.633	17.063	23.696	-
	2016	5	15	46	84	75	177	28	44	3.641	21.928	0	0	0	0	0	3	0	8	122	1.115	3.917	23.374	27.291	15,2
	2017	14	31	54	107	120	228	24	63	5.484	20.114	0	0	0	1	0	0	0	1	185	1.301	5.881	21.846	27.727	1,6
	2018	5	22	40	98	69	126	12	29	3.973	14.997	0	0	0	0	0	0	0	7	140	1.018	4.239	16.297	20.536	-25,9
	2019	18	44	92	162	168	375	32	91	4.857	19.532	0	0	0	0	3	0	0	1	232	780	5.402	20.985	26.387	28,5
	2020	17	46	68	148	183	396	48	116	3.654	18.114	0	0	0	0	0	0	0	0	38	673	4.008	19.493	23.501	-10,9
	2021	25	59	132	226	234	501	68	182	7.470	22.765	0	0	2	0	0	0	0	2	153	948	8.084	24.683	32.767	39,4
	2022	39	54	104	228	282	441	60	120	6.484	21.031	0	0	0	0	0	0	0	0	162	812	7.131	22.686	29.817	-9,0
	2023	30	85	122	208	321	555	140	224	8.301	21.183	0	0	0	0	0	0	0	0	221	982	9135	23.237	32.372	8,6
	2024	50	66	146	258	312	606	116	178	9.283	21.368	0	0	0	0	0	0	0	2	225	927	10.132	23.405	33.537	3,6
Forestry	2015	1	6	4	15	15	51	1	11	362	5.857	0	0	0	1	0	0	0	1	74	362	2.109	6.304	8.413	
	2016	1	3	2	32	12	24	0	20	252	5.554	0	0	0	0	0	0	0	0	10	252	458	5.885	6.343	-24,6
	2017	0	2	0	20	6	45	0	20	386	5.865	0	0	0	0	0	0	0	0	12	386	466	6.338	6.804	7,3
	2018	1	1	0	10	0	3	0	0	321	3.972	0	0	0	0	0	0	0	0	46	321	598	4.307	4.905	-27,9
	2019	0	9	4	28	18	72	0	24	266	4.634	0	0	0	0	0	0	0	0	12	266	223	5.033	5.256	7,2
	2020	0	4	4	24	0	57	0	20	241	5.089	0	0	0	2	0	0	0	0	22	241	556	5.437	5.993	14,0
	2021	0	11	4	40	3	105	0	28	463	6.918	0	0	0	0	0	0	0	0	2	463	118	7.565	7.683	28,2
	2022	1	15	0	34	18	105	0	36	724	9.494	0	0	0	0	0	0	0	0	24	724	717	10.408	11.125	44,8
	2023	3	5	4	44	6	87	0	44	594	7.162	0	0	0	0	0	0	0	0	1	594	225	7.936	8.161	-26,6
	2024	4	7	6	70	15	141	0	80	541	5.333	0	0	0	0	0	0	0	0	0	541	220	6.172	6.392	-21,7
Fishery	2015	2	1	8	18	27	24	0	8	145	1.883	0	0	0	0	0	0	0	0	12	145	228	2.079	2.307	
	2016	2	4	16	16	15	36	2	6	50	2.375	0	0	0	0	0	0	0	2	28	50	620	2.489	3.109	34,8
	2017	0	3	2	20	3	66	0	12	167	3.034	0	0	0	0	0	0	0	0	0	167	142	3.302	3.444	10,8
	2018	1	2	0	12	0	15	0	12	11	1.156	0	0	0	0	0	0	0	0	13	11	32	1.208	1.240	-64,0
	2019	0	7	2	18	6	57	0	44	295	4.846	0	0	0	0	0	0	0	0	2	295	414	5.267	5.681	358,1
	2020	0	5	0	30	6	75	0	20	85	2.969	0	0	0	0	0	0	0	0	0	85	68	3.184	3.252	-42,8
	2021	3	6	4	28	21	123	0	32	130	4.004	0	0	0	0	0	0	0	0	11	130	488	4.323	4.811	47,9
	2022	6	16	12	64	24	196	0	44	175	4.628	0	0	0	0	0	2	0	0	12	175	257	5.125	5.382	11,9
	2023	4	6	16	56	51	174	0	56	297	6.415	0	0	0	0	0	0	0	0	4	297	1.031	7.004	8.035	49,3
	2024	6	8	16	78	36	189	0	32	250	6.301	0	0	0	0	0	0	0	0	23	250	579	6.858	7.437	-7,4
TOTAL	2015	15	31	61	145	165	270	41	55	6.667	23.521	0	0	1	1	0	0	0	1	334	1.422	8.970	25.446	34.416	
	2016	8	22	64	132	102	237	30	70	3.943	29.857	0	0	0	0	0	3	0	10	160	1.417	4.995	31.748	36.743	6,8
	2017	14	36	56	147	129	339	24	95	6.037	29.013	0	0	0	1	0	0	0	1	197	1.854	6.489	31.486	37.975	3,4
	2018	7	25	40	120	69	144	12	41	4.305	20.125	0	0	0	0	0	0	0	7	199	1.350	4.869	21.812	26.681	-29,7
	2019	18	60	98	208	192	504	32	159	5.418	29.012	0	0	0	0	3	0	0	1	246	1.341	6.039	31.285	37.324	39,9
	2020	17	55	72	202	189	528	48	156	3.980	26.172	0	0	0	2	0	0	0	0	60	999	4.632	28.114	32.746	-12,3
	2021	28	76	140	294	258	729	68	242	8.063	33.687	0	0	2	0	0	0	0	2	166	1.541	8.690	36.571	45.261	38,2
	2022	46	85	116	326	324	742	60	200	7.383	35.153	0	0	0	0	0	2	0	0	198	1.711	8.105	38.219	46.324	2,3
	2023	37	96	142	308	378	816	140	324	9.192	34.760	0	0	0	0	0	0	0	0	226	1.873	10.391	38.177	48.568	4,8
	2024	60	81	168	406	363	936	116	290	10.074	33.002	0	0	0	0	0	0	0	2	248	1.718	10.931	36.435	47.366	-2,5

When examining daily incapacity periods in the total category, an overall increase of 137% is observed. When analysed by year, a fluctuating pattern emerges, with the impact of Covid-19 again evident in the 2020 data.

Table 5. Temporary incapacity period due to work-related accidents between 2015 and 2024 (Days)

	Year	Female			Male			Total		
		Day	Person	Day/ Person	Day	Person	Day/ Person	Day	Person	Day/ Person
Agriculture	2015	6.633	545	12	17.063	1.174	15	23.696	1.719	14
	2016	3.917	544	7	23.374	1.319	18	27.291	1.863	15
	2017	5.881	582	10	21.846	1.459	15	27.727	2.041	14
	2018	4.239	832	5	16.297	1.777	9	20.536	2.609	8
	2019	5.402	829	7	20.985	1.929	11	26.387	2.758	10
	2020	4.008	701	6	19.493	1.751	11	23.501	2.452	10
	2021	8.084	977	8	24.683	2.082	12	32.767	3.059	11
	2022	7.131	1.049	7	22.686	2.064	11	29.817	3.113	10
	2023	9.135	1.282	7	23.237	2.450	9	32.372	3.732	9
	2024	10.132	1.505	7	23.405	2.638	9	33.537	4.143	8
Forestry	2015	2.109	114	19	6.304	320	20	8.413	434	19
	2016	458	39	12	5.885	306	19	6.343	345	18
	2017	466	58	8	6.338	389	16	6.804	447	15
	2018	598	69	9	4.307	417	10	4.905	486	10
	2019	223	48	5	5.033	460	11	5.256	508	10
	2020	556	22	25	5.437	485	11	5.993	507	12
	2021	118	31	4	7.565	672	11	7.683	703	11
	2022	717	60	12	10.408	800	13	11.125	860	13
	2023	225	85	3	7.936	707	11	8.161	792	10
	2024	220	177	1	6.172	880	7	6.392	1.057	6
Fishery	2015	228	109	2	2.079	191	11	2.307	300	8
	2016	620	291	2	2.489	291	9	3.109	582	5
	2017	142	24	6	3.302	249	13	3.444	273	13
	2018	32	26	1	1.208	318	4	1.240	344	4
	2019	414	39	11	5.267	336	16	5.681	375	15
	2020	68	20	3	3.184	352	9	3.252	372	9
	2021	488	55	9	4.323	441	10	4.811	496	10
	2022	257	78	3	5.125	559	9	5.382	637	8
	2023	1.031	114	9	7.004	699	10	8.035	813	10
	2024	579	111	5	6.858	823	8	7.437	934	8
TOTAL	2015	8.970	768	12	25.446	1.685	15	34.416	2.453	14
	2016	4.995	874	6	31.748	1.916	17	36.743	2.790	13
	2017	6.489	664	10	31.486	2.097	15	37.975	2.761	14
	2018	4.869	927	5	21.812	2.512	9	26.681	3.439	8
	2019	6.039	916	7	31.285	2.725	11	37.324	3.641	10
	2020	4.632	743	6	28.114	2.588	11	32.746	3.331	10
	2021	8.690	1.063	8	36.571	3.195	11	45.261	4.258	11
	2022	8.105	1.187	7	38.219	3.423	11	46.324	4.610	10
	2023	10.391	1.481	7	38.177	3.856	10	48.568	5.337	9
	2024	10.931	1.793	6	36.435	4.341	8	47.366	6.134	8

When examining the change in the total number of days of incapacity for work resulting from occupational accidents, it is observed that the number of days, which was 34.416 in 2015, increased to

47.366 in 2024, representing a 37% increase. When examining the days/accident ratio, it was determined that the average incapacity period per accident, which was 14 days in 2015, had fallen to 8 days by 2024.

Beyond all these descriptive analyses, a trend analysis was conducted using the Linear Regression method to determine whether the change in the number of work accidents between 2015 and 2024 followed a regular pattern over time. The annual total work accident data for the agricultural sector was used in the analysis. Since the linear trend analysis by year contains two parameters, 10 observations more than meet the minimum statistical requirements for trend analysis estimation; however, the results are considered exploratory due to low power (Hyndman & Kostenko, 2007). The results of the linear regression analysis of work accidents over the ten-year period are presented in Table 6.

Table 6. Model Summary – Work Accident

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.000	0.000	0.000	1197.6
M_1	0.955	0.913	0.902	375.5

The analysis shows that the model explains 91% of the variance in the number of workplace accidents (R^2 = .913, Adjusted R^2 = .902). This result indicates a very strong time trend between the year and the number of workplace accidents. Furthermore, the RMSE = 375.5 value indicates that the model's prediction error is quite low.

Table 7. Model fit ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	$1.178\times10^{+7}$	1	$1.178\times10^{+7}$	83.54	< .001
	Residual	$1.128\times10^{+6}$	8	141020		
	Total	$1.291\times10^{+7}$	9			

A simple linear regression analysis was conducted to determine the effect of the year variable on the number of workplace accidents, and the model was found to be significant ($F(1,8) = 83.54$, $p < .001$)..

Table 8. Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	3875.4	378.72		10.233	< .001
M_1	(Intercept)	-759250.8	83494.43		-9.093	< .001
	Year	377.9	41.34	0.955	9.140	< .001

When examining the regression analysis coefficients, it is observed that the year variable has a positive and quite strong effect on the number of work accidents (B = 377.9, SE = 41.34, β = .955, p <

.001). These results reveal that the number of workplace accidents showed a consistent and strong upward trend over the ten-year period examined.

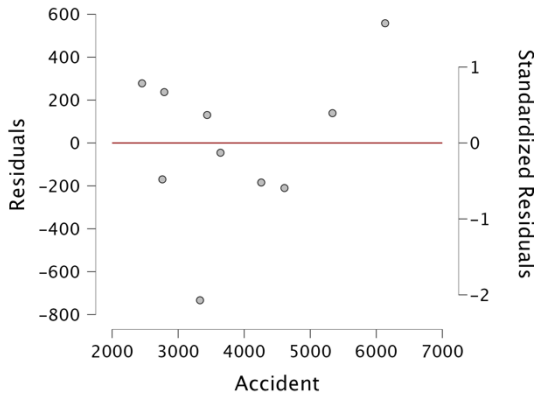

Figure 1. Residuals vs. Dependent Plots

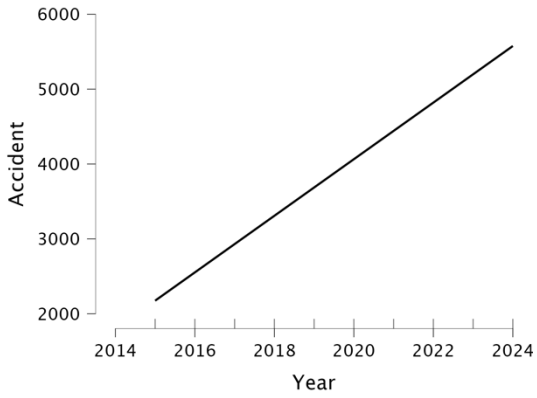

Figure 2. Marginal Effects Plots

The graph in Figure 1, which shows the relationship between the number of accidents and the residuals, indicates that the error terms are not completely randomly distributed around the zero line. The fact that the residuals are narrower at low accident values and wider at high accident values points to the possibility of heteroscedasticity in the model. Although this situation is frequently observed in data sets with few observations, it does not affect the validity and effectiveness of the model in determining the direction and magnitude of the trend (Antunes & Cardoso, 2015; Shumway & Stoffer, 2017).

Figure 2 shows that the number of work accidents has increased steadily over the years. The positively sloped structure of the curve shows annual increases consistent with the slope coefficient calculated in the model. This linear trend indicates that the number of work accidents is largely explained by the time variable, as indicated by the high R (0.955) and R^2 (0.913) values calculated in the study. All these indicators reveal that work accidents in the Turkish agricultural sector have been on a steady upward trend over the last 10 years.

RQ2. What is the change in the agricultural sector workforce and workplace accidents between 2015 and 2024?

The study also analysed changes in the workforce and workplace accidents between 2015 and 2024. Within this scope, workforce changes, workplace accidents and periods of incapacity for work were analysed.

Table 9. Changes in Labour Force, Work Accidents and Absenteeism Duration in the Agricultural Sector Between 2015 and 2024

	Year	Labor Force	Work Accident		Period of Inability to Work
			%	N	Day
Agriculture	2015	113.138	1,5	1.719	23.696
	2016	104.537	1,8	1.863	27.291
	2017	106.852	1,9	2.041	27.727
	2018	103.608	2,5	2.609	20.536
	2019	104.869	2,6	2.758	26.387
	2020	113.413	2,2	2.452	23.501
	2021	115.903	2,6	3.059	32.767
	2022	123.990	2,5	3.113	29.817
	2023	113.716	3,3	3.732	32.372
	2024	115.708	3,6	4.143	33.537
Forestry	2015	97.820	0,4	434	8.413
	2016	34.666	1,0	345	6.343
	2017	39.705	1,1	447	6.804
	2018	34.620	1,4	486	4.905
	2019	27.025	1,9	508	5.256
	2020	34.579	1,5	507	5.993
	2021	38.305	1,8	703	7.683
	2022	45.741	1,9	860	11.125
	2023	35.517	2,2	792	8.161
	2024	32.557	3,2	1057	6.392
Fishery	2015	8.041	3,7	300	2.307
	2016	8.467	6,9	582	3.109
	2017	9.062	3,0	273	3.444
	2018	9.306	3,7	344	1.240
	2019	9.784	3,8	375	5.681
	2020	12.556	3,0	372	3.252
	2021	13.878	3,6	496	4.811
	2022	15.583	4,1	637	5.382
	2023	14.615	5,6	813	8.035
	2024	15.342	6,1	934	7.437
TOTAL	2015	218.999	1,1	2.453	34.416
	2016	147.670	1,9	2.790	36.743
	2017	155.619	1,8	2.761	37.975
	2018	147.534	2,3	3.439	26.681
	2019	141.678	2,6	3.641	37.324
	2020	160.548	2,1	3.331	32.746
	2021	168.086	2,5	4.258	45.261
	2022	185.314	2,5	4.610	46.324
	2023	163.848	3,3	5.337	48.568
	2024	163.607	3,7	6.134	47.366

Workplace accident and incapacity rates have been examined in relation to workforce changes. In the total category, the workforce-to-workplace accident ratio, which was 1.1% in 2015, is seen to have risen to 3.7% in 2024. Compared to 2015, the workforce decreased by 25.3% over the ten-year period, while the number of accidents increased by 150%. The workforce-accident ratio rose from 1.1% to 3.7%. When examining the days of incapacity for work on a daily basis, it can be seen that despite the significant increase in the number of accidents at work, the days of incapacity for work increased by

a limited 37.6 per cent over the ten-year period. The analysis in Table 5 indicates that the incapacity period (days)-work accident ratio, which was 14 days in 2015, fell to 8 days in 2024, which contributed to this result. Again, despite the decline in the workforce, an increase in incapacity periods is observed. Of course, the decline in the workforce from 218,000 in 2015 to only 147,000 just one year later is seen to have had an impact on this result. In 2016, the workforce numbers suddenly decreased by 23%, and subsequently followed an up-and-down trend. Therefore, it is not possible to definitively state that there is a connection between the workforce and work accidents. A Bayesian correlation analysis was conducted within the scope of the study to determine whether there was a relationship between the workforce and workplace accidents. This analysis was specifically chosen due to the limited sample size (n=10). Bayesian correlation is more appropriate and useful for small samples than other correlation analyses (Nuzzo, 2017).

Table 10. Bayesian Pearson Correlations

	Pearson's r	**BF_{10}**	**Lower 95% CI**	**Upper 95% CI**
Labor Force - Accident	-0.085	0.396	-0.602	0.501

The analysis revealed that the Bayesian correlation coefficient was close to zero, with r = –0.085, 95% CI [–0.60, 0.50]. The Bayes factor provided evidence in favour of the no-relationship hypothesis (BF_{10} = 0.396). This value indicates that the null hypothesis (H_0) is approximately 2.5 times more supported than the alternative hypothesis (H_1). Consequently, no significant linear relationship was found between the two variables. However, due to the limitations of the sample size, the results are exploratory in nature.

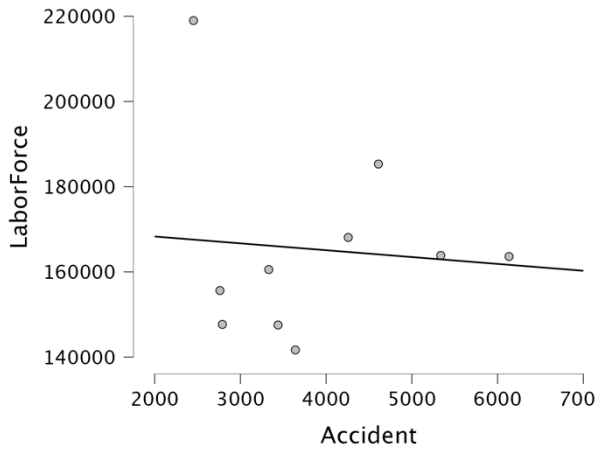

Figure 3. Scatterplot of Labor Force and Accident

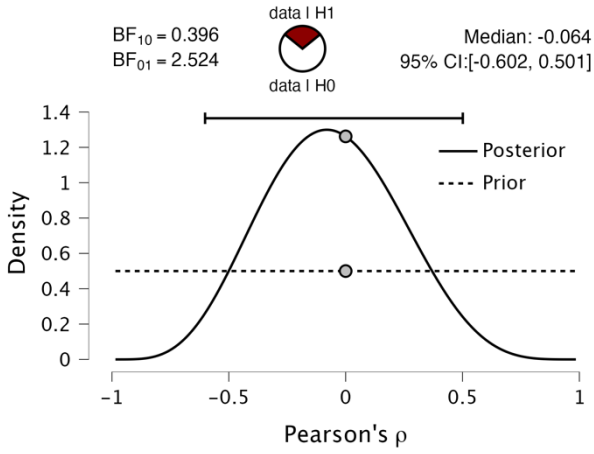

Figure 4. Prior and Posterior Distributions

The distribution graph showing the relationship between the workforce and the number of accidents reveals that the data points are spread over a wide area and do not form a clear linear structure. Although the regression line has a slight downward slope, this slope is extremely weak. Therefore, there is no meaningful linear relationship between changes in the workforce and the number of accidents. The posterior distribution curve is concentrated in a region close to the zero point, indicating that there is no strong evidence regarding the direction and magnitude of the relationship. Both the rates of change obtained from the descriptive data and the exploratory results of the Bayesian correlation analysis reveal that there is no linear relationship between the changing workforce and workplace accidents during the analysis period.

CONCLUSION

Occupational health and safety is a multifaceted concept with both human and economic dimensions, encompassing the protection of workers' health, the creation of decent working conditions, the prevention of workforce loss, and the maintenance of continuity in services and production. In this context, sectoral occupational safety analyses are important for monitoring sectoral development, identifying implementation gaps, and creating future projections. Studies examining occupational health and safety data in different sectors also emphasise this point (Altunkaynak, 2018; Işık & Işıkhan, 2025; Zengin & Sekmen, 2025). Within the scope of this study, the sectoral analysis conducted on occupational health and safety in the agricultural sector over the ten-year period between 2015 and 2024 reveals that work accidents have shown a significant upward trend over the years. The results of the year-based trend analysis also indicate a very strong temporal trend between the year and the number of work accidents. All these results reveal a steady upward trend in occupational accidents in the agricultural sector each year. A strong annual upward trend was also identified in the trend analysis of occupational accidents across all sectors in Turkey between 2013 and 2020 by Işık and Işıkhan (2025). A clear upward trend was also reported in the analysis of occupational accident data in the agricultural sector between 2018 and 2022 (Özdemir, 2024). Although there was a proportional increase in fatal occupational accidents, the decrease in the proportional change in occupational accidents/fatal occupational accidents is a positive indicator. The increase in workplace accidents was also reflected in the duration of incapacity for work. Despite the increase in the duration of incapacity for work, the ratio of incapacity days per workplace accident decreased from 14 days to 8 days. This indicates that although the number of workplace accidents increased, the duration of incapacity for work due to workplace accidents decreased.

When examining the changes in the workforce and workplace accidents, it is observed that despite a significant decline in the workforce, there has been an increase in workplace accidents. This result raises the question of whether there is a relationship between the workforce and workplace accidents, and for this purpose, a Bayesian correlation analysis of the workforce and workplace accidents was

conducted. The analysis found no significant relationship between the workforce and workplace accidents. In other words, the changes in the workforce were not found to be related to workplace accidents. Despite the numerical increase in workplace accidents, the reduction in accident-based incapacity periods is a positive indicator. Similarly, the decrease in the rate of fatal workplace accidents is also a positive result. However, the positive trend between the year and workplace accidents poses a risk factor for the sector. Significant progress has been made in occupational accidents and occupational diseases, which are combated much more vigorously under the Occupational Health and Safety Law No. 6331, with the establishment of a preventive occupational health and safety approach based on risk assessment, training, registration and reporting processes since 2012, the year the law came into force (Bilir, 2016). However, the year-on-year increase in the agricultural sector indicates that stronger implementation and measures are required (Ekmekci & Yaman, 2024; Özdemir, 2024).

The agricultural sector involves various hazards, including tools and equipment (tractors, ploughs, combine harvesters, greenhouse equipment, etc.), animals, climate and environment (heat, dust, chemicals, pesticides, water, humidity), ergonomic loads (heavy lifting, climbing, bending, etc.) and biological risks (poisoning, infection, plant/chemical contact) (Özdemir, 2024). In the agricultural sector, the most common hazards include tractor rollovers and accidents caused by the use of machinery and tools, working at heights during pruning, harvesting and greenhouse activities, slipping and falling, strain during the transport of heavy loads, and risk factors arising from the use of pesticides and other chemicals (İlikçioğlu & Batmaz, 2022). The vast majority of workers in the agricultural sector in Turkey are employed in small-scale family businesses. In addition, seasonal and temporary workers are employed in family businesses, and these individuals are employed informally and fall outside the protective scope of legal regulations (Kanvermez & Sümer, 2021). Prior to the Occupational Health and Safety Law No. 6331, many agricultural enterprises were excluded from the scope of the Occupational Health and Safety Law because they had fewer than 50 employees or were family businesses under the Labour Law No. 4857. Informal employment in the agricultural sector, the use of temporary or seasonal workers, and the high number of young, elderly, and female workers contribute to the inadequacy of occupational health and safety practices in the sector (Kanvermez & Sümer, 2021). In line with the above-mentioned situations, accidents occurring in agricultural enterprises outside the scope of the law are not officially recorded, leading to the problem of invisible accidents/occupational diseases. Furthermore, workers in these enterprises are unable to receive adequate occupational health and safety training and are excluded from protective equipment and risk assessment practices (Ünal et al., 2008). Therefore, the limited nature of control mechanisms and protective measures in the agricultural sector brings its own set of problems (Çamurcu & Seyhan, 2015). This situation makes it difficult to prevent accidents in the agricultural sector and also prevents work accidents from being fully reflected in official records. Consequently, it is thought that the current statistical figures represent only a portion of the accidents that occur in the field (Yalçın et al., 2016).

The increased temperatures brought about by climate change increase the stress of those working in the agricultural sector and also increase the psychosocial burden, leading to impairments in attention and concentration levels. Consequently, this situation indirectly contributes to the increase in occupational accidents (Tepe et al., 2022). A study on the impact of temperature increases associated with climate change in the agricultural sector on occupational accidents revealed a significant increase in occupational accidents and a statistically significant relationship between temperature increase and occupational accidents (Kahraman & Özdemir, 2023).

It is important to implement mandatory and continuous occupational health and safety training programmes for agricultural workers. In addition, improvements need to be made in the use of personal protective equipment (PPE), safe working with chemicals, and basic first aid practices . Field studies have shown that the risk of occupational accidents increases significantly due to inadequate use of personal protective equipment. This highlights the preventive role of such training (Ekmekçi & Yaman, 2024). In addition to occupational health and safety training, providing personal protective equipment (gloves, masks, goggles, helmets, etc.) to agricultural workers free of charge or at a lower cost and conducting inspections on the use of this equipment can provide a solution in terms of preventing existing risks.

Technological developments and increased mechanisation in the sector have also brought about different risk factors. In such a situation, it is extremely important to carry out technical inspections of agricultural machinery and tractors at regular intervals and systematically. In order to minimise risks that could cause serious injuries, such as overturning, crushing, or crushing, the use of protective equipment (e.g., ROPS cabins, emergency stop systems) should be made mandatory by law (Özdemir, 2024). It would be appropriate to launch machine safety training programmes in areas with a high concentration of small businesses and seasonal workers. Furthermore, the introduction and support of incentive mechanisms such as tax reductions, grant support, and credit facilities for farmers who fulfil occupational health and safety obligations could play a decisive role in eliminating existing risks. Such economic incentives for agricultural workers would contribute to the spread of a safety culture in the agricultural sector while also helping to reduce the financial pressure on producers.

Within the scope of technological developments brought about by Agriculture 4.0 and Agriculture 5.0 applications, it is important to ensure the integration of smart farming applications and occupational health and safety. For example, the use of digital tracking systems in agriculture, the installation of GPS-based speed-balance sensors on tractors and high-risk agricultural machinery, and the integration of rollover detection systems and remote monitoring modules are preventive measures in terms of accident risks. At this point, the activation of automatic shutdown and early warning systems in critical risk situations is extremely important in preventing potential accidents. Unlike traditional control mechanisms, these technology-based applications will contribute to continuous and preventive

monitoring, particularly in rural areas where controls are inadequate (Ağar, 2025; Çağlarer, 2025; Koç & Çelik, 2025; Yavuz & Özgen, 2025). Within the existing practices in Turkey, there is no mandatory link between agricultural insurance and actual occupational health and safety performance. However, at this point, it is important to view the direct linking of insurance premiums to occupational safety performance as an effective policy tool. In this regard, it would be appropriate to apply low premiums to agricultural enterprises that use safe machinery and document the use of training certificates and personal protective equipment, and high risk premiums to those that do not take safety measures. Through these measures, producers will be incentivised to adopt safe practices via direct economic incentives (Demirel & Aslan, 2024; Kanvermez & Sümer, 2024; Us & Akbıyık, 2023; Yurtçu, 2025).

Additional Declaration

Author Contributions

This study carried out by a single author.

Funding

This study was not funded by any institution or organization.

Responsible Artificial Intelligence Statement

In this study, artificial intelligence tools ChatGPT were used in literature review stages. The artificial intelligence tool was used to provide the colophon information of current related resources in the literature review. We declare that we, as the authors, take full responsibility for the problems that may arise from the content produced by artificial intelligence.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to the publication of this study.

Ethics Approval

In all processes of this study, the principles of Pen Academic Publishing Research Ethics Policy were followed. This study does not require ethics committee approval as it does not involve any direct application on human or animal subjects.

REFERENCES

Ağar, A. (2025). Topraktan sağlığa: Tarım ve hayvancılıkta iş güvenliğinin izinde. In K. Koçali (Eds.), *İş sağlığı ve güvenliğinin sosyal politika incelemeleri* (pp.109-119). Özgür Yayınları. https://doi.org/10.58830/ozgur.pub791

Akbıyık, N. (2008). Türkiye'de tarım kesiminde işgücü piyasalarının yapısı. *Elektronik Sosyal Bilimler Dergisi, 7*(24), 220-237.

Akdağ, R., & Mungan, F. P. (2025). Bir imalat işletmesinde iş sağlığı ve güvenliği risklerinin belirlenmesi ve sürekli iyileştirmenin uygulanması. *Sosyal Güvenlik Dergisi, 14*(2), 102-125. https://doi.org/10.32331/sgd.1699133

Altunkaynak, B. (2018). A statistical study of occupational accidents in the manufacturing industry in Turkey. *International Journal of Industrial Ergonomics, 66*, 101–109. https://doi.org/10.1016/j.ergon.2018.02.012

Antunes, J. L. F., & Cardoso, M. R. A. (2015). Using time series analysis in epidemiological studies. *Epidemiologia e Serviços de Saúde, 24*, 565-576.

Bilir, N. (2016). *Occupational safety and health profile: Turkey*. International Labour Organization / Ministry of Labour and Social Security.

Büyükkantarcı Tolgay, S., & Saygı, D. (2025). Organik ve iyi tarım üretiminin Türkiye tarım ihracatındaki potansiyel rolü. *Gaziantep Üniversitesi Sosyal Bilimler Dergisi, 24*(3), 1359-1379. https://doi.org/10.21547/jss.1667225

Ceylan, S., Ovacıllı, S., & Sandal, A. (2020). Tarım sektöründe iş sağlığı ve güvenliği. In A. N. Yıldız & A. Sandal (Eds.), *İş sağlığı ve güvenliği meslek hastalıkları* (P. 531). Hacettepe Üniversitesi Yayınları.

Creswell, J. W., & Creswell, J. D. (2022). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE.

Çağlarer, E. (2025). Real-time risk management in digital agriculture: Preventive approach with dynamic risk analysis. *Turkish Journal of Agriculture-Food Science and Technology, 13*(6), 1562-1570. https://doi.org/10.24925/turjaf.v13i6.1562-1570.7690

Çamurcu, S., & Seyhan, G. T. (2015). Tarım sektöründe iş sağlığı ve güvenliği. *Süleyman Demirel University Journal of Engineering Sciences and Design, 3*(3), 549-552.

ÇSGB (2025). *SGK istatistik yıllıkları*. Çalışma ve Sosyal Güvenlik Bakanlığı. https://www.sgk.gov.tr/Istatistik/Yillik/fcd5e59b-6af9-4d90-a451-ee7500eb1cb4

Demirel, S., & Aslan, T. (2024). Sosyal güvenlik reformu ve finansal etkileri. In M. Topçu (Eds.), *Finans Alanında Akademik Analizler* (pp.23-49). Yaz Yayınları.

Donham, K. J., & Thelin, A. (2006). *Agricultural medicine: occupational and environmental health for the health professions*. Blackwell publishing.

Ekmekci, M., & Yaman, S. (2024). Occupational health and safety among farmers: A comprehensive study in Central Anatolia, Turkey. *BMC Public Health, 24*, 2732. https://doi.org/10.1186/s12889-024-20249-7

Gürler, M. A. & Şimşek, Z. (2015). *Tarımda iş sağlığı ve güvenliği çalıştayı*. Harran.

Hyndman, R. J., & Kostenko, A. V. (2007). Minimum sample size requirements for seasonal forecasting models. *Foresight: The International Journal of Applied Forecasting, 6*, 12–15.

Işık, V., & Işıkhan, S. Y. (2025). Trend analysis of occupational accidents during 2013–2020 based on various characteristics in Turkey. *Work: A Journal of Prevention, Assessment & Rehabilitation, 81*(1), 2086–2096. https://doi.org/10.1177/10519815241300297

İlikçioğlu, E., & Batmaz, M. F. (2022). Tarımda iş sağlığı ve güvenliği. *Antep Fıstığı Araştırma Dergisi, 10*, 43-45.

İSGGM (2025). *Tarım sektöründe iş sağlığı ve güvenliği*. İş Sağlığı ve Güvenliği Genel Müdürlüğü. https://guvenlitarim.csgb.gov.tr

İTST (2025). *İş Sağlığı ve Güvenliğine İlişkin İşyeri Tehlike Sınıfları Tebliği*. Https://www.mevzuat.gov.tr/mevzuat?mevzuatno=16909&mevzuattur=9&mevzuattertip=5

Kahraman Z., & Özdemir, K. Y. (2023). İklim değişikliğine bağlı sıcaklık artışının tarım sektöründe iş kazalarına etkisi. *Osmaniye Korkut Ata University Journal of the Institute of Science and Technology, 6*(3), 1927-1942. https://doi.org/10.47495/okufbed.1169187

Kanvermez, Ç., & Korkut Sümer, S. (2021). Türkiye'de tarım sektöründe çalışanların iş sağlığı ve güvenliğinin kanun ve iş hukuku kapsamında değerlendirilmesi. *Ankara Üniversitesi SBF Dergisi, 76*(2), 575-596. https://doi.org/10.33630/ausbf.821707

Koç, Y., & Çelik, İ. (2025). İstihdamda tarım sektörünün seyri: Türkiye'deki değişimler ve gelecek görünümü. *Yeni Fikir International Journal of Academic Research and Ideas, 17* (34), 105-115. https://doi.org/10.57205/yenifikirjournal.1743354

Koçali, K. (2025). Kaza geliyorum der, Yağmur Ertekin, Ayrıkotu Yayınları, İstanbul 2022, 104 s. *Mecmua* (19), 263-268. https://doi.org/10.32579/mecmua.1532071

Menemencioğlu, K. (2012). Tarım ve orman işçiliğinde çalışma yeri koşulları ve karşılaşılan sorunlar. *Türk Bilimsel Derlemeler Dergisi, 5*(2), 72-76.

Nuzzo, R. L. (2017). An introduction to Bayesian data analysis for correlations. *PM&R, 9*(12), 1278–1282. https://doi.org/10.1016/j.pmrj.2017.11.003

Özdemir, M. (2024). A study on occupational health and safety in the agricultural sector in Türkiye: Analysis of work accidents, occupational diseases, and lost workdays. *Journal of Agricultural Production, 5*(4), 248–254. https://doi.org/10.56430/japro.1515703

Shumway, R. H., & Stoffer, D. S. (2017). *Time series analysis and its applications* (4th ed.). Springer.

Tepe, S., Eti, S., & Kahraman, Z. (2022). İklim değişikliğinin psikososyal riskler açısından iş kazalarına etkisinin VAR yöntemi ile değerlendirilmesi. *Trk Uluslararası Beşeri Bilimler ve Sanat Dergisi, 3*(2), 1–24. https://doi.org/10.5281/zenodo.7497279

Trochim, W. M., Donnelly, J. P., & Arora, K. (2016). *Research methods: The essential knowledge base*. Cengage Learning.

Turgut, D., Güler, B., & Vatansever, Ç. (2025). Mevsimlik tarım işçilerinin çalışma koşulları, yaşam koşulları ve sağlıkla ilişkili problemleri: sistematik bir derleme çalışması. *İş, Güç: Endüstri İliskileri ve İnsan Kaynakları Dergisi, 27*(1), 458-489.

Us, K., & Akbıyık, N. (2023). Tarım sektöründe istihdam ve çalışanların sosyal güvenliği. *Econharran Harran Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 7*(12), 25-36.

Ünal, H. G., Yaman, K., & Gök, A. (2008). Türkiye'deki tarımsal iş kazalarının analizi. *Journal of Agricultural Sciences, 14*(1), 38-45.

Yavuz, M., & Özgen, İ. (2025). Akıllı tarım teknolojilerine genel bakış. In C. Keskin & Y. K. Haspolat (Eds.), *Akıllı tarım uygulamaları: Gelecek perspektifi* (pp.18-39). Orient Yayınları.

Yurtçu, A. (2025). Türkiye'de iş kazaları ve sosyal güvenlik sisteminin koruyucu-önleyici rolü. In K. Koçeli (Eds.), *İş sağlığı ve güvenliğinin sosyal politika incelemeleri* (pp. 1-41). Özgür Yayınları. https://doi.org/10.58830/ozgur.pub791

Yurtlu, Y. B., Demiryürek, K., Bozoğlu, M., & Ceyhan, V. (2012). Çiftçilerin tarım makineleri kullanımına ilişkin risk algıları. *Journal of Agriculture Faculty of Ege University, 49*(1), 93-101.

Zengin, M. A., & Sekmen, M. (2025). Comparison of occupational incidence rates in risky sectors and future prospects. *International Journal of Engineering Research and Development, 17*(1), 75–91. https://doi.org/10.29137/umagd.1461648