

RURAL WOMEN'S PARTICIPATION IN DAIRY FARMING ACTIVITIES IN THRACE REGION OF TÜRKİYE

D. Özsayın

Çanakkale Onsekiz Mart University, Faculty of Agriculture, Department of Agricultural Economics, 17020, Çanakkale, Türkiye

Corresponding author's email: dozsayin@comu.edu.tr

ABSTRACT

This study aims to define the tendency towards participation in dairy farming activities of rural women who live in Thrace region of Türkiye. The collection of data from 380 rural women was accomplished using the proportional sampling method. Between December 2023 and July 2024, the survey for this study was carried out. The study data was examined with the use of descriptive statistics, participation index score and multiple regression analysis. Current study's findings revealed that women had an average age of 39.3, the average education level was 8.9 years, the average family size was 3.3 people, the average dairy farming experience was 7.3 years, the average annual household income was €2660.2 and the average volume of dairy cattle was 25.6 head. Rural women were found to be most engaged in dairy farming activities during the feeding and watering stage while the least in the purchasing, processing and marketing stage according to the participation index score results. The results of multiple regression analysis indicated a statistical significant association between rural women's participation level in dairy farming activities and socio-economic characteristics. The findings indicated that middle-aged, more educated and more experienced women were more inclined to engage in these activities than other women. Consequently, the study findings are expected to contribute the economy of the study area, to the decision makers and agricultural policy makers interested in this subject, and to further emphasize rural women's importance in dairy farming activities.

Keywords: Dairy farming, Index score, Multiple regression, Rural women, Thrace region.

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INTRODUCTION

Agriculture is one of the main sectors that may contribute to the common economic development all over the world. Especially, it makes significant contributions to the rural economy of developing countries like Türkiye. Livestock sector constitutes an important part of the agricultural sector. Dairy farming activity, which is an important branch of this sector, is of great importance in creating employment opportunities for people living in rural areas as well as providing basic food to people (Zahoor *et al.*, 2013; Banuree, 2019). In Türkiye, the agricultural sector has a great importance for female employment and those located in rural areas generally engage in crop and livestock activities. It is known that they make significant contributions to crop production and especially dairy farming (Kaur, 2015). The role of women in increasing family incomes and meeting food needs is more important, especially in small-scale dairy cattle farms. Women engaged in production activities are the most productive labor force in the economy of most developing countries, including Türkiye, in rural areas.

They constitute are the basic power source for the rural economy (Andaleeb *et al.*, 2017).

In Türkiye, dairy farming is one of the agricultural activities that provide significant added value to the Turkish economy. In 2023, the ratio of milk production value in Türkiye's total animal production value is 51% and the share of cow milk production amount in total milk production is 92.1% (TURKSTAT, 2023). Thrace Region (TR21 region) is one of the regions that contribute significantly to dairy farming of Türkiye and constitutes a large part of Türkiye territory on the European continent. It is Türkiye's gateway to Europe with this feature. It has a surface area (except lakes) of 18,665 km² and located between 40-42° North latitudes, and between 26-29° East longitudes (TDA, 2014). This region located in the far west of Türkiye and on the border of Bulgaria and Greece from the European Union countries consists of Edirne, Kırklareli and Tekirdağ provinces. There are highway crossings between Turkey and Europe in Thrace Region. In addition, a large part of the region's population migrated from the Balkan countries and settled in this region. These features have made TR21 region not only a physical but also a cultural

and social transition point. A large part of Thrace lands is used as agricultural land. In Edirne and Kırklareli provinces, the most important source in terms of revenue is agriculture and agriculture-based industry. In Tekirdağ province, which has intensive industrial production, a large part of the people living especially in the inner and western parts are engaged in agriculture-related work (TDA, 2014). In Turkey, TR21 region is responsible for around 2.6% of the total livestock population and 3.1% of the total milk production. The average milk yield of the provinces in the Thrace region is well above the average of other provinces in Türkiye. Tekirdağ, Kırklareli and Edirne provinces ranked 2nd, 5th and 7th, respectively, among all provinces in terms of average milk yield (TURKSTAT, 2023). In Türkiye, 17.2% of the total population employed by sectors (agriculture, industry and service) are employed in the agricultural sector and women constitute 41.4% of this employment. The agricultural sector employs 15.8% of the total population in the TR21 region of Türkiye and women constitute 33.3% of this employment (TURKSTAT, 2023). This shows that women's ratio employed in the agricultural sector in TR21 region is close to the average rate of Türkiye and this rate is important for this region.

Many studies in literature have been conducted on the employment of rural women and factors influencing women's participation in agricultural practices. In the study conducted by Begum and Yasmeen (2011) emphasized the obvious but invisible hand of women in agriculture. Soysal (2013) examined the current situation of women entrepreneurs operating in rural areas and the problems they face. In a study conducted in rural Lahore-Pakistan, the roles of women in agriculture were emphasized and the reasons for their participation in agricultural activities were determined (Ishaq and Memon, 2016). Pal and Haldar (2016) looked at how rural households participate and make decisions about different farming activities. In a study conducted by Erdoğan and Yaşar (2018), the factors that impact women's participation in the workforce were determined. The variables that affect female participation in agricultural activities were determined by Man *et al.* (2024). When the previous literature (national and international) on the subject is examined, it is seen that the focus of most of these studies is women's participation in crop production activities. These findings reveal the lack of studies in the literature evaluating women's participation in animal husbandry and especially dairy farming activities. Also, the number of studies on livestock and especially dairy farming is limited in the literature. Taj *et al.* (2012) stated that women's participation in livestock activities is high level. Ayvazoğlu Demir *et al.* (2017) explained that women dedicate approximately 5-6 hours daily to dairy farming

activities (milking, etc.). Several studies have demonstrated that female involvement in livestock activities is effective. Also, the effectiveness of their socio-economic and farm-related characteristics in their participation to these activities has been determined. The role of women in livestock farming and their participation in decisions taken in the farms was examined by Mulugeta and Amsalu (2014). In a study carried out in Erzurum, Erzincan, and Bayburt provinces, it was determined that women had played a significant role in agricultural production activities (Yavuz *et al.*, 2018). Awan *et al.* (2021) revealed the women's participation tendencies and constraints in different livestock management. In a study conducted in Natmawk township, located in the central dry zone area of Myanmar, it was determined that rural women participate in livestock management and household activities, and their decision-making behavior is influenced by their level of participation and decision-making behavior (Thu *et al.*, 2023). In previous studies, women's participation in plant and animal production stages was evaluated using mainly descriptive statistics and chi-square test and simple linear regression analysis for related variables. In the current study, descriptive statistics were used, but unlike other studies, in this study, the participation index score was used to determine the participation levels of female in dairy farming activities and multiple regression analysis was utilized to determine the variables that influence their participation levels. Furthermore, the previous studies have shown that there are few studies conducted in Türkiye on women's work related to dairy farming activities and the factors that affect them in doing these jobs. However, there is no study in the literature on the participation levels of rural women in these activities and the factors that affect their participation levels that makes this study unique. In this context, there is a need researching this topic in Türkiye. This region was chosen as a study area since the current zone has a strategic importance in agriculture, livestock and dairy farming, the ratio of women population participating in the agricultural sector is high and there is no study performed related to this subject. Considering the importance of TR21 region of Türkiye and the current gap in study area, the current study aims to define the socio-economic characteristics of rural women living in this region, their participation level in dairy farming activities and the variables that impact the participation level of women. The expectation is that this study will make a significant impact on the literature and fill the gap regarding this subject in the literature since there is no study on it in Türkiye. Moreover, the findings of this study are anticipated to the decision makers and agricultural policy makers interested in this subject and to further emphasize rural women's importance in these activities.

MATERIALS AND METHODS

Materials: The materials for the study were determined in two main stages. These are the selection of the study area and the preparation of the research questionnaires.

The study area: The study area included rural women participating in dairy farming activities on dairy farms in the provinces of Edirne, Kırklareli and Tekirdağ of Thrace Region (TR21). The current study is composed of

the data that were gathered from surveys with rural women who participated in livestock activities in dairy cattle farms in three provinces. Based on The data of Directorate of Provincial Agriculture and Forestry (MAF, 2023), the total number of dairy cattle farms were 8445 farms in Edirne province, 15528 farms in Kırklareli province and 9364 farms in Tekirdağ province (Figure 1).

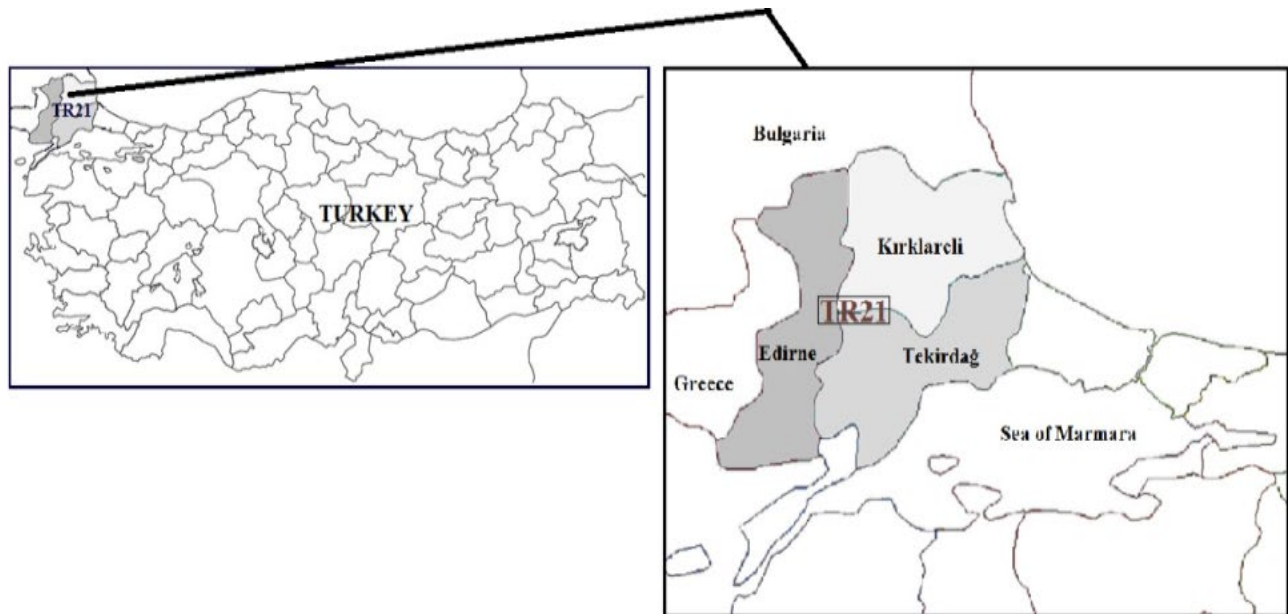


Figure 1. The study area

Study data: Previous studies on rural women's participation in livestock farming activities inspired the preparation of survey questions for the current study (Andaleeb *et al.*, 2017; Yavuz *et al.*, 2018). These questions consist of the information regarding rural women's socio-economic characteristics and the information to measure their participation level in dairy farming activities. The survey questions of this study consist of the information regarding rural women's socio-economic characteristics (age, education, experience, etc.) and the information to measure their participation level in some activities (milking, feeding, calf rearing, etc.).

Methods: The study was conducted in two main stages. In the first stage, the study data were collected and in the study data were analyzed in the second stage.

Data collection method: The study data was obtained by conducting a survey with rural women who were actively involved in dairy cattle activities in three provinces (Edirne, Kırklareli and Tekirdağ) in the TR21 region. The survey was conducted between December 2023 and July 2024. A technique that involved face-to-face questionnaires was employed to collect data from rural women. The survey was completed in July 2024. The

Directorate of Provincial Agriculture and Forestry's 2023 data was utilized to determine how many dairy cattle farms were in Edirne, Kırklareli and Tekirdağ provinces. In these three provinces, there are 33337 dairy cattle farms total (TURKSTAT, 2023; MAF, 2023). The proportional sampling method used in order to determine rural women who were interviewed on dairy cattle farms (Newbold, 1995). The sample volume was analyzed using a 95% confidence interval and a 5% margin of error. This method is expressed in the equation below (Eq.1). Using the equation given, the sample size was determined to be 380. The sample volume obtained was distributed proportionally between the women in Kırklareli, Tekirdağ and Edirne provinces. Then, 177 questionnaires were made with the women of Kırklareli province, 107 with the women of Tekirdağ province and 96 with the women of Edirne province.

$$n = \frac{N * p * q}{(N - 1) * \sigma^2 p + p * q}$$

$$= \frac{33337 * 0.5 * 0.5}{33337 - 1 * 0.0065 + 0.5 * 0.5} = 380 \quad (1)$$

$$\sigma^2 p = \left(\frac{r}{Z_{\alpha/2}}\right)^2 = \left(\frac{0.05}{1.96}\right)^2 = 0.00065$$

Where, the sampling size is n , N is the size of population (33337), the variance ratio is $\sigma^2 p$, the likelihood of the event occurring (0.5) is p , q is the probability of the examined situation not occurring ($1-p$), the critical value for the normal distribution at $\alpha/2$ (e.g. for $p=0.05$, $\alpha= 0.05$, the critical value is 1.96) is $Z_{\alpha/2}$ and the acceptable margin of error (0.05) is r .

Data analysis: In analyzing the available data, descriptive statistics, participation index score, and multiple regression analysis were utilized. Rural women’s socio-economic characteristics participating in dairy farming activities were determined using descriptive statistics. Four general aspects, which include 22 dairy farming activities, were taken into account to define female participation in these activities. They related to dairy farming practices were prepared inspired by few earlier studies (Kaur, 2015; Kabir *et al.*, 2019; Krishna *et al.*, 2020; Awan *et al.*, 2021; Khail and Ahmadzai, 2022). Their participation level in these activities was determined by their participation scores. As a result, female's participation levels were categorised into three groups: low (≤ 22), medium (23-42) and high (≥ 42). Three, two, one, and zero scores were evaluated using a four-point rating scale that assigns each point to 'mostly', 'sometimes', 'rarely', and 'not at all', respectively to define female's participation degree in these activities. The score for rural women who participated in dairy farming activities was between "0 ($0= 0 \times 22$) and 66 ($66= 3 \times 22$)" according to this scale. While 66 score indicates the highest level of participation by rural women in these activities, 0 score states no their participation in these activities. Additionally, there was a range of scores between "0 ($0= 0 \times 380$) to 1140 ($1140= 3 \times 380$)" for women’s participation in every aspect of these activities. Score of "0" indicates no their participation to any aspect of these activities while the score of "1140" shows the highest their participation in these activities. The participation index score (*PIS*) is a result of an activity against all respondents (Yasmin and Ikemoto, 2015; Krishna *et al.*, 2020). The extent of these activities participation of rural women was compared in terms of 4 general aspects, including 22 dairy farming activities. These aspects had their *PIS* (participation index score) and *PE* (extent of participation) determined using the following equations (Eq.2 and Eq.3):

$$PIS = (N_{no} \times 0) + (N_{ra} \times 1) + (N_{so} \times 2) + (N_{mo} \times 3) \quad (2)$$

$$PE = PS / PHPS \times 100 \quad (3)$$

Where, the participation index score is *PIS*, N_{no} is rural women’s numbers who participated not at all, rural women’s numbers who rarely participated is N_{ra} , N_{so} is rural women’s numbers who participated sometimes and N_{mo} is rural women’s numbers who participated

mostly. The participation extent is *PE*, the observed participation score is *PS* and the possible highest participation score is *PHPS*. In order to define the relationship between rural women's participation level in dairy farming activities and the socio-economic characteristics of them, the multiple regression analysis was used (Eq. 4 and Eq. 5). The model's explanation was based on their participation level in dairy farming activities and socio-economic characteristics of them were independent variables. This analysis is intended to demonstrate the level of influence of the independent variables on the explanatory variable and to predict the most suitable correlation between the independent variables and the explanatory variable (Gujarati, 1995).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon \quad (4)$$

$$Y = f(X_1, X_2, \dots, X_n) \quad (5)$$

Where, the dependent variable is Y , the constant term is β_0 , independent variables is X_n , regression coefficients are $\beta_1, \beta_2, \dots, \beta_n$ and the error term is ϵ . In this model, multicollinearity problem and collinearity diagnosis were measured since it is not desired to have a strong correlation between independent variables. If there is an issue with multicollinearity between the independent variables, high tolerance and the inflating factor values for low variance ($VIF < 10$) will indicate it (Hair *et al.*, 2006).

Socio-economic characteristics of rural women were determined by descriptive statistics (percentage, frequency, mean, standard deviation); a comparison between their participation levels in these activities and their socio-economic status was analyzed using multiple regression analysis. For this purpose, SPSS software version 23.0 was used (IBM Corp, 2015).

RESULTS

Rural women’s some characteristics: Table 1 describes rural women’s socio-economic characteristics who participated in these activities. According to these results, the majority of rural women were 49 years old and under, 52.4% of them were between 30 and 49 years old and the average age of them was 39.3. The majority of rural women (33.2%) were primary school graduates and 66.8% of them were a secondary or higher education graduates. The average household size of rural women was 3.3 people, the majority (40%) of them had 2 and less individuals in the family and only 24.7% of them had more than 5 individuals in the family. Most of rural women (40%) had between 5 and 9 years of dairy farming experience and the average dairy farming experience of them were 7.3 years. The majority of rural women had an annual household income level of between €1756 and €3354.6 and 25.5% of them had earning €3355 or more and the average annual household income was €2660.2. The majority of farms (40.5%) had 28 head

and above dairy cattle and the number of dairy cattle in farms was 25.6 head on average.

The participation level of rural women: In this study, 22 activities were described to detect rural women's participation level in dairy farming activities. These activities were scored by considering rural women's participation levels. Since rural women's scores participating in dairy farming activities are different, group in the low participation category had 22 scores or

less from these activities, group in the medium participation category had between 23 and 42 scores and group in the high participation category had 42 scores and above (Table 2). Thus, in the possible range of 0-66 scores, rural women's participation level in these activities between 17 and 53 scores. Rural women had a medium participation level in these activities as a majority. Also, 33.2% and 21.3% of them had high and low participation level, respectively.

Table 1. Rural women's socio-economic characteristics (n=380)^a

Characteristics	Frequency	Percentage	Mean	**SD
Age (year)				
≤29	89	23.4		
30-49	199	52.4	39.3	9.48
≥49	92	24.2		
Education level (year)				
Primary school graduates	126	33.2		
Secondary school graduates	100	26.3	8.9	3.56
High-school graduates	89	23.4		
University graduates	65	17.1		
Household size (person)				
≤2	152	40.0		
3-5	134	35.3	3.3	1.29
≥5	94	24.7		
Dairy farming experience (year)				
≤4	93	24.5		
5-9	152	40.0	7.3	2.84
≥9	135	35.5		
*Household income (€ year ⁻¹)				
≤€1755.7	119	31.3		
€1756-€3354.6	164	43.2	€2660.2	1315.1
≥€3355	97	25.5		
The number of dairy cattle (head)				
≤17	135	35.5		
18-28	91	24.0	25.6	14.74
≥28	154	40.5		

^aSource: Survey data; *1 Euro=34.51 TRY (Turkish lira) in December 2023-July 2024 (average)-Low income (≤€1755.7), Medium income (€1756-€3354.6), High income (≥€3355); **SD=Standart deviation

Table 2. Rural women's participation level in dairy farming activities^a

Level	Score	Frequency	Percentage	Mean	*SD	Min.	Max.
Low	≤22	81	21.3				
Medium	23-42	173	45.5	35.5	9.9	17	53
High	≥42	126	33.2				
Total		380	100.0				

^a Source: Survey data; *SD=Standard deviation

To determine how much rural women participate in 22 dairy farming activities under 4 general aspects, *PIS* and *PE* values were calculated. Table 3 shows that rural women's involvement in dairy farming activities ranged from 12.3% to 79.7%. In addition, it was showed that

milking (79.7%), care of pregnant livestock (79.6%) and giving feed (79.5%) ranked 1st, 2nd and 3rd among in these activities, respectively. Also, the activity with the lowest ratio in which the participation by them was the vaccination of the livestock (12.3%). Milking ranked 1st

among the extent of their participation in these activities. As the mean value (\bar{X}) in Table 3, the PIS values in this study were between 498 and 673.3. The score results indicated that rural women were more engaged in dairy farming activities in the feeding stage and watering stage

(\bar{X} =673.3), but less engaged in purchasing, processing and marketing stage (\bar{X} =498). Other activities participated by they were management of livestock (\bar{X} =645.6) and harvest (\bar{X} =641).

Table 3. Rural women's participation ratio in dairy farming activities

Activities	Mostly (3)	Sometimes (2)	Rarely (1)	Not at all (0)	PIS ¹	PE ² (%)	Rank (22-issues)	Rank (4 aspects)
A. Feeding and Watering								
1. Giving feed	275	37	7	61	906	79.5	3 rd	
2. Giving water	214	56	8	102	762	66.8	6 th	
3. Grazing	131	50	0	199	493	43.2	17 th	
4. Green fodder collection	195	50	11	124	696	61.1	10 th	
5. Harvesting fodder crops	158	65	10	147	614	53.9	15 th	
6. Carrying harvested fodder	150	40	1	189	531	46.6	16 th	
7. Storage of feed, green and hay fodder	216	25	13	126	711	62.4	8 th	
\bar{X} of A					673.3			1 st
B. Management of Livestock								
8. Cleaning of cattle-shed	196	105	12	67	810	71.1	4 th	
9. Cleaning and bathing of livestock	137	87	25	131	635	55.7	12 th	
10. Milking	281	33	0	66	909	79.7	1 st	
11. Collection of manure	177	86	39	78	703	61.7	9 th	
12. Maintaining of farm record	41	24	0	315	171	15.0	21 st	
\bar{X} of B					645.6			2 nd
C. Health Care								
13. Care of sick livestock	223	53	7	97	782	68.6	5 th	
14. Vaccination of livestock	33	15	11	321	140	12.3	22 nd	
15. Care of pregnant livestock	247	83	0	50	907	79.6	2 nd	
16. Care of newborn livestock	213	42	12	113	735	64.5	7 th	
\bar{X} of C					641			3 rd
D. Purchasing, Processing and Marketing								
17. Purchase of feed and fodder	114	54	13	199	463	40.6	18 th	
18. Purchase of livestock	58	33	0	289	240	21.1	20 th	
19. Making of milk products	146	79	21	134	617	54.1	14 th	
20. Marketing of milk	185	54	30	111	693	60.8	11 th	
21. Marketing of milk products	180	41	0	159	622	54.6	13 th	
22. Selling of livestock	81	50	10	239	353	30.9	19 th	
\bar{X} of D					498			4 th

¹PIS=participation index score; ²PE=participation extent

Factors that impact rural women's participation in dairy farming activities: To determine the factors that influence rural women's participation level in these activities, multiple regression analysis was used in the present study (Table 4). In this analysis, the partial correlation score calculated below 0.80 and their variance inflation factor (VIF) was found to be less than 10. According to these results, there was no multicollinearity problem. The model degree explaining the variance in the explanatory variable was $R^2=0.624$. R^2 value of 0.624 indicated that 62.4% of the variance rural women's

participation in these activities was determined by six independent variables. According to this analysis results, the regression equation looks like:

$$Y = 26.318 - 0.413X_1 + 0.666X_2 - 1.927X_3 + 1.701X_4 + 0.003X_5 + 0.231X_6 \quad (6)$$

The results obtained from the study showed that age, educational level, household size, dairy farming experience, household income and the number of dairy cattle have an impact on rural women's participation level in dairy farming activities. These findings suggest

that rural women's age and the participation in these activities are statistically significant ($P<0.05$) and negatively. Thus, rural women's participation rate in dairy farming activities decreases by 0.413 when their age increases by one year. Rural women's participation in these activities has a positive and statistically significant association ($P<0.05$) with their educational level. Thus, the level of participation in these activities increases by 0.666 when rural women increase their education level by one year. The presence of a negative and statistically significant association ($P<0.05$) between rural women's household size and their participation level in these activities has been found. Thus, when one person is added to the number of rural women's household individuals, their participation level in these activities decreases by 1.927. Rural women's dairy farming

experience and their participation level in these activities are found to be both positive and statistically significant ($P<0.05$). Thus, rural women's participation in these activities increases by 1.71 when they increase their dairy farming experience by one year. There is a statistically significant ($P<0.05$) and positive association between the annual household income and rural women's participation level in these activities. Thus, rural women's participation in these activities increases by 0.003 when their annual household income increases by one unit. A statistically significant and a positive relationship ($P<0.05$) has been found between the number of dairy cattle on farms and rural women's participation in these activities. Thus, when the number of dairy cattle in farm is increased by one unit, rural women's participation in dairy farming activities increases by 0.231.

Table 4. Factors affecting rural women's participation level in dairy farming activities

	Unstandardized coefficients		Standardized coefficients	<i>t</i>	<i>p</i> *	Correlations		Collinearity statistics	
	<i>B</i>	<i>SE</i>	Beta			Partial	Part	Tolerance	VIF
Constant	26.318	1.953		13.475	0.001				
Age	-0.413	0.036	-0.395	-11.498	0.002	-0.512	-0.362	0.843	1.187
Educational level	0.666	0.089	0.238	7.456	0.000	0.360	0.235	0.972	1.029
Household size	-1.927	0.246	-0.249	-7.821	0.002	-0.375	-0.246	0.976	1.024
Dairy farming experience	1.701	0.121	0.485	14.043	0.000	0.588	0.442	0.834	1.200
Household income	0.003	0.000	0.372	11.685	0.001	0.518	0.368	0.980	1.021
The number of dairy cattle	0.231	0.021	0.344	10.826	0.000	0.489	0.341	0.982	1.018

Dependent variable: Y (rural women's participation level in dairy farming activities); Independent variables: age (X_1), educational level (X_2), household size (X_3), dairy farming experience (X_4), household income (X_5), the number of dairy cattle (X_6); $R=0.794$; $R^2=0.630$; Adjusted $R^2=0.624$; The significance levels= $p<0.05$ and $p<0.001$; $F_{(6;373)}=105.69$, $p=0.000$ *; SE =Standard error; VIF =Variance inflating factor

DISCUSSION

In the results obtained from the study area on the socio-economic features of rural women, most women that participated in dairy farming activities were middle aged and above. In particular, the participation ratio of women aged 29 and under in dairy farming were lower than women in other age groups. These results indicated that the interest of the younger population (≤ 29 age group) in dairy farming is not at the desired level. Therefore, ensuring the participation of younger women in dairy farming activities is important for the sustainability of this activity. These results are in line with those of Khare and Singh (2019), Awan *et al.* (2021) and Thu *et al.* (2023) who reported that most women engaged in livestock activities were middle-aged. However, they are in contrast with findings of Mthi *et al.* (2018) who stated that 42.5% of women involved in dairy farming activities were 60 years old and above. The majority of rural women's had primary school education. In the studies conducted by Zahoor *et al.* (2013) and Kaur (2015), the ratios of rural women graduating from

primary school were found to be 19.8% and 26% respectively. Cherryl and Indira (2020) reported that most women (81.7%) were illiterate. These results showed that rural women's ratio graduating from primary school in the research area is higher than the results of previous studies. According to these results, it can be said that the basic reason behind this low education level in the study area is that men get more importance from rural people to acquire education while rural women face restrictions to attain this opportunity. Rural women's average household size was 3.3 persons. In Türkiye, this ratio is 3.2 persons on average (TURKSTAT, 2023).

The results indicated that rural women's average household size was higher than Türkiye's average and they had a nuclear family structure. These findings are in line with the results of Mthi *et al.* (2018). Contrary with these findings, Zahoor *et al.* (2013) reported that women in rural areas had relatively large families. Dairy farming activities were experienced by most rural women (40%) for between 5 and 9 years. These results are consistent with the results of Khail and Ahmadzai (2022), which reported that 41.7% of women had medium level (6-10

years) dairy farming experiences. However, they are inconsistent with those of Naz *et al.* (2018) and Awan *et al.* (2021) who reported that rural women's experience in livestock was between 11-15 years and more than 15 years, respectively. According to these results, it may be said that the majority of women in the research area have fewer experience compared to women in previous studies. Rural women were predominantly in the middle-income group. In a study performed in India, it was reported that 60.8% of families involved in dairy farming had low income (Rathod *et al.*, 2011). The findings in the study area showed that most of women were part of the middle-income group and their income was more elevated than women's income in India. Accordingly, women's participation in dairy farming activities can be influenced by an increase in their household income level. The majority of rural women (40.5%) that participated in dairy farming activities had 28 head and above dairy cattle. In a study revealed that 35.8% of women farmers have 1-2 animals (Cherryl and Indira 2020). Khail and Ahmadzai (2022) reported that the majority of households (62.8%) were the small-scale livestock holders, including one to three milking cows. The results indicate that women's participation in dairy farming activities will be affected by the number of animals on the farm.

Rural women's participation in dairy cattle activities was a medium and high level according to the results of determining their participation level in these activities. This result can be construed as a sign that rural women value participating in these activities. Considering that the majority of rural women participate in medium and high level in dairy farming activities, it is seen that their tendency to participate in these activities is high. Therefore, the support and incentives given to rural women can further increase their tendency to this activity. In this context, these supports are expected to have a positive impact on the participation ratio of rural women in dairy farming activities. These results are not congruent with the results of Khare and Singh (2019), which reported that the extent of rural women's participation in animal husbandry practices was in low level.

The results revealing the extent to which rural women participated in 22 dairy farming activities showed that their highest participation ratio of rural women is in milking. Kaur (2015) reported that most of the rural women were involved in the care of pregnant animals. In a study conducted by Ishaq and Memon (2016) explained that 95.7% of rural women in Pakistan were engaged in fodder cutting. Mthi *et al.* (2018) and Kabir *et al.* (2019) reported that the majority of women were involved in the care for sick animals. In a study conducted in district Bahawalpur in Punjab of Pakistan, it stated that 95% of rural women were engaged in shed cleaning (Awan *et al.*, 2021). Khail and Ahmadzai (2022) reported that the

participation of rural women was the highest in feeding animals. These study findings are consistent with those of previous studies. Because the activities in which rural women participated in the current study are similar to the activities in which women participated in previous studies. However, the priority order of activities that rural women participate in differs from the priority order of previous studies. The average values obtained from 22 dairy farming activities grouped into 4 groups showed that rural women were less involved in dairy farming activities during the purchasing, processing, and marketing stages. Based on these results, it can be said that women are successful in participating in dairy farming activities and contributing to the development of these activities. In addition, women are involved in dairy farming activities at a high level due to livestock activity being the sustainable source of income and the animal products being an essential food source. Also, they are conscious about the activities of dairy farming.

Age, educational level, household size, dairy farming experience, household income and the number of dairy cattle were the main factors that contributed to rural women's participation in these activities in this study. The age factor is especially important for activities that require more intense use of physical power. The concept of aging, which is related to this factor, is related to the decrease in various components of physical working capacity (Kathiriya *et al.*, 2013). The age factor is particularly important in terms of activities that use more physical strength. Accordingly, age is an influential factor in the participation of individuals in socio-economic activities. In this context, the age change of women will have an impact on their participation in dairy farming activities. The most important reason for this is that these activities require labor-intense and physical power. These characteristics related to the age factor and aging support the age findings obtained from the research field. These results suggests that women are less inclined to engage in dairy farming activities as their age increases. The current study's results are similar to those of Kathiriya *et al.* (2013) and Zahoor *et al.* (2013), which explained that women's age had a negative relationship with their participation in livestock activities. However, these results are not congruent with those of Andaleeb *et al.* (2017), which stated that age of women's had a positive and significant coefficient in livestock activities. Livestock activities are generally a laborintensive production type and participation in this activity requires physical labor (Kathiriya *et al.*, 2013). In the study area, most of the women are between the ages of 30-49. However, as rural women age, their biological inadequacies will increase, and therefore their participation in these activities, which require more physical strength and labor, will decrease. These findings show that middle-aged female are more likely to participate in these activities than rural women in other

age groups. Therefore, it is important to increase the participation level of women aged 49 and under in these activities. Because the participation ratio of young women in dairy farming activities is higher than that of older rural women. Education can play an effective role in facilitating rural women's labour force participation, and thus the increase in their education level can also positively affect their participation in agricultural activities (Cameron *et al.*, 2001). The study area's findings show that rural women's participation in dairy farming activities is affected by their education levels. These findings are inconsistent with results of Kathiriya *et al.* (2013) and Akhtar *et al.* (2020), who stated there was a negative association between the increase in rural women's education level and their participation in dairy farming activities. The results of previous studies showed that educated rural women preferred for occupation in the services sector (entrepreneurial, technical works etc.) instead of the livestock sector. Accordingly, an increase in rural women's education level may lead to them becoming more knowledgeable and active in their livestock activities. Additionally, this increase may be effective in their adoption of innovations related to livestock farming. As a result, this situation may increase the tendency of rural women to engage in livestock practices and production activities. Azid *et al.* (2001) stated that the social impact of living in a nucleus family on rural women's participation in work is significant. In context, the number of family members is effective in women's labor force participation (Er, 2013). For this reason, women's labor force participation tendencies in rural areas may differ depending on their household size. The results in the study area revealed that the growth in the number of rural women's household individuals negatively affects their participation in dairy farming activities. Rathod *et al.* (2011) and Akhtar *et al.* (2020) indicated that family type and size (joint and large families) were found to have a positive relationship with women's participation in livestock activities. However, these results are not congruent with those of the previous studies. Considering that rural women's household size in this study is 3.3 people on average and most women are in nuclear family structure, their home responsibilities and workload may increase slightly depending on how many members are in family. This can negatively affect women's participation levels in activities. Farmers' experience in agricultural activities can be defined as all the information obtained during the period in which they were interested in these activities (Nath and Athinuwat, 2021). These experiences can always give women farmers the chance to obtain the information they need and find solutions to agricultural issues. Thus, depending on women's dairy farming experience, their tendencies to participate in these activities can change. The findings in the study area showed that the increase in rural women's dairy farming experience affects their involvement in

dairy farming activities. The current study's findings are in line with those of Zahoor *et al.* (2013) and Andaleeb *et al.* (2017), which stated that women's experience will lead to an increase in their participation in livestock activities. As a result, it can be said that those who gain experience with livestock over time can make positive decisions on lives and involvement of them in these activities. In the study area, 40% of women have dairy farming experiences between 5 and 9 years. Therefore, it is crucial to boost their inclinations towards these activities. Because, their knowledge and skills will also increase as their experience in dairy farming increases. Accordingly, women who have experience in dairy farming will have a greater likelihood of planning production activities as rationally and using their knowledge more effectively. Household income is crucial for participating in agricultural activities, and female's involvement in livestock activities can be influenced by their household income level, whether it's high or low. The study determined that there is a positive relationship between annual household income and the level of participation of rural women in these activities. Although the coefficient obtained regarding income has a positive sign in the current study, the participation score ratio obtained was low. This result showed that the change in income will not significantly affect the participation rates of women in this activity. In this study, there is a positive association between annual household income and rural women's participation level in these activities. The present study's results are not in line with those of Rathod *et al.* (2011), which stated that women from low-income groups were found to participate more in livestock operations than women from high-income groups. Given that 68.7% of women (medium and high income) interested in these activities, the increase in income is expected to have a positive effect on their participation in dairy farming activities. High-income households have sufficient financial resources to employ more female labor force in dairy farming, which is labor intensive and necessitates a skilled female labor force. Therefore, as household income increases, women are more likely to work and innovate to improve their dairy farming activities and thus their participation in these activities is more likely to increase. Women's participation level in livestock activities is affected by changes in the number of dairy cattle (Afridi *et al.*, 2009). Because, the participation ratio of women in these activities may vary due to the increase or decrease in dairy cattle on farms. Rural women's participation in dairy farming activities was determined to be affected by the number of dairy cattle in this study. Rathod *et al.* (2011) and Kathiriya *et al.* (2013) indicated that the married women were held more responsible to take care of the livestock when compared to unmarried women. Accordingly, it has been shown that women generally take on roles such as helping and supporting the activities

of their husbands in the institution of marriage. Andaleeb *et al.* (2017) indicated that herd size has a positive on the contribution of rural people in livestock practices. The results of the current study are consistent with those of Rathod *et al.* (2011) and Andaleeb *et al.* (2017). Considering that 40.5% of farms in the research area have 28 head and more dairy cattle, the increase in the number of dairy cattle is anticipated to boost the participation of rural women in these activities. Because, works related to their care and management also increases when the number of livestock in farms is more. Accordingly, rural women's participation ratio in these activities will increase also.

Conclusions: The ratio of rural women's participation level in these activities is high since dairy farming provides them with a sustainable income source. Most women who participate in dairy farming activities are among middle-aged and above. In order to improve dairy farming activities, it is important to include rural women aged 29 and under in these activities. Since the majority of rural women (78.7%) were involved in dairy farming activities at average and low levels, rural women's participation ratio in dairy farming activities can be increased by increasing their tendency to both training programs regarding agricultural carried out by public extension organizations and agricultural credit supports. Women had a different participation rate in dairy farming activities in the study area. Their primary involvement was in activities like milking, care of pregnant livestock and giving feed. Age, educational level, household size, dairy farming experience, household income, and the number of dairy cattle factors have an impact on the participation levels of rural women in these activities. This situation shows that changes in rural women's socio-economic characteristics can significantly affect their tendency to participate in these activities. Based on the findings explained above, it can be concluded that it is important to increase the participation levels of rural women, especially young women, in dairy farming activities and that sufficient incentives and support should be provided to ensure this participation and to develop dairy farming activities.

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