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The Relationship Between Female Employment in Agriculture and Agricultural Sector in EU Countries

Avrupa Birliği Ülkelerinde Tarımda Kadın İstihdamı ile Tarım Sektörü Arasındaki İlişki

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Zeynep Çolak[1]

Abstract

Female employment rates tend to decrease both in the world and across regions.The technological change in agriculture and the transformation in agriculture have restricted the employment potential of female labor in agriculture in many parts of the world. Within the scope of the research, data belonging to the years of 1991-2018 from the whole 27 European Union (EU) countries were used. In the application part of the study, the relationships between female employment rate in agriculture, oil crops production index, cereals production index and fruit and vegetable production index were examined. In the analysis of the data, the correlational survey model, which examines the existing relationships and connections between the variables was selected. The results reveal that there is a one way panel casuality from the female employment rate in agriculture to the oil crops production index in the short term, but there is a long-term cointegration relationship between all variables. Besides it is found that the female employment rate in agriculture has a positive and significant effect on the oil crops production index.

Keywords: Women Employment, Agriculture Sector, Correlational Survey Model

Öz

Kadın istihdam oranları, dünyanın bir çok bölgesinde azalma eğilimindedir. Tarımdaki teknolojik değişim ve tarımdaki dönüşüm, dünyanın birçok yerinde tarımda kadın emeğinin istihdam potansiyelini sınırlamıştır. Araştırma kapsamında 27 Avrupa Birliği (AB) ülkesinin 1991-2018 yıllarına ait veriler kullanılmıştır. Çalışmanın uygulama bölümünde tarımda kadın istihdam oranı, yağ bitkileri üretim endeksi, tahıl üretim endeksi ile meyve ve sebze üretim endeksi arasındaki ilişkiler incelenmiştir. Verilerin analizinde değişkenler arasındaki mevcut ilişkileri ve bağlantıları inceleyen ilişkisel tarama modeli seçilmiştir. Sonuçlar, kısa vadede tarımda kadın istihdam oranından yağ bitkileri üretim endeksine tek yönlü bir panel nedensellik olduğunu, ancak tüm değişkenler arasında uzun vadeli bir eşbütünleşme ilişkisinin olduğunu ortaya koymaktadır. Ayrıca tarımda kadın istihdam oranının, yağ bitkileri üretim endeksi üzerinde olumlu ve anlamlı bir etkiye sahip olduğu tespit edilmiştir.

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Anahtar Kelimeler: Kadın İstihdamı, Tarım Sektörü, İlişkisel Tarama Modeli.

INTRODUCTION

The emphasis on agricultural activities with the settled life of human beings has preserved the importance of agricultural activities in food production until today. Agricultural products, which were produced by manpower in the past, are now produced by machines. This situation caused a decrease in the agricultural workforce. On the other hand, the labor force potential of women has always existed in the agricultural field from past to present.

The role of women in the agricultural sector is directly linked to the intensity of their active participation in the production of field crops, their age, social class, and the type of crop to be cultivated. Rural women work almost 11 to 14 hours a day. During the cultivation and harvesting of agricultural products, women faced an enormous burden. Particularly, their participation in wheat, cotton and vegetable production is higher than in other crop cultivation (Ishaq and Memon, 2016) .

Boserup has addressed different issues that are systematically related to the role of women in the economy. Boserup mentioned that the work done by women varies significantly between countries and regions. She stated that although there are many similar parties to women's jobs in the industrialized urban sector, different patterns emerge in connection with the specific characteristics of each area of work in village life. She emphasized that, contrary to the limited roles of women in Asia and Latin America, they have central roles in African agriculture (as cited in Serdaroğlu and Yavuz, 2010).

Today, in France, not only the labor that women spend in the production of products for domestic use, but also the production they make for the market falls under the category of unpaid labor. This applies to all sectors where the production unit (unlike the workshop or factory) is the family, namely in agriculture, trading and craftsmanship for the most part. This labor of women cannot be regarded as marginal in any way: In 1968, the spouses of French farmers spent an average of 4 hours a day on agricultural work (Delpy, 2008).

Since the 2000s, female employment rates in the agricultural sector tend to decrease both in the world and in the regions. The technological change in agriculture and the transformation in agriculture, especially starting from the 1980s, has restricted the employment potential of female labor in agriculture in many regions of the world. In this process, small-scale household production has decreased all over the world, and the economic liberalization markets applied have made large-scale commercial farming and the production of agricultural products for export advantageous. On the other hand, as a result of gender-based division of labor, women lost their jobs as labor-intensive and repetitive harvesting and weeding were mechanized (Toksöz, 2011). Thus, female labor, which is concentrated mainly in the family business in agriculture, was limited and the relevant issue was reflected in employment rates.

The female population in rural areas of the EU accounts for less than 50% of the total rural population. Economically, they represent 45% of the active population. Since their informal participation in the rural economy is not statistically recognized, their importance in the rural economy is actually even greater than these rates. Although there was an overall increase in female employment rates in the EU, including rural areas, between 2013 and 2017, significant differences remain between EU countries (Eurostat, 2017).

As a result of the transformation of societies from agricultural society to industrial society and the change caused by migration, women started to take part in the labor market more. This situation has started to change over time and has led to changes in the way and conditions of women work. The sectoral distribution of this situation had an effect on the development levels of the countries. With the effect of development, the labor force has shifted from agriculture to non-agricultural sectors. While female employment is clustered in the agricultural sector in developing countries, it is observed that women are mostly employed in the service sector in developed countries (Berber and Eser, 2008).

In the study, an analysis of women's employment in the production of some agricultural products for the whole 27 European Union member countries will be made. In the second part, studies in this field will be given. In the third and fourth parts, analysis and result will be made for women's employment in oil crops, cereals, fruit and vegetable production for the whole 27 member countries of the European Union. In the last part, the conclusion of analysis is given.

1. Conceptual Review

Looking at the average of 28 EU countries, it is seen that the female employment rate increased from 56% to 63.3% from 2005 to 2018. The employment rate of women in all EU countries except Greece showed an increasing trend from 2005 to 2018. Looking at the 2018 EU average (63.3%) of women's employment rates, women's employment rates are above the EU average in all countries except France and Belgium. The countries with the highest female employment rate are respectively; Sweden 76%, Netherlands 72.8%, Denmark 72.6%, Germany 72.1% and Finland 70.6%. The countries with the lowest employment rates of women in the EU are respectively; Greece 45.3%, Italy 49.5%, Spain 56.9%, Portugal 66.9%.Looking at the other EU countries, the countries where the employment rate of women is above the EU average are Lithuania (71.6%), Estonia (71.4%), Latvia (70.1%), Czechia (67.6%), Slovenia (70.1%). 67.5% and Bulgaria (63.9%), while the countries with the lowest rates are Croatia (55.9%) and Romania (56.2%) (Eurostat, 2019).

It is seen that the sector with the highest female employment in the EU is the service sector (87.465.1). The service sector is followed by industry (10.363.7), agriculture (2.771.1) and construction (1.521.3). Unlike the EU ranking, the least female employment in Slovakia is in the agriculture sector instead of the construction sector. In Greece, the ranking is in the service, agriculture, manufacturing and construction sectors. It is noteworthy that the agriculture sector is the second sector in which women are employed the most, after the service sector (Öz ve Peri, 2019).

Among the EU countries, the countries with the largest agricultural land area are respectively; France, Spain, Germany, Poland, Romania and Italy. In countries such as Malta, Southern Cyprus and Luxembourg, the size of agricultural land area is quite low. The countries with the most agrobusiness are Romania, Poland, Italy and Spain.

Luxembourg, Malta and Estonia are the countries with the lowest number of agrobusiness (Worldbank, 2020).

Most of the research over the decades has been about women's roles in agriculture (Boserup, 2007; Björkhaug and Blekesaune, 2008; Weindl, Staudengarten and Herausgeber 2010; Rheinischer LandFrauenverband ev and Westfälisch-Lippischer LandFrauenverband; Rossier, 2014; Rossier and Ressig, 2014; Relf 2014). The contribution of women to production in agriculture is important, but it is impossible to empirically verify the share of what women produce. Women always work more in unpaid, seasonal and part-time jobs, and women are often paid less than men for the same job. In general, women are more likely to work in the informal economy than men in member states of the European Union. The rate of unregistered work in female employment in agriculture is highest in Romania, Slovenia, Lithuania and Croatia, and lowest in Sweden, Malta, Czech Republic and Germany (Franić and Kovačićek, 2019). The countries where female employment is important in the European Union countries are Romania, Slovenia, Austria, Poland, Greece, Portugal and Lithuania. In each of these countries, the female employment rate is more than 40% (Eurostat, 2020).

Women have an important role in improving the quality of life in agriculture and rural areas. However, women's contributions remain hidden for some social reasons and gender discrimination. Most government programs fail to bring women in the agricultural sector together and these failures hamper the potential benefits of programs related to food production, increased household income, nutrition, literacy, and poverty reduction. Access to educational opportunities for rural women will increase their performance and change their status in society. In addition, women will be more actively involved in areas such as agricultural extension, development of agricultural systems, land reform and rural welfare (Prakash, 2003).

The share of women in the agricultural workforce in Europe fell sharply to 7% between 1992 and 2010. However, there are also important differences between Eastern and Southern Europe. While the share of women in agricultural workforce decreased by 10% in Eastern Europe, there was a 3% increase in Southern Europe. This decrease in the share of women participating in the agricultural workforce corresponds to a general decrease in female employment in agriculture in Central and Eastern Europe (ILO, 2012).

According to Eurostat (2013) data, women make up 21% of the agricultural workforce in Europe, mainly in Romania, Poland and Spain. However, this rate represents only 4% of the total number of working women. Women are the most important factor in the development of rural and national economies. They constitute 43% of the world agricultural workforce, which has risen to 70% in some countries. In most EU member states, employment in agriculture has been declining in the last 50 years, and the aging of the current workforce poses an additional challenge. In the member states of the European Union, 58.2% of the total workforce is men. As the share of female employment in agriculture is about 41%, the 'visible' contribution of women to the agricultural workforce is less pronounced than that of men (EIGE, 2016).

Studies show that in all countries in Europe, rural women have fewer employment opportunities than both rural men and urban women (Bock, 2004). In the last decade, the share of female employment in the predominantly rural areas of the EU has remained around 45%. As a result of the analysis of the situation in EU Member States; while the countries with the highest rates of registered employment in agriculture in the 20-64 age

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group are Sweden, Germany, Austria and the United Kingdom (70-80%), this rate is around 50% or less in Italy, Greece and Croatia (Eurostat, 2017).

Women, who make up half of the world's population, are the leading actors of agricultural production all over the world, especially in developing countries. Considering the studies, the rate of female employment in the agricultural sector in the world is higher in underdeveloped or developing countries such as South and Southeast Asia, the Middle East and Africa. However, in developed countries, this rate is less due to mechanization and the development of technology.

In recent years, one of the most studied topics in the literature is women's studies. Inequality between the genders is particularly interesting. When studies on the situation of women working in agriculture are examined, most of the studies have been about underdeveloped or developing countries. However, especially in developed countries such as the European Union's countries, there is no study on which crops women are employed more in agriculture. Women's employment in agriculture, which has declined sharply in Europe, is the subject of little recent scientific studies, and no study specifically focuses on specific agricultural products. The aim of the study is to investigate in which products women are employed in agriculture in the European Union's countries, which are among the developed countries.

2. Method

Female employment rates tend to decrease both in the world and across regions. The technological change in agriculture and the transformation in agriculture have restricted the employment potential of female labor in agriculture in many parts of the world. In line with these developments, the study aimed to examine female employment in the production of agricultural products for the period 1991-2018 for the whole 27 European Union member countries. In this study, in which the effects of the women employment on the agricultural products in European Union countries were examined, correlational survey model was used. Correlational survey model studies are conducted to determine the relationships between two or more variables and to obtain clues about cause and effect (Büyüköztürk et al., 2018). Because the goal of this study is to see the cause and effect relationships between female employment rate and some various agricultural productions (oil crops production, cereals production and fruit and vegetable production), correlational survey model was chosen.

Within the scope of the research, the data of the whole 27 EU member countries for the years 1991-2018 were analyzed. In addition, the study is limited to the variables of female employment rate in agriculture, oil crops production index, cereals production index and fruit and vegetable production index of the EU member countries.

The equations created within the scope of the research are presented below. In Equation 3.1, the effect of female employment rate in agriculture on the oil crops production index; in equation 3.2, the effect of female employment rate in agriculture on the cereals production index and in equation 3.3, the effect of female employment rate in agriculture on the fruit and vegetable production index are examined.

$$\Delta oilcrops\_prdc\_indext = \beta 0 + \beta 1 \Delta female\_emply\_ratet + \varepsilon\_t \quad (3.1)$$

$$\Delta cereals\_prdc\_indext = \beta 0 + \beta 1 \Delta female\_emply\_ratet + \varepsilon\_t \quad (3.2)$$

$$\Delta fruitvegtbl\_prdc\_indext = \beta 0 + \beta 1 \Delta female\_emply\_ratet + \varepsilon\_t \quad (3.3)$$

"Δ" symbol in the name of the variable indicates that the variable gets stationary at first level. So, as seen in the equations, all the variables get stationary at first level in the study.

Within the scope of the research, the data of the female employment rate in agriculture variable was from the World Bank official web site "www.worldbank.org"; and the data of the the oil crops production index, cereals production index and the fruit and vegetable production index variables were obtained from Food and Agricultural Organization of the United Nations official web site "www.fao.org".

The agricultural production indexes are prepared by the Food and Agriculture Organization of the United Nations (FAO). The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 2004-2006. They are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. The resulting aggregate represents, therefore, disposable production for any use except as seed and feed. All the indices at the country, regional and world levels are calculated by the Laspeyres formula. Production quantities of each commodity are weighted by 2004-2006 average international commodity prices and summed for each year. To obtain the index, the aggregate for a given year is divided by the average aggregate for the base period 2004-2006 (www.fao.org, Date of access: October, 2020). The female employment rate is calculated by dividing the number of females by the number of males employed in agricultural sector (www.worldbank.org, Date of access: October, 2020).

Excel 2013, SPSS 22, Stata 15 and Eviews 10 programs were used to analyze the data. First, the means for the data belonging to whole 27 EU member countries were calculated and the graphs of these data were created. In order to make the data stationary, differentiation processes were applied. Since the cross-section dependence was determined in all the variables as a result of the cross-section dependence test, the stationarities of the data were tested with CADF (Cross Sectionally Augmented Dickey Fuller) second generation unit root test. Delta test was used to check the homogeneity of slope coefficients. Westerlund panel cointegration test was conducted to determine if there are cointegrations between the variables. Dumitrescu Hurlin panel causality analysis was made to determine short-term relationships between variables. And finally to determine the effects of the female employment rate in agriculture on the oil crops production index, the cereals production index and the fruit and vegetable production index, Augmented Mean Group (AMG) analysis was applied.

3. Findings

3.1. Research Data

Descriptive statistical information about the variables in the study is presented in this section.

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The means for all 4 variables (Female employment rate in agriculture, oil crops production index, cereals production index, fruit and vegetable production index) of the whole 27 EU member countries between the years of 1991-2018 are as in Table 1.

Table 1. Means For All 4 Research Variables of Whole 27 EU Member Countries Between the Years of 1991-2018

Country	FER (%)	OPI	CPI	FVPI
Austria	5.70	89.07	93.23	124.86
Belgium	1.89	97.78	81.00	96.84
Bulgaria	10.97	74.96	52.86	164.91
Croatia	15.17	93.50	68.13	79.38
Cyprus	5.99	234.66	116.66	152.90
Czech Republic	4.59	84.72	71.67	137.50
Germany	2.29	89.50	81.72	98.34
Denmark	3.33	92.16	69.66	97.45
Spain	6.10	92.12	92.66	87.53
Estonia	7.30	61.55	54.04	113.32
Finland	5.72	92.59	124.98	89.28
France	3.83	95.77	87.35	106.35
Greece	15.37	113.01	85.92	107.18
Hungary	6.27	83.12	61.70	109.56
Ireland	7.74	85.64	64.48	92.95
Italy	4.92	104.73	127.34	105.20
Lithuania	14.85	58.83	53.38	111.73
Luxembourg	2.04	100.37	104.37	123.95
Latvia	12.92	54.44	50.75	125.33
Malta	1.86	92.00	31.94	96.24
Netherlands	3.18	92.14	128.74	72.45

Norway	3.68	91.44	103.32	91.25
Poland	17.06	90.79	58.59	83.75
Portugal	11.10	106.77	70.55	90.61
Romania	33.29	79.44	58.34	110.79
Slovak Republic	5.88	76.87	68.78	220.72
Slovenia	9.30	84.21	65.12	102.88
Sweden	2.60	86.16	73.55	79.99

Note: FER: Female employment rate in agriculture; OPI: Oil crops production index; CPI: Cereals production index; FVPI: Fruit and vegetable production index.

The highest mean of female employment rate in agriculture is Romania's with 33.29%; and Romania is far ahead of other EU member countries; the highest mean of oil crops production index belongs to Cyprus with 234.66. Cyprus is clearly ahead of other EU member countries with its oil crops production index. Netherlands has the highest mean for cereals production index (128.74) but not with a big difference and Slovak Republic has the highest mean for fruit and vegetable production index (220.72) and there seems to be have a big difference when compared to other EU member countries'.

3.2. Cross Section Dependency, Unit Root and Delta Tests Results

In terms of the reliability of the analysis, firstly, the cross-section dependency of the data, the homogeneity/heterogeneity of the slope coefficients and if the data's having unit roots were examined (Güriş et al., 2017). In order to determine which test will be used to control whether the data are stationary or not, firstly the cross-section dependency states of the variables were examined. Cross section dependency results are presented in Table 2.

Table 2. Cross Section Dependency Test Results

Variables	Pesaran CDLM Tests	
	Test Statistic	Probability (p)
female_emply_rate	82.06487	.0000
oilcrops_prdc_index	30.58195	.0000
cereals_prdc_index	21.21292	.0000
fruitvegtbl_prdc_index	2.307419	.0210

Since the cross-sectional dimension (N = 27 countries) is larger than the time dimension (T = 18 years) in the study, the Pesaran CDLM tests were applied (Pesaran, 2004). The results show that all 4 variables have cross section dependency (For "female_emply_rate", Test Statistic= 82.06487, p= .0000 < 0.05; "oilcrops_prdc_index", Test Statistic= 30.58195, p= .0000 < 0.05; "cereals_prdc_index", Test Statistic= 21.21292, p= .0000 < 0.05; "fruitvegtbl_prdc_index", Test Statistic= 2.307419, p= .0210 < 0.05).

Since the variables in the study have cross-section dependence, the stationary / non-stationary conditions of the variables were checked with the CADF second generation unit root test. The results are as in Table 3.

Table 3. CADF Unit Root Test Results

Variable		CADF					
		t-bar	cv 10	cv 5	cv 1	Z[t-bar]	p
female_emply_rate		-1.768	-2.070	-2.150	-2.300	.091	.464
Δfemale_emply_rate		-3.168	-2.070	-2.150	-2.300	-7.380	.000
oilcrops_prdc_index		-2.078	-2.070	-2.150	-2.300	-.732	.232
Δoilcrops_prdc_index		-3.011	-2.070	-2.150	-2.300	-2.786	.003
cereals_prdc_index		-2.353	-2.070	-2.150	-2.300	-1.613	.095
Δcereals_prdc_index		-7.832	-2.070	-2.150	-2.300	-16.804	.000
fruitvegtbl_prdc_index		-1.543	-2.070	-2.150	-2.300	.714	.652
Δfruitvegtbl_prdc_index		-4.246	-2.070	-2.150	-2.300	-5.234	.000

All 4 variables get stationary when first level difference process is applied to them (For "Δfemale_emply_rate", t= -3.168, p= .000 < 0.05; for "Δoilcrops_prdc_index", t= -3.011, p= .003 < 0.05; for "Δcereals_prdc_index", t= -7.832, p=.000 < 0.05; for "Δfruitvegtbl_prdc_index", t= -4.246, p= .000 < 0.05). The slope coefficients' homogeneity/heterogeneity was carried out by delta test.

Table 4. Delta Test Results

Delta Tilde		Delta Tilde Adj.	
Test Statistics	Probability (p)	Test Statistics	Probability (p)
1.983	.045	-2.368	.031

As a result of the Delta test, both the Delta Tilde (Test statistics = 1.983, p= .045< 0.05) and the adjusted Delta Tilde test statistics (Test statistics = -2.368, p= .031< 0.05) are lower than .05 showing that the slope coefficients are heterogeneous.

3.3. Westerlund Panel Cointegration Analysis

It was decided to use Westerlund panel cointegration analysis to determine the cointegration relationship between since all the variables have cross-section dependence and become stationary at the first level difference. The results are as in Table 5.

Table 5. Westerlund Panel Cointegration Analysis Results

Equation 3.1. (Female Employment * OilCrops Production Index)			
Statistic	Value	Z Value	Probability (p)
Gt	-5.870	-23.871	.000
Ga	-34.820	-26.851	.000
Pt	-42.606	-35.769	.000
Pa	-36.549	-37.223	.000
Equation 3.2. (Female Employment * Cereals Production Index)			
Statistic	Value	Z Value	Probability (p)
Gt	-8.632	-34.219	.000
Ga	-32.255	-25.811	.000
Pt	-43.713	-37.267	.000
Pa	-34.861	-35.786	.000
Equation 3.3. (Female Employment * Fruit and Vegetable Production Index)			
Statistic	Value	Z Value	Probability (p)
Gt	-7.324	-31.482	.000
Ga	-32.524	-23.774	.000
Pt	-40.436	-33.246	.000
Pa	-33.620	-33.756	.000

Interpretation of the results is done in two different ways depending on whether the slope coefficients are homogeneous or heterogeneous. When the slope coefficients are

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homogeneous, the Pt and Pa panel test statistics of the cross section units are taken as basis, while when the slope coefficients are heterogeneous, the Gt and Ga test statistics are taken as basis (Aytun and Akın, 2014). Since it was found that the slope coefficients were heterogeneous as a result of the Delta test before, the interpretation was made on the statistical values of the Gt and Ga test statistics.

The results indicate that there is a cointegration between the variables in all three equations. In other words; it is observed that there is a cointegration between the female employment rate in agriculture and the oil crops production index (Equation 3.1; Gt = -5.870, p= .000 < 0.05; Ga = -34.820, p= .000 < 0.05); there is a cointegration between the female employment rate in agriculture and the cereals production index (Equation 3.2; Gt = -8.632, p= .000 < 0.05; Ga = -32.255, p= .000 < 0.05) and there is a cointegration between the female employment rate in agriculture and the fruit and vegetable production index (Equation 3.3; Gt = -7.324, p= .000 < 0.05; Ga = -32.524, p= .000 < 0.05).

3.4. Dumitrescu Hurlin Panel Casualty Analysis

Within the scope of the research, Dumitrescu Hurlin panel causality analysis was used to determine the causality relationships between the female employment rate in agriculture, the oil crops production index, the cereals production index and the fruit and vegetable production index. Because Dumitrescu Hurlin panel casualty test is usable for both cross section dependency situations and heterogeneous panels, it was selected as the panel casuality test.

Table 6. Dumitrescu Hurlin Panel Casualty Test Results

Casualty Direction	W Stat..	Z Bar Stat.	P
Δfemale_emply_rate →Δoilcrops_prdc_index	3.5248	7.3584	.0000
Δoilcrops_prdc_index →Δfemale_emply_rate	.8621	.4971	.1704
Δfemale_emply_rate →Δcereals_prdc_index	.7056	-1.0614	.2314
Δcereals_prdc_index →Δfemale_emply_rate	.8317	-.2391	.2116
Δfemale_emply_rate →Δfruitvegtbl_prdc_index	.5744	-1.5237	.4128
Δfruitvegtbl_prdc_index →Δfemale_emply_rate	.8621	-.3584	.1721

As can be seen in Table 6, with the exception of one way panel casuality from the female employment rate in agriculture to the oil crops production index (p= .0000 < .05); no panel causality relationship was detected between the variables (For Δoilcrops_prdc_index →Δfemale_emply_rate, p= .1704 > .05; Δfemale_emply_rate →Δcereals_prdc_index, p= .2314 > .05; Δcereals_prdc_index →Δfemale_emply_rate, p= .2116> .05; Δfemale_emply_rate →Δfruitvegtbl_prdc_index p = .4128 > .05; Δfruitvegtbl_prdc_index →Δfemale_emply_rate, p = .1721 > .05).

3.5. AMG (Augmented Mean Group) Tests

The parameter coefficients of the cointegrated relationship were estimated after determining that the series were cointegrated in the long run with Westerlund panel cointegration test. Since AMG test is usable for cross section dependency situations, it was selected to determine the coefficents. The results for the three equations were presented in Table 7.

Table 7. AMG Test Results

The Dependent Variable	The Coefficient of The Independent Variable (Δfemale_emply_rate)	Std. Error	P
Δoilcrops_prdc_index	4.041464	2.621244	.023
Δcereals_prdc_index	-.3281385	.8812365	.710
Δfruitvegtbl_prdc_index	1.638901	1.503831	.276

According to the results obtained from the AMG tests, the coefficient of the female employment rate in agriculture is positive and statistically significant for the first equation (β= 4.041464, p= .023 < 0.05). That means the female employment rate in agriculture affects the oil crops production index positively. 1% percent increase in the the female employment rate in agriculture causes 4.04 unit increase in the oil crops production index. It's seen that the female employment rate in agriculture doesn't have a significant effect on cereals production index (β= -.3281385, p= .710 > 0.05) and fruit and vegetable production index (β= 1.638901, p= .276 > 0.05).

4. Conclusion

The economic efficiency of rural women and the economic efficiency of urban women are structurally very different from each other. While women working in rural areas are not paid workers, they are women who work in the family business and do not have any social security, while very few of the women working in the cities are employed as agricultural workers and are paid for their labor (Arat,1986). Women make significant contributions to the agricultural and rural economies of all regions of the world. However, the precise contribution is often difficult to assess, both in terms of magnitude and nature. The contribution of women in agriculture varies highly between countries and regions.

The labor force participation rate of women in agriculture is higher than the labor force participation rate worldwide. The majority of women employed in agriculture in rural

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areas work in low-status, labor-intensive jobs. While the importance of agricultural activities in labor force employment is gradually decreasing, the place of women in agriculture and their participation in economic activities have gained a different dimension. The level of women's participation in production in the agricultural sector varies according to the land and livestock owned by the family, income and product pattern. However, as the level of mechanization in agriculture increases, women break away from agricultural production and their working potential turns to housewives. (Yıldırak et al., 2002). In families with little land, women participate in all stages of plant and animal production, especially seasonal labor (Gülçubuk, 1999).

In the application part of the research, the relationships between female employment rate in agriculture, crop production index, cereal production index and fruit and vegetable production index were examined. Data from 27 European Union (EU) for the years 1991-2018 were used within the scope of the research. In the analysis of the data, the correlational research model examining the existing relationships and connections between variables was chosen.The results reveal that there is a one way panel casuality from the female employment rate in agriculture to the oil crops production index in the short term, but there is a long-term cointegration relationship between all variables. Besides it is found that the female employment rate in agriculture has a positive and significant effect on the oil crops production index. Employing women in the production of oil crops production, which has significant relationships in particular, can increase production efficiency and it is seen that female employment is effective in the production of agricultural products in the long term. The highest mean of female employment rate in agriculture is Romania’s with 33.29%; and Romania is far ahead of other EU member countries; the highest mean of oil crops production index belongs to Cyprus with 234.66. Cyprus is clearly ahead of other EU member countries with its oil crops production index. Netherlands has the highest mean for cereals production index (128.74) but not with a big difference and Slovak Republic has the highest mean for fruit and vegetable production index (220.72) and there seems to be have a big difference when compared to other EU member countries’.

This study, which will serve as a basis for future studies, can be developed to make a comparison for less developed countries, developing countries and developed countries.

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