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Impact of the European Green Deal (EDG) on the Agricultural Carbon (CO_2) Emission in Turkey

Sanjay Taneja[1], Ercan Ozen[2*]

[1] Department of Finance and Banking, Faculty of Applied Sciences, University of Uşak, Usak 64200, Turkey
[2] Department of Finance and Banking Eylul Campus, Faculty of Applied Sciences, University of Uşak, Usak 64200, Turkey

Corresponding Author Email: ercan.ozen@usak.edu.tr

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ABSTRACT

The European Union (EU) hopes to motivate a sustainable green transition in response to widespread concern that the earth is heading toward environmental calamities due to climate-change issues. The present study focused on analyzing the impact of the EGD on Agricultural carbon emissions in Turkey. European Union and Turkey have strong trade relations; Turkey exports a significant portion of its exports to the European Union. This fact made it compulsory for Turkey to follow the regulations implemented in the EU regarding trade. In reaction to the European Union's EGD, Turkey formulated EGD Action Plan, this plan laid down the roadmap for Turkey to follow the regulations under the EU's EGD. Agriculture carbon emissions in Turkey and EGD are taken as the variables for the study. In the present report, an attempt has been made to analyze impact of the EGD on agriculture carbon emissions. In study, we consider agriculture CO_2 emissions as the dependent-variable and the EGD as the independent-variable. Secondary data from the various published sources have been collected and analyzed with statistical tools, and findings are drawn from them. Statistical tools like Unit Root Tests, the Ordinary Least Square Test, and Auto regressive distributed lag model, are used to interpret the impact. The result of our study shows that EGD significantly impacts agriculture carbon emissions.

1. INTRODUCTION

The consequences of environment transformation and global warming are no longer hidden [1]. Every type of life on earth is in danger due to the planet's rising temperature [2]. Throughout history, there have been natural changes to the climate [3]. However, since the start of the 19th century, human-caused greenhouse gas emissions have accelerated this trend. Extreme weather, extinction of species, and food shortages are only a few of the severe challenges posed by climate change to the expansion and survival of humanity [4]. Industrialization and rapid economic growth have made climate change more catastrophic [5]. The earth's environment, including its ecology, is experiencing extreme stress and disaster [6]. According to the UN Environment Programme, global temperatures could rise by more than 3°C if we keep up our industrial habits [7]. Such a rise in temperature has the potential to ruin our economies, disrupt our industries, and drive more people into poverty [8]. Various methods of evaluating environmental issues have been developed due to growing concern for them worldwide and, more recently, among businesses and organizations [9]. As a result, nations have been evaluated and ranked based on how well they perform in terms of the environment. The top nations are receiving the "Champion of the Earth Award" for the environmental policies they have put in place [10]. The "Global Green Economy Index" and many other assessment indices has been applied to rank the world economies [11]. The "Golden Peacock Environment Management Award" is given for excellence in corporate governance [12]. One of the most significant concern developing and developed nations are currently dealing with is climate change [13]. Most developing nations are in a phase of transition for their economic and social growth, making them extremely sensitive to climate change and reliant on international climate finance to support their climate protection and mitigation programs [14].

The European Union (EU) hopes to motivate a sustainable green transition in response to widespread concern that the earth is heading toward environmental calamities due to climate change issues [15]. By 2050, the European Union (EU) aspires to achieve its goal of a climate-neutral continent via its EGD (EGD), unveiled in December 2019. All of the European Union's initiatives to take the lead in combating the climate issue and global warming are collectively known as the EGD [16]. With the EGD, more ambitious GHG reduction objectives were established, and a reorganization of the EU industry according to circular economy principles was announced [17-19].

CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3 are regarded to be greenhouse gases [20, 21]. The economy is the primary source of GHG emissions, and climate change has far-reaching consequences for human endeavors. Fuel combustion and fugitive emissions from fuels (energy including logistics), IPPU (product use and processes in industry), agriculture, LUCLUF (land use change, land use, and forestry), and waste management are five primary emission source sectors [22, 23].

On the administrative front, Turkey has been carefully monitoring the EGD and its implementation from the outset.

In February 2020, a working group coordinated by the Ministry of Trade was established, comprised of representatives from several Turkish ministries [24, 25]. In July 2021, Turkey's EGDAP was unveiled as a result of consultations with many stakeholders, including the business sector [26, 27]. The present ties between the EU and Turkey are not encouraging, even though EGDAP handles the majority of the problematic areas and anticipates strong collaboration with the EU [28, 29]. The EU and Turkey have been in admission talks since 2005 [30, 31]. However, it has been quite erratic. Settling on a way to work together on green transformation could be seen as a new chance to improve Turkey's stalled and frozen relations with the EU, since the EGD was introduced and Turkey had to change to fit it [32-37]. With the EGD, third-party countries with economic ties to the EU, like Turkey, could take steps to adapt to a green transition. The new economic structure the green revolution will create will gradually spread worldwide [38]. Turkish EGDAP has 81 actions and 32 targets organized into the following 9 themes (Table 1):

Table 1. Major themes under the Turkish EGD action plan

S.N.	Particulars
1	Carbon Border Adjustment
2	Informative and Educational Activities
3	Defend Climate
4	Ecological Economy
5	Eco-Finance
6	Agricultural Sustainablity
7	Smart Mobility with Sustainablity
8	Diplomatic Policies
9	Affordable, Clean, and Secure Energy Supply

Source: Author compilation

Due to the close trade and industry ties between the EU and Turkey as trading partners, European Commission's introduction of the EGD garnered considerable attention from both state authorities and the business community in Turkey [39, 40]. After the EGD and the associated CBAM were announced, In response to raising matters and pressure from the business sector, the Turkish government began to implement an dynamic policy for climate by the end of 2020 [41, 42]. This was mostly done under the direction of the Ministry of Trade [43, 44]. At the Glasgow COP26 Summit, Turkey quickly released a plan for adapting to EGD, passed the Paris Agreement in parliament, and promised to be carbon neutral by 2053 [45, 46]. Turkish exporters may choose from a broad range of options throughout the value chain [47].

1.1 EGD and cultivation

It is a well-known piece of evidence that drastic fluctuations in the climate, such as droughts, floods, rising sea levels, and the disruption of ecosystems, are causing instability in ranching, fisheries, animal husbandry, etc., not only in Turkey but also in European region. Most crops grow increasingly vulnerable to high temperatures as they reach their reproductive and maturity phases [48]. The challenge of predictability for agricultural output is exacerbated by the high seasonality and unpredictability of feed supply and pasture conditions due to weather fluctuations [49].

The EGD laid forth the primary objectives concerning different agricultural techniques that are to be accomplished by 2030 [50, 51], and they are as follows:

1. Relating to the use of insecticides. It has been decided to cut down on chemical pesticides and their hazards by half, with an additional 50% reduction in the usage of the most dangerous pesticides [52, 53]. The agreed goals are based on the recognition of the harmful effects from the use of pesticide in agriculture on water, soil, and air pollution [54, 55].

2. Regarding how fertilizers are used, chosen goal is cut down on fertilizer consumption by at least 20% and avoid nutrient loss by at least 50% [56, 57]. The establishment of the objectives intended to simplify fertilizer management on farms is a direct response to the realization that excessive nutrient runoff significantly contributes to air, soil, and water pollution, consequently, deleterious effects on biodiversity and climate [58, 59].

3. Concerning the selling of antimicrobials. For this reason, we have set a goal of halving the market share of antimicrobials used on farms and in fish farms by 2025 [60]. Because antimicrobials are so often used to treat animals and people, certain germs have become resistant to them. This rising resistance is responsible for an estimated 33,000 annual fatalities in the EU, making it imperative to alter farming practices there [61].

4. Concerning the popularisation of organic farming. In this respect, a lofty objective has been set: 25% of all cultivated land should be farmed in line with organic standards [32, 62-64]. Reasons for adopting such a lofty goal include its relevance in preserving natural resources (via ecologically sound farming methods) and its beneficial effects on the environment generally and on biodiversity in particular [65].

A McKinsey Global Institute analysis claims that Turkey, Iran, and Mexico will be among those hit worst by water scarcity as a result of global warming [66]. Given anticipated droughts and a potential lack of fresh water supplies, this will seriously jeopardize the fertility of agricultural areas and the entire food systems [67]. Due to rising of demand, and pollution in the water collecting basins, drought, the quantity of water in the nation is progressively becoming insufficient to satisfy the demands of industry and agriculture [68]. The Problems with water management stem is insufficient planning, monitoring, assessment, and examination; a shortage of a shared database and information flow; and a lack of institutional coordination [69, 70].

Despite a rapidly expanding population, Turkey has a challenge with the significant loss of arable land and the overall amount of agricultural land used [71-74]. From 41.000 thousand hectares in 2001 to 37.762 thousand hectares in 2020, as shown by data compiled by TurkStat, the overall area used for agriculture decreased [75]. According to statistics of Ministry of Agriculture and Forestry and TurkStat, pesticide use increased from 2006 to 2020, going from 45 000 to 54 000 tonnes, despite the EU's efforts to reduce pesticide use [76].

European Fisheries Control Agency and The European Food Safety Authority (EFSA) can work together on four initiatives (EFCA) [77]. While there used to be ad hoc technical cooperation between Turkey and the EFSA, there is currently none with the EFCA [78].

Turkey should work with the EU through the EFSA to adapt to the EU's pesticide and anti-microbial reduction targets perform R&D on waste, reduction generalize biological and biotechnological conflict and waste reuse in agricultural output, and prevent food waste and waste recycling [79, 80].

The Present paper includes the 6 sections and Section 1 depicts the introduction followed by section 2 presents the Literature, section 3 highlights the Objective and Methodology, Section 4 presents the result analysis with sub section 4.1. Includes descriptive analysis, 4.2 includes Stationarity Test, 4.3 depicts Ordinary Least Square Test, Section 5 presents the conclusion and Suggestions and Section 6 depicts the Limitations and future research.

2. LITERATURE

Cordella and Sala [57] highlighted that the Sustainable Development Goals (SDGs) have not been achieved yet, and the world is now dealing with issues like environmental degradation and climate change and [81, 82]. The EGD is one instance of an initiative showing how science-based policies may advance sustainability worldwide [83]. The EGD provides a worldwide reference for developing sustainable and flexible economies in the aftermath of the COVID-19 crisis, together with the lesson learned from the 2008-2009 fiscal crisis [84]. The EGD draws on the sustainability debate that has taken place over the last several decades and the supporting scientific evidence [85]. To maintain the planetary limits, it is essential to decouple economic development from resource usage and environmental repercussions [86]. This may be done using sustainability assessment techniques like life cycle sustainability assessment [87]. However, in order to have a significant worldwide influence, multiparty agreements, multinational associations, and joint venture, as well as long-term obligations, need to be further pushed [88].

Ciot [89] stated that the EGD is the European Commission's new and ambitious growth plan for making the EU into a wealthy and flexible society built on a competitive economy, resource allocation efficiency, and a healthy environment [89]. However, this study aims to highlight the fundamental objections to the EGD by considering the market's entrepreneurial and competitive aspects [90]. A systematic evaluation of the specialized literature was made to gather information regarding the issue [91]. The study's findings demonstrated that, despite the free market, the EGD prioritizes the environment and has an impact on entrepreneurial activity [92]. The EGD outlines the backdrop of governmental regulations and interventions that would distort entrepreneurial and competitive processes via fiscal tools, policies and other mechanism in order to accomplish the stated aims [93]. According to the study, the EGD has problems, including a lack of transparency, vague goals, and exorbitant prices [94]. However, when looking at the long view, the study findings are far from negating the significance of the EGD [95].

Faichuk et al. [45] highlighted the threats and challenges under the provisions of the EGD for the exporters of agricultural products to the European Union [96]. They revealed comparative advantages index (RCA), after apply of correlation, comparison method, taxonomic method and regression techniques. The tests' results helped identify the fundamental causes of agricultural exports to the EU [97]. It also revealed that even some of the leading exporters to the EU are not adhering to the regulations set under the EGD [98]. Correlation and regression analysis revealed that the volume of fertilizers used per cropland strongly influences CO_2 emissions [99]. They quoted that if the executive body and government of the exporting countries did not take significant steps towards the fulfillment of the requirement of EGD, then they might have to face a reduction in the exports values to the European Union [100].

Tutak signified the contribution of the EGD in the EU-Turkey relations [101]. The research intends to investigate the possibilities for EU-Turkey climate collaboration and a green agenda, emphasizing the need for such cooperation, outlining the situation as it is, and proposing relevant platforms and policy areas for efficient EU-TR cooperation on green transformation [102, 103]. The following are five priority fields that have been highlighted as high latent areas for cooperation: (1) the transition to carbon pricing and clean energy [104]; (2) the circular economy and sustainable industries; (3) sustainable agriculture; (4) sustainable transportation; and (5) the availability of green financing and capacity development. This collaboration may be realized through participation in the EU's industrial alliances and related decentralized EU institutions. An inclusive stakeholder participation strategy is essential to ensuring societal acceptability and widespread support for the green revolution [105-107].

Researchers had analyzed the greenhouse gas (GHG) emissions consolidated in the value-added substance of Turkish mutual trade with the European Union [108, 109]. For the study, they developed a model considering the principles of Ecological Unequal Exchange (EUE) theory [110]. They attempted to evaluate the direct and indirect emissions along the national and intenrnational value-added chains [111]. They took the data from 1995 to 2015, and the results showed that Turkey had a deficit in trade with the EU during the mentioned period [112]. However, the GHG emissions resultant from Turkey's export activity to the EU lead to an increase in the EU's GHG emissions resultant from exports activity of the EU to Turkey [113].

Dazzi [114] conducted a study to analyze the potential impact of the Cross Border Adjustment (CBA) mechanism on the production sector of Turkey. They have constructed Applied General Equilibrium (AGE) model around 24 production sectors in the Walrasian tradition wherein they have simulated the aggregate demand and the supply with the interaction of relative prices to carry equilibrium in the foreign exchange, market of services, labor, and goods [115]. The proposed model is flexible and functional at a multi-level to create a link between the production activities with GHGs emissions, public expenditures, and the government mechanism of the environmental policy tools [116]. The outcome of their study showed that the unfavorable effect of the CBA on the Turkish economy will vary from 2.7 to 3.6% loss of the GDP by 2030 over the trade -as-(un)usual position path [117]. They have also suggested ratifying the Paris Climate Agreement and revising the INDC targets in the Parliament to speed up the process of the Emission Trading System in the Turkish economy [118].

Leonard et al. [119] had undertaken a study to analyze how far the renewable energy use, forest area, economic growth urbanization, industrialization, agriculture productivity, and tourism in Turkey had contributed towards achieving the environmental sustainability goals of the country by lowering carbon dioxide emissions. For the purpose of the study, they have taken time series data from 1990 to 2020 and applied the Dynamic Ordinary Least Squares method for analysis [120]. The results of the study depicted that a 1% rise in the growth of economy, industrialization, urbanization, and tourism will lead to an increase in carbon dioxide emissions by 0.39%, 1.22%, 0.24%, and 0.02% in Turkey, respectively. Moreover, a 1% increase in renewable energy consumption, agricultural productivity, and forest area will decrease carbon dioxide emissions by 0.43%, 0.12%, and 3.17%, respectively. However, this research recommended the formulation of a more robust regulatory framework to minimize environmental deterioration and foster sustainable development growth in Turkey [121, 122].

Biresselioglu et al. [123] conducted a study to assess the impact of the European Union (EU) 's climate change policy which has the Climate Pact and the EGD as their significant components [124, 125]. They have undertaken a comparative study between Austria, Germany, Greece, Italy, Spain, and Turkey [126, 127]. Through this study, they aimed to understand better the status of the Renewable Energy Communities (RECs) and citizen energy communities (CECs) in the EU and nonmember countries. The study's results revealed that none of the countries under the study had yet succeeded in harmonizing their legislation concerning RECs and CECs with the legal and administrative framework [128]. They also suggested that a lot more progress is required at the varying levels in each country under study [129].

3. OBJECTIVE AND METHODOLOGY

This study focused on analyzing the impact of the EGD on the Agricultural carbon emissions in Turkey. European Union and Turkey have strong trade relations; Turkey exports a significant portion of its exports to the European Union. This fact made it compulsory for Turkey to follow the regulations implemented in the EU regarding trade. In response to the European Union's EGD, Turkey formulated EGD Action Plan, this plan laid down the roadmap for Turkey to follow the regulations under the EU's EGD.

EGD highlighted the significance of sustainable agriculture for the responsible development of the economies. Specific objectives are set under the EGD regarding the sustainable growth of agriculture. Even Turkey's EGDAP mentioned many actions for the agricultural sectors sustainable development in the Turkey.

The study's primary question is whether EGD has any impact on the carbon emissions from the agriculture sector in Turkey or not. For the same, the data has been collected regarding carbon emissions and analyzed with the help of statistical tools and techniques.

Agriculture carbon emissions in Turkey and EGD are taken as the variables for the study. In the present report, an attempt has been made to analyze the effect of the EGD on agriculture carbon emissions. In this case, we consider agriculture carbon emissions as the dependent variable and the EGD as the independent variable.

Secondary data from the various published sources have been collected and analyzed with statistical tools, and findings are drawn from them. Statistical tools like Unit Root Tests, the Ordinary Least Square Test, and Auto regressive distributed lag model, are used to interpret the impact.

Time series data related to the carbon emissions of the agriculture sector in Turkey has been collected from the TURKSTAT, an official website of the Turkey Government for the statistical data related to the various domains. We took emissions data from the year 1990 to 2020. As per the latest published reports of the Turkey government on Environment and Energy, data is available up to 2020 only.

As per the objective of this study, it is decided to analyze the impact of the EGD on the Agriculture Carbon Emissions in Turkey. Data for agriculture CO_2 emissions is taken from published official sources. However, for the study, we also require some quantitative data related to the EGD. So, we took Dummy Variables to quantify the EGD for the sake of study. For the years when EGD is not applicable, i.e., from 1990 to 2018, we took values as 0, and for the years 2019 and 2020, we took the values as 1.

Dummy variables used for instance, in econometric time series analysis to track the occurrence of wars or other significant events. Thus, it might be considered a truth value represented by the numbers 0 or 1.

4. RESULT

4.1 Interpretation of data for analyzing the impact of EGD on the Agriculture carbon emissions

4.1.1 Descriptive statistics

The Figures 1-6 below show the descriptive statistics for the agriculture carbon emissions; it is assumed that descriptive statistics provide information about the essential characteristics of the data set, which is helpful for the researcher in organizing, simplifying, and summarizing data. The histogram is also drawn for a better understanding of the data.

Descriptive statistics show that the average carbon emissions from the agriculture sector are 48.62 million tonnes from 1990 to 2020, with maximum emissions of 73.15 million tonnes and minimum emissions of 37.60 million tonnes during this time. Graphical figures are also shown to enhance the understanding of the series.

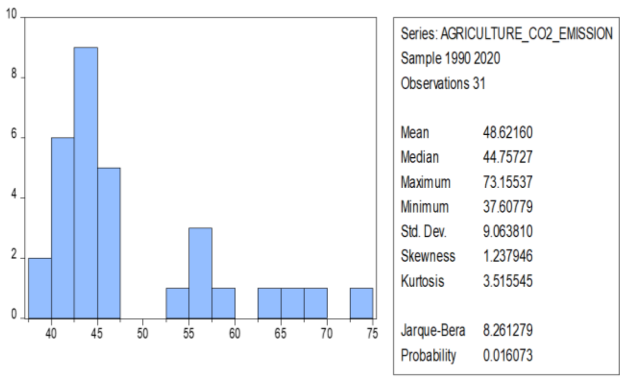


Figure 1. Descriptive statistics for the agriculture carbon emissions
Source: Author compilations

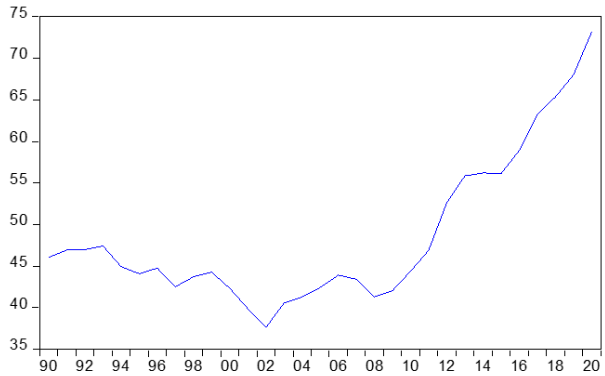


Figure 2. Agriculture carbon emissions

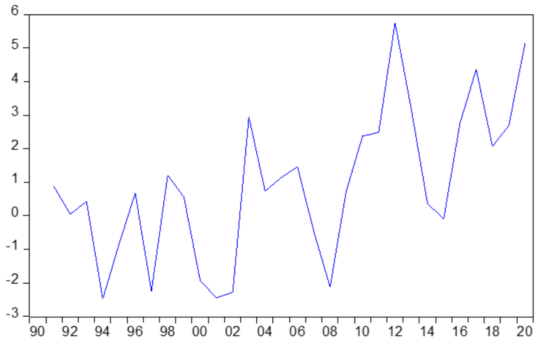


Figure 3. Differenced agriculture CO_2 emissions

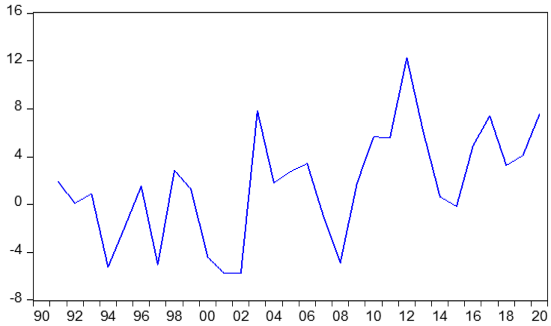


Figure 4. % Change agriculture CO_2 emissions

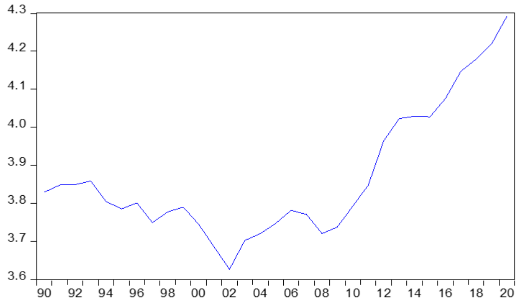


Figure 5. Log agriculture CO_2 emission

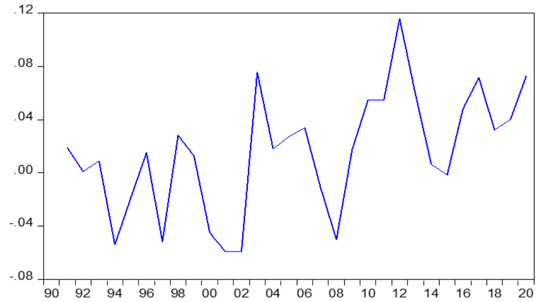


Figure 6. Log differenced agriculture CO_2 emissions

4.2 Stationarity test

At various levels, stationarity tests have been undertaken using the Augmented Dickey-Fuller Unit Root Test for agricultural carbon emissions DATA based on time series.

4.2.1 Unit Root Test at level including intercept

First, investigated the stationarity of agriculture CO_2 emissions data series at Level including intercept in test equation, taking null hypothesis as agriculture CO_2 emissions has a unit root and exogenous as constant. We took a lag length equal to 0 and a maximum lag length equal to 7. However, the results of the Augmented Dickey-Fuller test statistic show that result is not significant as the prob. value is 1.00, which is higher than the required 0.05 value. So, the results of the Unit Root Test at level including intercept depict that the agriculture CO_2 emissions data series is not stationary (Tables 2 and 3).

Table 2. Unit Root Test at level including intercept

ADF		t-Statistic	Prob.*
		2.730636	1.0000
Test critical values:	1%	-3.67017	
	5%	-2.963972	
	10%	-2.621007	

*MacKinnon (1996) one-sided p-values

Table 3. Unit Root Test at level including intercept

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGRICULTURE_ CO_2_EMISSIONS (-1)	0.127982	0.046869	2.730636	0.0108
C	-5.214625	2.270419	-2.296768	0.0293
R^2	0.210297	Mean dependent var		0.90339
Adjusted R^2	0.182093	S.D. dependent var		2.22459
S.E. of regression	2.011875	Akaike-info-criterion		4.30035
$\sum resid^2$	113.3339	Schwarz-criterion		4.39376
Log likelihood	-62.50527	Hannan-Quinn criter		4.33024
F statistic	7.456374	Durbin-Watson-stat		1.38018
Prob (F-statistic)	0.010811			

4.2.2 Unit Root Test at level including trend and intercept

The Unit Root Test based insignificant result at the level including intercept only prompted us to try it with the inclusion of trend. Thus, we examined stationary from use of the Unit Root Test, including the trend and the intercept. We consider the null hypothesis as agricultural CO_2 emissions have a unit root and the exogenous variable as constant, linear trend. The lag length considered is 0, and the maximum lag length is 7. The results of test revealed that the series is not stationary at level including the trend and the intercept as the prob. value is 0.9989, which is again higher than the required prob. value is 0.05 (Tables 4 and 5).

Table 4. Unit Root Test at level including trend and intercept

ADF		t-Statistic	Prob.*
		0.527919	0.9989
Test-critical values:	1%	-4.296729	
	5%	-3.568379	
	10%	-3.218382	

*MacKinnon (1996) one-sided p-values

Table 5. Unit Root Test at level including trend and intercept

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGRICULTURE_ CO_2_EMISSIONS (-1)	0.030197	0.057200	0.527919	0.6019
C	-2.606794	2.306155	-1.130364	0.2683
@TREND ("1990")	0.133332	0.051792	2.574359	0.0158
R^2	0.365933	Mean dependent var		0.903390
Adjusted R^2	0.318965	S.D. dependent var		2.224585
S.E. of regression	1.835835	Akaike-info-criterion		4.147516
$\sum resid^2$	90.99788	Schwarz-criterion		4.287636
Log likelihood	-59.21274	Hannan-Quinn criter		4.192341
F statistic	7.791126	Durbin-Watson-stat		1.567572
Prob (F-statistic)	0.002132			

4.2.3 Unit root at 1st difference including intercept

Here under took the Unit Root Test at the first difference, including the intercept. We took the null hypothesis as at first difference agriculture carbon emissions series has a unit root and also considered the exogenous variable as constant. We took the lag length as 0 and the maximum lag length as 7. We applied the Unit Root Test on the time series data with these assumptions. The results depict that series is not stationary at the first difference, including the intercept, as the probability value is greater than 0.05 (Tables 6 and 7).

Table 6. Unit Root Test at 1st difference including intercept

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.668413	0.0917
Test critical values:	1%	-3.679322	
	5%	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values

Table 7. Unit Root Test at 1st difference including intercept

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (AGRICULTURE_ CO_2_EMISSIONS (-1))	-0.481522	0.180453	-2.668413	0.0127
C	0.511624	0.398818	1.282851	0.2104
R^2	0.208685	Mean dependent var		0.146850
Adjusted R^2	0.179377	S.D. dependent var		2.227217
S.E. of regression	2.017596	Akaike-info-criterion		4.308163
$\sum resid^2$	109.9087	Schwarz-criterion		4.402459
Log likelihood	-60.46836	Hannan-Quinn criter.		4.337695
F statistic	7.120426	Durbin-Watson-stat		1.838024
Prob (F-statistic)	0.012732			

4.2.4 Unit Root Test at 1st difference including trend and intercept

After testing agriculture data series stationarity at 1st difference including intercept, found that it is not stationary at that level. Then tried it at 1st difference including trend and intercept; here took the null hypothesis as at first difference agriculture CO_2 emissions has a unit root and exogenous variable as constant, linear trend. The lag value is taken as 1, and the maximum lag value is 7. the results depict that agriculture CO_2 emissions are stationary at this level. Here the prob. value is 0.0102, which is lesser than the required value of 0.05. So, agriculture CO_2 emissions are stationary at first difference including trend and intercept (Tables 8 and 9).

Table 8. Unit Root Test at 1st difference including trend and intercept

Null Hypothesis: D (AGRICULTURE_ CO_2_EMISSIONS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.315427	0.0102
Test critical values:	1%	-4.323979	
	5%	-3.580623	
	10%	-3.225334	

*MacKinnon (1996) one-sided p-values

Table 9. Unit Root Test at 1st difference including trend and intercept

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGRICULTURE_ CO_2_EMISSIONS (-1))	-1.053353	0.244090	-4.315427	0.0002
D(AGRICULTURE_ CO_2_EMISSIONS (-1),2)	0.301592	0.192266	1.568620	0.1298
C	-2.057140	0.856643	-2.401398	0.0244
@TREND ("1990")	0.182589	0.054183	3.369882	0.0025
R-squared	0.465382	Mean dependent var		0.181500
Adjusted R-squared	0.398555	S.D. dependent var		2.260112
S.E. of regression	1.752783	Akaike info criterion		4.091850
Sum squared resid	73.73393	Schwarz criterion		4.282165
Log likelihood	-53.28590	Hannan-Quinn criter.		4.150031
F-statistic	6.963954	Durbin-Watson stat		2.039339
Prob(F-statistic)	0.001562			

4.3 Ordinary Least Square Test

Applied Ordinary Least Square Test on the data series. We took Agriculture CO_2 emissions as the dependent variable and the EGD as the independent variable. The results show that EGD significantly impacts the Agricultural carbon emissions in Turkey as the Prob. is less than 0.05. However, the value of R-squared and adjusted R-squared is less than 0.5, which depicts that the prediction rate is lower in this case. However, one of the reasons behind the lower values of the R-squared and the adjusted R- squared can be that EGD is in its infancy stage right now (Table 10).

Table 10. Statistics of Ordinary Least Square Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.10661	1.305294	36.08888	0
EGD	23.48233	5.138949	4.569481	0.0001

R^2	0.418607	Mean dependent var	48.6216
Adjusted R^2	0.398558	S.D. dependent var	9.06381
S.E. of regression	7.029226	Akaike info criterion	6.800371
$\sum resid^2$	1432.89	Schwarz criterion	6.892886
Log likelihood	-103.4058	Hannan-Quinn criter.	6.830529
F statistic	20.88016	Durbin-Watson stat	0.414079
Prob (F-statistic)	0.000084		

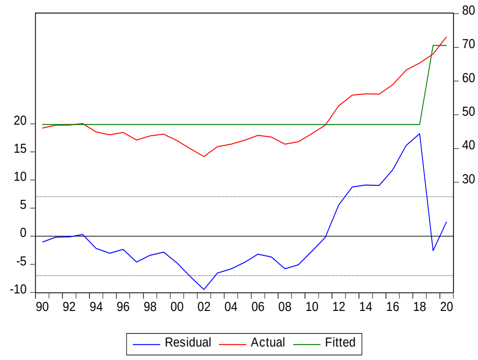


Figure 7. Agriculture CO_2 emissions residual, actual, fitted

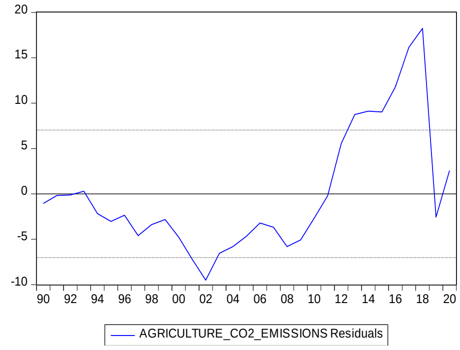


Figure 8. Agriculture CO_2 emissions residuals

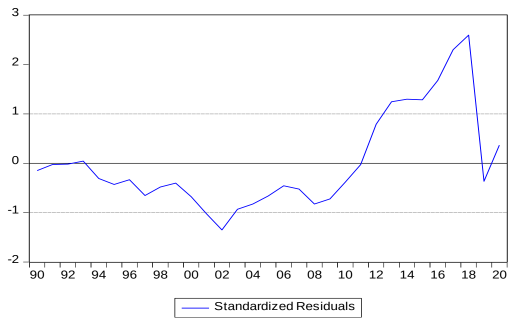
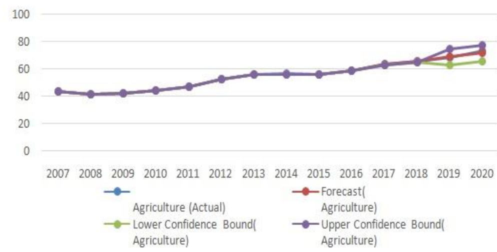
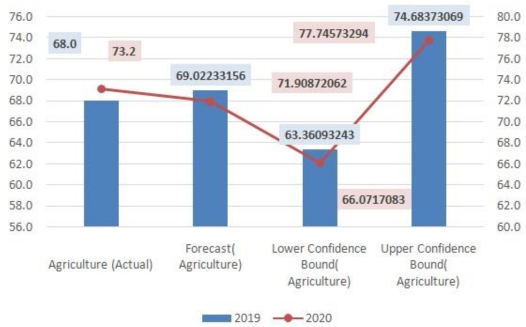


Figure 9. Agriculture CO_2 emissions standardised residuals



Source: Author Compilation

Figure 10. Forecasting of carbon emissions with and without EGD



Source: Author Compilation

Figure 11. Carbon emissions with EGD

Here an attempt is made to forecast the agriculture carbon emissions in Turkey after the implementation of the EGD. The actual emissions are 68 million tonnes and 73.2 million tonnes for 2019 and 2020, respectively. Our forecast is that CO_2 emissions may reduce to 71.9 million tonnes, with lower confidence bound of 66.07 million tonnes and upper confidence bound of 77.74 million tonnes for the year 2020 (Figures 7-11).

5. CONCLUSION AND SUGGESTIONS

In this study, we have sought to investigate the expected impacts of the EGD on the Carbon emissions in Turkey. We specifically choose Agriculture Sector for the purpose of the study because of its significant contribution to the Turkish economy. The EGD announced in December 2019 will affect the Turkish economy as a significant portion of Turkey's foreign trade is with the European Union. This fact made it compulsory for Turkey to fulfill the requirements of the EGD; otherwise, Turkey would have to face adverse effects on its foreign trade with the EU. Turkey formulated the EGD action plan to implement the regulations mentioned in the EGD.

An attempt is made to analyze the impact of the EGD on Agriculture carbon emissions; conducted pre-implementation and post-implementation analyses to study the impact of carbon emissions. We took dummy variables for the EGD and applied the Ordinary Least Square Test [120]. The result of our study shows that EGD significantly impacts agriculture carbon emissions. However, the results are significant Turkey [121, 122]; the prediction rate could be more promising; it is just 41.8% in this case. Although, the carbon emissions from the agriculture sector are also showing an increasing trend even after the implementation of the EGD. It might take a few more years of implementation to analyze the EGD's impact on carbon emissions significantly. As of now, Turkey is trying to reduce its emissions, also implemented the EGD action plan to adhere to the regulations of the EGD [119], but it will take some years to make the results of the policies visible.

6. LIMITATIONS AND FURTHER SCOPE OF THE RESEARCH

The limitation of the present study is that it considers only the agriculture sector's carbon emissions to study the impact on the EGD; further studies can be undertaken with the coverage of other sectors of the economy. The present study is based on secondary data; future studies can also be conducted based on the primary data to explore the challenges faced by the exporters in adopting environmentally friendly and sustainable practices. Moreover, this study analyzed the impact of EGD only in Turkey; other economies can also be considered for a more precise and extensive analysis.

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