KSÜ Tarım ve Doğa Derg 27 (Ek Sayı 2), 483-492, 2024
KSU J. Agric Nat 27 (Suppl. 2), 483-492, 2024
https://doi.org/10.18016/ksutarimdoga.vi.1463974

The Dairy Farming Future from Farmers' Perspectives in The Northern Region of Iraq

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ABSTRACT

The main purpose of this study was to analyze dairy farmers' feelings of safety about the future of dairy farming in the northern region of Iraq and to investigate how environmental factors and demographic characteristics of dairy farms impact their sense of security. Primary data were collected from 280 dairy farmers in four provinces of northern Iraq: Erbil, Sulaymaniyah, Dohuk, and Halabja. Descriptive statistics, the Chi-square test, and binary logistic regression were employed for analysis. The results of binary logistic regression analysis indicated that age, gender, marital status, education, experience, and household size significantly influenced farmers' perceptions of whether dairy farming could secure their future. Moreover, the binary logistic analysis revealed that five elements of dairy farming – technology, dairy farm structure, government policy, marketing, and extension – were significantly associated with farmers' perceptions of future security through dairy farming. However, the study concludes that to promote agricultural development at the macro level, it is essential to prioritize the provision of support services to farmers in policy formulation so that farmers can effectively leverage these services to enhance farm production and income levels.

Agricultural Economics

Research Article

Article History
Received : 03.04.2024
Accepted : 04.10.2024

Keywords
Dairy farm
Milk production
Government policy
Security
Iraq

Kuzey Irak'ta Yetiştiricilerin Bakış Açısıyla Süt Sığırcılığı İşletmelerinin Geleceği

ÖZET

Bu çalışmanın temel amacı, Kuzey Irak'ta süt sığırcılığı işletmelerinin süt hayvancılığının geleceğine ilişkin güvenlik duygularını analiz etmek ve işletmelerin çevresel faktörlerinin ve demografik özelliklerinin güvenlik duygularını nasıl etkilediğini araştırmaktır. Birincil veriler, Irak'ın kuzey bölgesindeki dört ildeki (Erbil, Süleymaniye, Dohuk ve Halepçe) 280 süt çiftçisinden toplanmıştır. Analiz için tanımlayıcı istatistikler, Ki-kare testi ve ikili lojistik regresyon kullanılmıştır. İkili lojistik regresyon analizinin sonuçları, yaş, cinsiyet, medeni durum, eğitim, deneyim ve hane büyüklüğünün çiftçilerin süt hayvancılığının geleceklerini güvence altına alıp alamayacağına ilişkin algılarını önemli ölçüde etkilediğini göstermiştir. Ayrıca, lojistik analizi, süt sığırcılığının beş unsuru olan teknoloji, süt çiftliği yapısı, hükümet politikası, pazarlama ve yayımın çiftçilerin süt hayvancılığı yoluyla gelecekteki güvenlik algılarıyla önemli ölçüde ilişkili olduğunu ortaya koymuştur. Bununla birlikte, çalışma, makro düzeyde tarımsal kalkınmayı teşvik etmek için, politika oluşturma sürecinde çiftçilere destek hizmetlerinin sağlanmasının önceliklendirilmesinin gerekli olduğunu, böylece çiftçilerin bu hizmetlerden etkili bir şekilde yararlanarak çiftlik üretimini ve gelir seviyelerini artırabileceklerini vurgulamaktadır.

Tarım Ekonomisi

Araştırma Makalesi

Makale Tarihçesi
Geliş Tarihi : 03.04.2024
Kabul Tarihi : 04.10.2024

Anahtar Kelimeler
Süt sığırcılığı işletmesi
Süt üretimi
Hükümet politikası
Güvenlik
Irak

Atıf Şekli: Hakim, E.A. & Akbay, C. (2024). Kuzey Irak'ta Süt Sığırcılığının Geleceğinin Çiftçilerin Perspektifinden Değerlendirilmesi. *KSÜ Tarım ve Doğa Derg 27* (Ek Sayı 2), 483-492. https://doi.org/10.18016/ksutarimdoga.vi. 1463974

To Cite : Hakim, E.A. & Akbay, C. (2024). Assessment of the Dairy Farming Future from Farmers' Perspective in Northern Iraq. *KSU J. Agric Nat 27* (Suppl. 2), 483-492. https://doi.org/10.18016/ksutarimdoga.vi. 1463974

INTRODUCTION

Governments in developing countries have been progressively engaged in supporting the commercial agricultural crop and livestock sectors recently (Nakane and Tauer, 2009). Many countries have introduced various support programs to increase farm profitability (Smith and Glauber, 2012). Iraq is dependent heavily on milk and other animal products in their regular diet. However, a significant part of the milk and dairy products needed are imported, especially from the Gulf countries and Türkiye (Hakim and Akbay, 2022). Over the past few years, several livestock projects have been implemented in the region for various purposes. For example, the distribution of cultured breed cows has increased significantly in recent years (UNDP, 2019). As a result, the government has recognized the drain of foreign exchange resources flowing out of the country, and, as a relief measure, various policies have been implemented to steer the dairy sector towards development, particulary to increase domestic production (Abid-Al Ammer et al., 2017). Despite this progress, recent policies aimed at addressing related challenges have not been adequately formulated and implemented (Nanakali, 2021).

Due to the current political approach, livestock's share of the country's wealth resources is not properly designed to meet the serious financial needs of producers. On the other hand, inflation and a sharp increase in livestock costs for farmers have resulted in a surge of economic activity in both the national and local economies. In addition, the growing and hidden rent-seeking in the country's layers of management and economy has caused more and more serious challenges for livestock to progress. This is because steps have not been taken to use political and economic management of the land to support livestock and farmers by ignoring irregular livestock imports, supporting importers, and planning to control and regulate imports.

Over the past 30 years, the ability of the Iraqi Ministry of Agriculture and Water Resources and other government institutions to provide agricultural services has deteriorated significantly (Lucani and Saade, 2012; UNDP, 2019). Budget cuts have led to a decline in skilled human resources in agricultural support services. It is necessary to strengthen the capacities of the government and smallholder organizations. Policy gaps must be addressed to help increase the sector's competitiveness and contribute to rural development and poverty alleviation. Furthermore, due to a lack of security and stability, in addition to an uncertain policy environment, the private sector has made no significant investments in agriculture (IFAD, 2017). Security, unclear requirements for business registration and closure, licensing requirements, limited communication infrastructure and logistics, difficulties in accessing finance, and an uncompetitive business environment with a lack of transparency and clear legal framework for rules-based market competition are all problems in the region. In addition, it is said that obtaining a license is difficult if one does not have the right contacts. Contracts are awarded to farmers who have good relationships with the authorities, who often control important political and governmental positions, and who usually subcontract the work after they have received their share (Jongerden et al., 2018).

To date, there is little academic literature that comprehensively examines the impact of government policies on dairy farms in Iraq's northern region. Bragg and Dalton (2004) investigated factors influencing farmers' decision to exit dairy farming and stated that older producers, those with higher off-farm income, lower returns relative to variable costs, and greater farm income diversification were more likely to abandon dairy farming. Nakane and Tauer (2009) further highlighted that exit decisions are influenced by factors other than milk prices and suggested that national or regional dairy programs should consider strategies other than price support to ensure a stable dairy industry and reduce the rate of dairy farm exit decisions. To optimize the development of dairy farms, the effects of government policy, farmer training, the structure of dairy farms, environmental issues, and milk safety must be investigated. The primary objective of this study is to analyze dairy farmers' feelings of safety concerning the future of dairy farming in the northern region of Iraq. Additionally, the study explores farmers' perceptions of their dairy farms, aiming to identify the reasons behind these perceptions and the environmental factors influencing them. In addition, it investigates the impact of demographic characteristics of dairy farms on farmers' sense of security regarding the future of dairy farming, which has been little studied in previous research. Our hypotheses are:

- ✓ Government policy has a positive and significant influence on the farmers' view of dairy farming's future security.
- ✓ Structural characteristics of a dairy farm have a positive and significant influence on farmers' view of dairy farming's future security.

This research aims to address these gaps by contributing a detailed investigation into the multifaceted challenges faced by dairy farmers. The findings are expected to inform the design of more effective and targeted policy interventions, ensuring sustainable development and stability of the dairy industry in the northern region of Iraq. For the government of the northern region of Iraq, this study is valuable in that it provides general information on

the state of the dairy sector and the financial constraints that influence it in the region. Policymakers will find this study crucial in developing and implementing policies that support and enhance the dairy sector.

MATERIAL and METOD

A survey was conducted to assess the status of dairy farming in the northern region of Iraq. Four provinces, namely Erbil, Sulaymaniyah, Dohuk, and Halabja were selected for the survey because they encompass the northern region of Iraq, have a high number of dairy animals, and represent a range of geographical and economic conditions. The survey was based on face-to-face interviews with dairy farmers. The sample size was calculated using the following formula (Newbold, 1995):

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

where n is the sample size, N is the size of the population (25600), p=0.5 is the probability of examining situations occurring (the absence of preliminary information concerning government policy effect factors), q is the probability that the situation will not occur (q = 1-p), and $\sigma^2_{p_x}$ is the variance ratio.

The sample size was calculated as 280 to empower the research by using an acceptable marginal error (5.85) and 95% confidence interval. Questionnaires were distributed randomly.

The chi-square test and binary logit regression were used to analyze the effect of dairy farmer characteristics on farmers' confidence about the future of dairy farming. Regression analysis is a multivariate technique that predicts a binary dependent outcome from a set of independent variables to estimate the probability that an event will or will not occur (Draper & Smith, 1981). Logistic regression does not require a linear relationship between the dependent and independent variables. Moreover, the main advantage of the logit model is that it makes no assumptions about the normality, linearity, or homogeneity of variances of the independent variables (Mutura et al., 2015). Logistic regression is widely used in agriculture, biology, medicine, and social sciences (Begizew, 2008). In this study, the logit regression model is used because there are two binary events, farmers consider whether dairy farming secures their future (or not). The binary logistic model used in this study is specified as follows:

$$P = p(Y = 1/X) = \frac{e^{\beta_0 + \sum_{i=1}^{n} \beta_i X_i}}{1 + e^{\beta_0 + \sum_{i=1}^{n} \beta_i X_i}}$$

Where, P is the dairy farming secures their future (P(Y=1/X), X_i are the explanatory variables such as age, gender, marital status, education, household size, land size, experience, perceptions, and β_i are coefficients of corresponding variables (Ganiyusufoğlu et al., 2022).

$$1 - P = p(Y = 0/X) = \frac{1}{1 + e^{\beta_0 + \Sigma_{i=1}^{n} \beta_i X_i}}$$

A transformation of P known as the logit transformation is defined as:

$$\text{Logit P} = \log\left[\frac{P}{1-P}\right] = \beta_0 + \sum_{i=1}^{n} \beta_i X_i$$

The Odds ratio (Exp ß) shows how many times (relatively) a unit increase in a single explanatory variable increases the probability of the dependent variable if all other variables are kept constant (Hosmer et al., 2013; Hair et al., 2014).

RESULTS AND DISCUSSIONS

According to the results of the surveys, 81% of farmers in the research area were male and 65% were married. The average age of the farmers was 42.05 years, with 31% of them aged less than 30 years and 33% aged older than 40 years. The educational level of farmers indicates that 42% were illiterate or had completed elementary school, while 19% had graduated from university. Results indicated that 69% of the farmers had more than four family members, and 76% had experience in the field for more than six years. Social protection programs are absent in the northern region of Iraq, as indicated by the survey results where 76.1% of farmers suggested the necessity to eliminate the deficiency in social protection policies aimed at protecting agriculture. Moreover, 70.4% of the farmers stated that animal husbandry is profitable and that they want to continue dairy farming in the future (Table 1). However, a significant number of farmers stated that it is necessary to be cautious before entering livestock, and they are not sure whether profitability will continue in the future.

The northern region of Iraq faces many challenges that directly impact the country's economic sectors. These challenges include weak institutions, the security situation, and corruption (Lucani and Saade, 2012). According to the results, 72.5% of the farmers stated that corruption in the region affects the economy as well as the dairy sector. Moreover, low productivity and growth rates in the sector are attributed to various problems and government policies. The results reveal that 46.1% of the participants were not satisfied with the government's policies for the expansion of animal husbandry-related service support (Table 1).

Agricultural subsidies are broadly classified into two types: domestic subsidies and export subsidies. They encompass various support mechanisms such as deficiency payments, direct payments, compensatory

payments, crop insurance assistance, livestock assistance, rural development assistance, and environmental set aside (Akbay et al., 2016). Despite the significant role of subsidies in agriculture (Akbay and Bilgiç, 2023), the dairy sector has notably received less support from both the government and the public sector. Our analysis of the dairy farms identified both favorable and negative factors influencing the development of the sector. The findings revealed that approximately 42.5% of farmers initiated dairy farming with financial assistance inherited from relatives, whereas 57.5% started with their resources (Table 2).

Table 1. Farmers' perspectives, needs and satisfaction with dairy farming
Çizelge 1. Çiftçilerin süt çiftçiliğiyle ilgili bakış açıları, ihtiyaçları ve memnuniyetleri

Variable	Answer	Number of farms	Percent
Do retired farmers need social protection?	Yes	213	76.1
	No	67	23.9
Will you keep dairy farming?	Yes	197	70.4
	No	83	29.6
Do you think corruption has affected your job?	Yes	203	72.5
	No	77	27.5
Are you satisfied with the level of support you receive from the government?	Satisfied	59	21.1
	A little satisfied	62	22.1
	Not satisfied	129	46.1
	No idea	30	10.7

Table 2. Sources and purposes of loans in dairy farming
Çizelge 2. Süt sığırcılığı işletmelerinde kullanılan kredilerin kaynakları ve amaçları

Variables	Number of farms	Percent
Initial funding to set up dairy farming		
From relatives	119	42.5
My own resources	161	57.5
Source of loans		
Friends, relatives, neighbors	238	85.0
Agricultural bank	42	15.0
Purpose of loan		
Land operations	36	12.9
Purchase of in-calf heifers	141	50.4
Purchase of dairy feeds	47	16.7
Others	56	20.0
Reasons for not accessing credit services		
High tax rate	49	17.5
Demand for collateral	79	28.2
Lengthy process	72	25.7
Lack of access	80	28.6
Total	280	100.0

There are no government-owned dairy farms in the northern region of Iraq. Most dairy farms in the northern zone are privately owned. According to the findings, 15% of farmers obtained credit from agricultural banks, while 85% relied on credit from friends, relatives, and neighbors. Credit from these sources was used for various purposes, including production, meeting consumer demands, and fulfilling social obligations. Notably, there are no collateral requirements for credit from these personal sources, and no interest is charged in the area. An oral promise, confidence, trust, and mutuality are frequently sufficient as collateral or security. In contrast, agricultural bank loans generally entail sensitivity to collateral requirements and are subject to interest charges. Interestingly, this study revealed that many farmers borrowed money from agricultural banks without making projects.

The survey findings underscored the pivotal role of credit in financing essential investments for dairy farming, with expenditures primarily allocated to purchasing in-calf heifers (50.4%), constructing barns or for social purposes (20%), purchasing milk feed (16.7%), and buying land (12.9%). Credit plays a vital role in financing investments and farm processes essential for commercializing dairy farming (Ağır and

Akbay, 2018). Despite its importance, producers in the northern region of Iraq demonstrated limited knowledge of dairy farming credit issues, resulting in low credit utilization rates. Furthermore, it delved into factors influencing credit availability for producers, highlighting key challenges such as lack of access (28.6%), stringent collateral requirements (28.2%), protracted application processes (25.7%), and elevated tax rates (17.5%).

Impact of Dairy Farmers' Characteristics on the Future Security of Dairy Farming

Table 3 provides detailed descriptions of the explanatory variables used in the Logit model. The Logit model is used in this context because it effectively handles binary outcome variables, like whether farmers are confident or not about the future of dairy farming. At the heart of our inquiry lies a pivotal question: "Do you feel confident about the future of dairy farming?" This question serves as our dependent variable, delineated as a binary outcome where "satisfied" corresponds to (1) and "dissatisfied" to (0). The findings reveal that 62% of farmers expressed confidence in the future of dairy farming. However, a significant portion, comprising 38% of farmers, were not confident and had a view that working on a dairy farm was the last choice of work. They argue that working on dairy farms requires effort and time, that it is a complicated, dirty, non-potential job that threatens their future, and that it does not pay well. Consequently, they envision alternative pathways for their future endeavors, including aspirations to join the public sector as government employees, army or police officers, among other pursuits.

Table 3. Definition and descriptive statistics of variables used in the model
Çizelge 3. Modelde kullanılan değişkenlerin tanımı ve tanımlayıcı istatistikleri

Variables	Definition of variable	Mean	Standard deviation
Dependent variable	Feel confident about the future of dairy farming: 1 for Yes; 0 for No	0.62	0.49
Age1	1 if the household head is aged less than 30; 0 otherwise	0.31	0.47
Age2	1 if the household head is aged between 31 and 40; 0 otherwise	0.36	0.48
Age3	1 if the household head is aged above 40; 0 otherwise	0.33	0.47
Edu1	1 if the household head graduated from elementary school or is illiterate; 0 otherwise	0.42	0.49
Edu2	1 if the household head graduated from high school; 0 otherwise	0.39	0.49
Edu3	1 if the household head graduated from university; 0 otherwise	0.19	0.40
Gender	1 if the household head is male; 0 otherwise	0.81	0.39
Marital status	1 if the household head is married; 0 otherwise	0.64	0.48
Experience	1 if having work experience is above 6 years; 0 otherwise	0.30	0.46
HSize	1 if the household size is ≥5; 0 otherwise	0.31	0.47
Land	1 if agricultural land size is >10 dunam*; 0 otherwise	0.20	0.40

*: 1 dunam= 2500 m^2

The model summary shows that the log-likelihood statistic is 317.17 and the Chi-square test value is 54.31 with a p-value of 0.0001, indicating the joint significance of all coefficient estimates (Table 4). The correctly predicted result indicates that the model predicted 79.1% of the observed ratings correctly, which is considered adequate. Estimated coefficients are tested using standard errors, t-ratios, and p-values. Therefore, all statistically significant coefficients, based on a two-tailed test at α =0.1, 0.05, and 0.01 levels, were noticeable. In addition, as P-values, statistics obtained for the independent variables indicate that the coefficients for gender, marital status, age and education of farmers, and farm size were statistically significant.

The findings of the binary logit regression reveal a strong relationship between the age of dairy farmers and the future security of dairy farming. Therefore, the age of the farmer is a crucial factor. The results indicate that farmers aged between 31 and 40 years are 3.19 times more likely to feel that dairy farming secures their future compared with younger farmers. Moreover, for farmers aged over 40 years, this number was 3.18 and positive. The positive sign on the age coefficient indicates that older and middle-aged farmers are 3.2 times more likely to feel that dairy farming secures their future than younger farmers.

Education is thought to play a critical role in farming, especially in the adoption of new technologies, training, and putting into practice the knowledge gained (Lien et al., 2017). According to the statistically significant coefficient, education has a negative effect on dairy farming's future security. The results of the binary logit regression indicate that farmers' education level is strongly related and a critical factor affecting dairy farms. The outcomes indicated that farmers at the high school level were 0.43 times less likely to continue dairy farming to secure their future, and

farmers at the bachelor level were 0.36 times less likely to feel that dairy farming secures their future than farmers who are illiterate or have a primary education degree. The negative impact of education level on the perceived future security of dairy farming might initially appear counterintuitive. However, this result can be attributed to the fact that individuals with higher education often have access to a broader range of career opportunities. These educated individuals may perceive dairy farming as less secure or less appealing compared to other professions that offer better job security, higher income, or improved working conditions. As a result, they are more likely to explore alternative career paths that align with their qualifications and offer greater long-term stability.

The estimation results of a statistically significant coefficient showed that male farmers were 0.47 times less likely to be involved in dairy farms and felt dairy farming secures their future. This is because women are more likely than men to take up dairy farming, given similar opportunities and incentives. However, the country has made only marginal progress in breaking down the cultural barrier that prevented women from owning cattle in their families (Manell and Roberson, 2015). However, the findings for the northern region of Iraq could be explained by the fact that livestock management roles are traditionally performed by women in Kurdish ethnic societies. In the research area, husbands are involved in dairy production in specific roles such as consulting veterinary services, sales, or purchasing animals.

The cultural and social norms related to marital status often emphasize the stability and support system provided by marriage, which is beneficial for farming operations. In many communities, marriage is seen as a partnership where both spouses contribute to the success of the household and its economic activities, including farming. Family members assist each other in making and implementing critical farming decisions (Ramos, 2021). The research indicates a statistical correlation between marital status and future dairy farming security. The model suggests an odds ratio of 2.08 (greater than one), which could mean that married farmers are 2.08 times more likely to continue dairy farming to secure their future, as compared to singles. In addition, some farmers in the village usually prefer to marry at least two wives to have many partners and/or children to help them in their farming or livestock activities.

Another significant socio-demographic characteristic was the household size of dairy farms. Household size is known to be a source of labor for farm and off-farm income-generating activities, sometimes in a village setting (Kuteesa and Waholi, 2018). Large families can provide more labor resources for dairy farming, which is labor-intensive. Family members can assist with various tasks such as feeding, milking, and caring for the animals, as well as maintaining the farm. This can reduce the need to hire external labor, lowering costs and increasing efficiency. The odds ratio of the coefficient indicates that farmers with large household sizes are 2.6 times more likely than farmers with small household sizes to engage in dairy farm activities.

Considering the statistically significant and positive coefficient of experience, farmers with high farming experience are more likely to continue dairy farming, compared with those with low farming experience. Experience acquired in dairy farming is a de facto reason why experienced farmers are more likely to continue dairy farming than less experienced farmers.

The availability of land is indispensable for dairy farming (Anugrah et al., 2021). Table 4 shows a significant and negative relationship between land size and respondents' satisfaction with dairy farming's future security. This implies that when respondents' landholding size increases, their perceived secure future in dairy farming decreases. The most likely reason for this seems to be that small-scale farms continue to use dairy cattle to survive. On the other hand, on plant production farms, there is a desire to earn more income from dairy farming in the future, where dairy farming is done more intensively in farms with less land. Therefore, enterprises with less land believe that animal husbandry will be more beneficial for their future than enterprises with more land. The most likely reason is that more land allows farmers to increase production, which generates more income that can be used to purchase farm inputs. As a result, farmers with relatively large farm sizes are more likely to use improved technologies. This also implies that respondents with larger farm sizes will seek newer ideas.

Bragg and Dalton (2004) investigated the factors influencing the decision to exit dairy farming. According to their results, the exit decision was significantly influenced by four variables; older producers, those with higher off-farm income, lower returns over variable costs, and greater farm income diversification were more likely to abandon dairy farming. Because exit decisions are influenced by factors other than milk prices, national or regional dairy programs should consider strategies other than price support to secure a stable dairy industry and a lower rate of dairy farm exits.

Effect of Perception on Farmers' Feelings of Safety Regarding the Future of Dairy Farming

The results also support the hypothesis that dairy farming to secure the future of farmers is not related only socioeconomic characteristics of producers but also to the satisfaction of producers with technology, government support, advisory service, veterinary service, marketing, and climate change. A binary logistic model was used to analyze the effect of

dimension factors on the dependent variable. Table 5 gives descriptive statistics of the variables used in the model. "Do you feel confident about the future of dairy farming." was used as a dependent variable.

Table 4. Effect of farmers characteristics on farmers' feelings of safety regarding the future of dairy farming
Çizelge 4. Çiftçilerin özelliklerinin süt çiftçiliğinin geleceğine ilişkin güvenlik duyguları üzerindeki etkisi

Variables	Coefficient	Standard error	P-value	Odds ratio
Constant	0.636	0.468	0.174	1.889
Age2	1.155***	0.341	0.001	3.186
Age3	1.159***	0.338	0.001	3.180
Edu2	-0.817**	0.327	0.042	0.432
Edu3	-0.840**	0.412	0.028	0.359
Gender	-0.752*	0.395	0.057	0.472
Marital status	0.778***	0.282	0.006	2.176
Experience	0.769*	0.471	0.100	2.158
HSize	0.974**	0.452	0.031	2.647
Land	-0.711**	0.339	0.036	0.491
-2 Log likelihood: 317.17; Chi-square (P- value): 54.31(0.000); Correctly predicted: 79.1%				

Note: *, ** and *** indicate significance levels at 10%, 5% and 1% respectively

Table 5. Descriptive statistics of the variables on some perceptions of farmers' feeling of safety regarding the future of dairy farming in the model
Çizelge 5. Modelde süt işletmelerinin geleceğine ilişkin çiftçilerin güvenlik hissine ilişkin bazı algılarla ilgili değişkenlerin tanımlayıcı istatistikleri

Perceptions	Definition	Definition of variables	Mean	S. D.
Structural characteristics of dairy farm	Relating to herd size, race, lactating, type of cow	1= Dissatisfy…. 5= Satisfy	1.65	0.256
Dairy cattle technology used by farmers	Directly correlated with the technology used by farmers	1= Dissatisfy…. 5= Satisfy	2.23	0.611
Government support and policies	Farmers' opinion about government support	1= Dissatisfy…. 5= Satisfy	1.88	0.256
Extension and advisory services	Information about dairy farming	1= Dissatisfy…. 5= Satisfy	2.29	0.611
Marketing	Selling products through different channels	1= Dissatisfy…. 5= Satisfy	1.89	0.305
Veterinary medicines	Veterinary medicine used by farmers	1= Dissatisfy…. 5=Satisfy	2.22	0.616
Climate change	Perceived effect of climate change on dairy farming	1= Decreasing… 5=Increasing	2.30	0.625

The model summary shows that the log-likelihood statistic is 313.99 and the chi-square test value is 57.49 with a p-value of 0.0001, indicating joint significance of all coefficient estimates. The Correctly predicted result indicates that the model predicted 70% of the observed ratings correctly, which is considered adequate (Table 6). Model results showed that coefficients for dairy farm structure, dairy cattle technology used by farmers, government support and policy, extension and advisory services, and marketing were significant. The coefficients for veterinary medicine and climate change were found to be insignificant.

The results of the binary logistic regression explained that the structural characteristics of dairy farms had a positive and statistically significant relationship with dairy farming future security, and farmers with a well-structured dairy farm were more likely to be satisfied (P=0.015). There was also a significant relationship between dairy farming future security and farmers

who were satisfied with their use of dairy cattle technology (P=0.001). The results also indicated that dairy farming and government support and policy were statistically significant and negatively correlated (P=0.001). Erdal et al. (2020) stated that the amount of support provided per animal is insufficient and this support item is the most important factor in increasing animal presence in Türkiye. Likewise, there was a negative and statistically significant relationship between extension and advisory services and dairy farming future security (P=0.044).

In our study, we observed significant coefficients reflecting the impact of various factors on dairy farming's future security. Notably, marketing exhibited a positive effect (P=0.046), indicating its role in enhancing the stability and prospects of dairy farming enterprises. Moreover, veterinary medicine had a negative and insignificant relationship with dairy farming's future security (P=0.381). This result may be since veterinarians are not allowed to access their farms during outbreaks in rural areas. Climate change affects the quantity and quality of feed differently, depending on location, livestock system, and species (Rojas-Downing et al., 2017). Interestingly, a majority of farmers expressed disagreement regarding the perception that their farms have encountered more variable or unusual weather patterns. Additionally, our analysis revealed a non-significant relationship between a farmer's belief in anthropogenic climate change and their observation of more variable weather on their farm (P=0.911). These findings underscore the complexity of climate-related perceptions and their correlation with on-farm experiences.

Table 6. Effect of perceptions on farmers' feelings of safety regarding the future of dairy farming
Çizelge 6. Algıların çiftçilerin süt işletmeciliğinin geleceğine ilişkin güvenlik duyguları üzerindeki etkisi

Variables	Coefficient	Standard error	P-value	Odds ratio
Constant	-3.044	1.993	0.127	0.048
Structural characteristics of dairy farm	1.900**	0.783	0.015	6.684
Dairy cattle technology used by farmers	2.878***	0.846	0.001	17.786
Government support and policies	-2.071***	0.599	0.001	0.126
Extension and advisory services	-0.320**	0.163	0.040	0.726
Marketing	0.419**	0.215	0.046	1.521
Veterinary medicines and food security	-0.429	0.490	0.381	0.651
Climate change	-0.094	0.209	0.654	0.911
2 Log likelihood: 313.99; Chi-square (P- value): 57.49 (0.000); Correctly predicted: 70.0%				

Note: *, ** and *** indicate significance levels at 10%, 5% and 1% respectively

CONCLUSION and RECOMMENDATION

The main objective of this study was to investigate the opinions of producers on the future of dairy farming in northern Iraq. The dairy sector in the region is largely characterized by small-scale, disorganized milk animal holders, as well as scattered, insufficient, and inappropriate animal feeding and health care.

The findings reveal that corruption in the region is a major concern negatively affecting the dairy sector. Farmers' confidence in dairy farming is influenced by age, education, gender, household size, and experience. Older farmers and those with larger households are more optimistic, while female and more educated farmers are less confident. It is recommended that government policies address these gaps, particularly by encouraging female participation and tackling cultural barriers.

Key recommendations include reducing corruption, introducing social protection programs, improving government support, and easing access to credit. Efforts should also focus on enhancing market competitiveness and addressing production challenges like the high cost of feed. Farmers need better access to training and education on modern dairy practices, which can be achieved through collaboration between public and private institutions.

Improving government support mechanisms and promoting technological adoption are vital for the sector's growth. Large-scale dairy farms should be encouraged for qualified applicants, and ongoing training on livestock management and disease control is essential. To enhance cross-border trade, the government should improve monitoring and control of imported dairy products. Future research should focus on the long-term impacts of advanced technologies, sustainable practices, and the role of government policies in ensuring the sector's sustainability and profitability.

Acknowledgment

This study was produced from the first author's PhD thesis "The Effect of Government Policy on Dairy Farms in the Northern Region of Iraq" accepted by Kahramanmaraş Sütçü İmam University, Graduate School of Natural and Applied Sciences.

Researchers' Contribution Rate Statement

The authors declare that they have contributed equally to the article.

Conflict of Interest Statement

The authors of the article declare that there is no conflict of interest between them.

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