Input usage and cost analysis in paddy production: a case study of Çanakkale City-Turkey

Recebimento dos originais: 15/01/2020
Aceitação para publicação: 14/07/2020

Arif Semerci, Assoc. Prof. Dr.
Institution: Çanakkale Onsekiz Mart University
Address: Faculty of Agriculture, Department of Agricultural Economics, P.O.Box:17100. Çanakkale, Turkey.
E-mail: **arifsemerci69@gmail.com**

Abstract

Rice is an important product in human nutrition. The global rice production amount for the period of 2016/17 reached 483 million tons, and 74% of this amount was provided by China, India, Indonesia, Bangladesh, and Vietnam. Between the years 2002 and 2016, Turkey's paddy production area increased at a level of 93,46%, production amount increased 155,56%, and productivity increased by 32,17%. Turkey's annual rice consumption amount is around 750.000 tons; 550.000 tons of the demand is met by internal production, while the rest of the demand is met by importation. Due to the gap in demand and supply amounts, Turkey is one of the 3 countries that have the highest increase in rice importation amount over the last decade along with China and Indonesia. According to FAO data for 2017, the global paddy production area size was 167,2 million ha, and the global production amount was 770 million tons. Turkey's proportion of that production area was 0,07%, was 0,12% in production amount, and Turkey's self-sufficiency rate for rice was 70%. According to TSI data for 2018, Turkey's paddy production area size was 120.142 ha, and its production amount was 940.000 tons. The research area of Çanakkale, takes up 6,95% of Turkey's paddy production area, and is the 4th city in terms of production amount with a proportion of 6,71%. Çanakkale's productivity average in paddy is 7,553 ton/ha which is below Turkey's average (7,824 ton/ha). Within the study, the economic aspect of paddy production in Çanakkale City was examined using the data of 74 enterprises which were chosen by the Stratified Sampling Method. According to the research results; paddy production takes first place in the cropping pattern with a proportion of 44%, paddy production area size average per enterprise was calculated as 14,14 ha, and productivity per enterprise was calculated as 7,852 ton/ha. According to the research results, paddy production costs were 2.906,17 USD/ha, gross profit was 2.072,47 USD/ha, and net profit was found as 1.254,85 USD/ha. It was also found that some subsidies such as diesel fuel, fertilizer, certified seed usage subsides, and deficiency payments; increase gross output value at a level of 5,69%, increase gross profit value at a level of 11,43%, and decrease costs at a level of 8,15%. In order to produce 7,852 ton/ha of paddy; 217,9 kg of seeds, 371,5 kg of pure fertilizer, 10,7 lt of agricultural pesticide, and 262,6 lt of disesel fuel were needed per hectare. Also required were 2.186 KW of electricity for irrigation, and 120 hours of manpower and machine power per hectare.

Keywords: Cereals. Paddy. Input Usage. Cost. Çanakkale. Turkey.

1. Introduction

Agricultural sectors have an important place in country's economies in terms of national income contribution, human nutrition, foreign trade, and providing raw material for agricultural industries. One of the subbranches in agricultural production is plant production. Furthermore, one of the important production activities in plant generation is paddy production which falls under cereals.

Global rice production amount for the period of 2016/17 reached 483 million tons, and 74% of this amount was provided by China, India, Indonesia, Bangladesh, and Vietnam. Despite that Turkey is an importer country in paddy and rice products, there has been a considerable increase in paddy production due to agricultural subsidy policies since the early 2000s' such as; an increase in usage of good quality seeds, and modernisation in agricultural production techniques (FAO, 2019a; TSI, 2019).

Turkey has eligible climate conditions to grow paddy, and paddy production has had a tendency to increase since the early 2000s'. While the ratio of meeting demand/supply was 38%, this ratio reached 73,60% in 2016 (TOB, 2017). In the time period mentioned above, paddy production area increased at a level of 93,33%, production amount increased 155%, and productivity per unit area increased at a level of 32,17% (TSI, 2019). It is to be considered that these developments occured due to agricultural subsidy policies, and that they helped relatively in decreasing Turkey's paddy importation amount.

Turkey's annual rice consumption is around 750.000 tons; 550.000 tons of the demand is met by internal production and the rest of the demand is met by importation. Because of the gap in demand and supply amounts, Turkey is one of the 3 countries in the world that have the highest increase in rice importation amount for the last decade along with China and Indonesia.

In this study, the economic analysis of paddy production in the Çanakkale region was presented. The monetary and quantitative values that are used in paddy production were additionally mentioned. Also in the research, paddy enterprises were separated into 5 groups based on their sizes. In the last part of the study, effects of subsidies on paddy production cost and producer income were examined.

2. Literature Review

There are alot of studies about the economic analysis of paddy production, however, only few of them have detailed information about the topic. In this section, literature reviews of paddy production economics is summarized.

Semerci (1998), carried out a study that was titled *''Agricultural Structure in Thrace Region and Productivity Analysis in Primary Agricultural Products''.* In the study, input usage and productivity in sunflower (Tekirdağ City), wheat (Kırklareli City), and paddy (Edirne City) were examined. Within the study, input/output relationship in paddy production was examined with data from 97 producers.

Güngör and Semerci (2000), conducted a study titled *''Productivity Analysis of Paddy Production in Edirne City''* focused on economic efficiency levels of inputs that are used in paddy production in Edirne City, and examined real increases in input and production sale prices.

Can and Baytekin (2001), administered a research that was titled *''Problems of Paddy Production in Çanakkale City and Solution Offers''* there was emphasis on the importance of paddy production for Çanakkale City. It was mentioned that paddy production is mostly common in the districts of Biga, Gelibolu, and Ezine; and that paddy production has a tendency of extending into Çanakkale City, especially in the districts of Biga and Gelibolu due to basin based subsidies.

Güngör (2007), executed a study entitled *''Agricultural Structure in Thrace Region and Productivity Analysis in Primary Agricultural Products''* examined agricultural structure and production potential of the Thrace Region. Also, problems of agricultural enterprises and agricultural policies were examined within the study.

Erdem (2012), conducted a study entitled *''Production and Marketing Problems of Wheat, Sunflower and Paddy in Thrace Region''* production and foreign trade structures of wheat, sunflower, and paddy regionally and country wide were examined, and the problems were presented in terms of marketing.

Sezer et.al. (2012), administered a research titled *'' Paddy Production Systems''* examined irrigation systems in paddy production in Turkey, and mentioned negative and positive aspects of irrigation systems.

Azarpour and Moraditochaee (2013), carried out a research titled *"A Comparative Study on Energy Use and Cost Analysis of Rice Varieties Under Traditional and Semi-Mechanized Farming Systems in North of Iran*". According to energy and cost analysis

results, the paddy species named Khazar, Hybrid (GRH1) and Gohar (SA13) were found to be better compared to other species. It was also mentioned that is better to use renewable energy resources in paddy production over fossil based resources.

Şapaloğlu (2015), conducted a study entitled *''Structure of Marketing Chains in Paddy Production and Consumption, and Paddy Marketing Margins'',* the marketing chain of paddy was examined from field to fork, and the effect of each chain on consumer prices were presented.

Yavuz et.al. (2016), executed a research titled *''Effects of Deficiency Payments on Wheat, Maize, and Paddy Production''* the effects of deficiency payments on 3 product groups were examined. According to the research results; in paddy production the average production area size was found as 25,54 ha, producer age average was found as 48 years old, average period of study was found as 7,61 years, and average agricultural experience period was found as 27,26 years. It was also found that producers are more willing to produce paddy if there is an increase in the amount of deficiency payments.

IGC (2017), administered a study titled *"Five-year baseline projections of supply and demand for wheat, maize (corn), rice, and soybeans by 2022/23"* projections for wheat, maize, rice, and soybeans were presented while considering some presuppositions such as; population growth, agricultural and trade policy tendencies, and the global economy.

Seal et.al. (2017), carried out a research titled *"Productivity, Energy Use Efficiency, and Economics of Organic Scented Rice Cultivation in Sub-Humid Agroecosystem"* metioned the increase in demand for native aromatic rice among other organic cereals in recent years. The study found that aromatic rice that was grown by using IRF (Inhana Rational Farming Technology) was more productive at a level of 18% compared to the ones that are grown in traditional ways. Also, the net profit of organic paddy was higher by 17%.

Kudal (2019), conducted a study entitled *''Examination of the Paddy Production and Subsidy Policies in Edirne City''* agricultural income, farming experience, and agricultural record keeping were found as factors that affect producer satisfaction level about agricultural subsidies. Eventhough most of the producers stated their satisfaction about current agricultural subsidy policies, 70% of them stated that subsidies are not affecting their decisions about production.

Semerci et.al. (2019), administered in a study titled *''Examination of the Changes in Paddy Production Area Size, Production Amount, and Productivity in Turkey''* paddy production data from the last 15 years were examined. In the study, it was mentioned that

between 2004 and 2018, paddy production area size increased at a level of 71,65%, paddy prodution amount increased by 91,84%, and productivity per decare increased by 11,76%.

3. Materials and Methods

3.1. Materials

Main material of the research consisted of primary data that were gathered in 2019 from paddy producers in the Çanakkale region. Secondary data of the reasearch were gathered from organizations such as; UN Food and Agriculture Organization (FAO), Republic of Turkey Ministry of Agriculture and Forestry (MAF), Turkish Statistical Institute (TSI), Turkish Undersecretariat of Foreign Trade (UFT), Turkish Ministry of Development (MD), Turkish Ministry of Trade (MT), and foreign literature that related to the topic. In addition, national and international reports from several organizations, commission reports, and academic dissertations about paddy were also used.

3.2. Methods

3.2.1. Sampling Method

In order to examine the socio-economic structure of enterprises in studies, agricultural enterprises are often divided into groups either based on their size or on their income levels due to the heterogeneous structure of their sizes. This method helps to increase the precision level of hypotheses about the population, and also increase the representation degree of different layers in a population (Oğuz and Karakayacı, 2017). In the very begining of the study, one of the formulas of "Stratified Layered Sampling Methods" that was suggested by Neyman was used in order to determine the sampling frame and sample size, The formula of the method is given below (Çiçek and Erkan, 1996; Yamane, 2010):

$$n = \frac{[\Sigma(Nh*Sh)]^2}{N^2*D^2+\Sigma(Nh*Sh)^2} \qquad D^2 = (d / t)^2$$

n= Sample size

Nh= Number of enterprises at h^{th} layer

Sh= Standard deviation at h^{th} layer

Sh^2= Variation of data at h^{th} layer

t= "t value" at a certain confidence limit

N= Total enterprise number that belongs to the sampling frame

d= Deviation ratio from average

The formula below was used in order to distribute the sample size into the layers:

$n=[(N_h*S_h)*n] / \Sigma(N_h* S_h)$

In order to determine sample size, 2018 data from the Farmer Registration System of Ministry of Forest and Agriculture were used. The sample size was determined in cooperation with the Çanakkale Provincial Directorate of Agriculture and Forest. 74 enterprises were determined as the sample size with a 5% margin of error, and at a 99% confidence interval. Paddy enterprises were divided into five groups depending on their size as follows:

1st Group of Enterprises;<=2,5 ha production area (9 enterprises),

2nd Group of Enterprises;<=5,0 ha production area (9 enterprises),

3rd Group of Enterprises;<=10,0 ha production area (17 enterprises),

4th Group of Enterprises;<=20,0 ha production area (20 enterprises),

5th Group of Enterprises;>=20,0 ha production area (19 enterprises).

3.2.2. The Calculation Method of Paddy Production Cost

Cost charts released by the Provincial Directorate of Agriculture in the cities of Edirne and Çanakkale, and charts used in other studies, were taken into consideration in the calculation of paddy production cost. Paddy cost was calculated by the method below (Yılmazi 1997; Semerci, 1998; Özkan and Yılmaz, 1999; Yılmaz and Yılmaz, 1999; Alemdar, 2014; İnan, 2016).

Gross Output Value (GOV): Main Product [Productivity (ton/ha) x Product Sale Price (USD/ton)

Variable Costs: Soil Cultivation + Planting + Fertilization + Harvest + Transportation + Seed + Pesticide + Fertilizer + Packing + Drying.

Fixed Expenses: Land Rent (*) + Capital Interest (**) + Administrative Expenses (***)

Land Rent (*): Land rental value for paddy production or rental value of their own ground that is calculated by Alternative Cost Principle.

Capital Interest (**): Variable Costs x 2,75%

Administrative Expenses (***): Total Cost x 3%

Total Cost: Variable Costs + Fixed Costs

Gross profit: GOV – Variable Costs

Net profit: GOV – (Variable Costs + Fixed Expenses)

In the study, paddy cost values were calculated based on USD. Monetary Values in Turkish Liras (TL) which is the local currency, were converted as 5,51 TL = 1 USD (Central Bank of the Republic of Turkey-CBRT, 2019).

4. Results and Discussion

4.1. World Paddy Production and Trade

4.1.1. General Information About Paddy Plant

Paddy is the name of the seed with the husk that belongs to the Gramineae family and is a species of *Oryza sative L.* Husked paddy becomes rice after some processes that include separation of the embryo and husk from the aleurone layer. Paddy grows in hot climates and is considered a symbol of civilization in regions where paddy growth is common (TOB, 2017).

Paddy has a high level of importance due to it being consumed as a main food product in more than half of the world's population. In the Far East and South Asian countries, rice consumption amount per person reaches 200 kg annually. Furthermore, rice is the second product that is consumed most in the world after wheat. In Turkey, paddy production is only conducted with legal permission (TOB, 2017).

4.1.2. Paddy Production Areas in the World

According to FAO data, global paddy production area size reached 167,2 million ha from 151,2 million ha between 1998 and 2017 (FAO, 2019a). In the same time period;

Turkey's total paddy production area size increased to 110.000 ha from 60.000 ha, and Turkey's proportional share in global paddy production increased to 0,07% from 0,04%. In the last two decades, while the increase rate of paddy production area size was 10,26% in the world, it was 82,86% in Turkey (Table 1).

Table 1: Paddy Production Area Sizes in the World (1998-2017)

Year	Turkey		World		Turkey's Ratio (%)
	Production Area (ha)	Change (1998=100)	Production Area (ha)	Change (1998=100)	
1998	59.885	100,00	151.681.531	100,00	0,04
1999	64.983	108,51	156.833.899	103,40	0,04
2000	57.859	96,62	154.001.911	101,53	0,04
2001	59.000	98,52	151.951.868	100,18	0,04
2002	59.809	99,87	147.826.507	97,46	0,04
2003	65.000	108,54	148.447.197	97,87	0,04
2004	69.990	116,87	150.702.977	99,35	0,05
2005	84.909	141,79	155.266.253	102,36	0,05
2006	99.043	165,39	155.559.995	102,56	0,06
2007	93.799	156,63	155.314.941	102,40	0,06
2008	99.493	166,14	160.077.463	105,54	0,06
2009	96.444	161,05	157.793.328	104,03	0,06
2010	98.966	165,26	161.699.737	106,60	0,06
2011	99.383	165,96	162.752.574	107,30	0,06
2012	119.664	199,82	162.645.204	107,23	0,07
2013	110.592	184,67	165.216.811	108,92	0,07
2014	110.880	185,15	164.141.695	108,21	0,07
2015	115.856	193,46	162.376.860	107,05	0,07
2016	116.056	193,80	165.219.224	108,93	0,07
2017	109.505	182,86	167.249.103	110,26	0,07

Source: FAO,2019a.

According to Table 2, in terms of production area sizes, the first three paddy producer countries are respectively India (26,18%), China (18,38%), and Indonesia (9,44%). The first five countries hold 67,09% of the total global paddy production area (FAO, 2019a).

Table 2: Important Countries in terms of Paddy Production Areas (2017)

Country	Production Area (ha)	Ratio (%)
India	43.789.000	26,18
China	30.747.000	18,38
Indonesia	15.788.000	9,44
Bangladesh	11.272.000	6,74
Thailand	10.614.829	6,35
Others	55.038.274	32,91

Total	167.249.103	100,00

Source: FAO,2019a.

4.1.3. Paddy Production Amount in the World

According to FAO data of 2017, the global paddy production amount reached 770 million tons from 579 million tons between 1998 and 2017. During the same time period, Turkey's paddy production amount reached 900.000 tons from 315.000 tons (FAO, 2019a). While the global increase ratio in paddy production amount was 30,64%, Turkey's increase ratio was 92,06%, and Turkey's proportional share in global paddy production amount increased to 0,12% from 0,05% (Table 3).

Table 3: Global Paddy Production Amount (1998-2017)

Year	Turkey		World		Turkey's Ratio (%)
	Production (ton)	Change (1998=100)	Production (ton)	Change (1998=100)	
1998	315.000	100,00	578.813.977	100,00	0,05
1999	340.000	107,94	611.177.579	105,59	0,06
2000	350.000	111,11	598.668.171	103,43	0,06
2001	360.000	114,29	600.246.617	103,70	0,06
2002	360.000	114,29	571.051.228	98,66	0,06
2003	372.000	118,10	586.931.423	101,40	0,06
2004	490.000	155,56	607.348.698	104,93	0,08
2005	600.000	190,48	634.225.091	109,57	0,09
2006	696.000	220,95	640.705.012	110,69	0,11
2007	648.000	205,71	656.556.273	113,43	0,10
2008	753.325	239,15	687.050.383	118,70	0,11
2009	750.000	238,10	685.656.731	118,46	0,11
2010	860.000	273,02	701.138.548	121,13	0,12
2011	900.000	285,71	726.376.264	125,49	0,12
2012	880.000	279,37	736.596.755	127,26	0,12
2013	900.000	285,71	742.504.938	128,28	0,12
2014	830.000	263,49	742.438.725	128,27	0,11
2015	920.000	292,06	745.337.946	128,77	0,12
2016	920.000	292,06	756.158.217	130,64	0,12
2017	900.000	285,71	769.657.791	132,97	0,12

Source: FAO,2019a.

The total global paddy production amount was 770 million tons in 2017 (FAO, 2019a). India holds largest paddy production area size in the world, and China comes first in terms of production amount with a proportion of 28% (Table 4).

Table 4: Important Countries in terms of Paddy Production Amount (2017)

Country	Production Amount (ton)	Ratio (%)
China	212.676.000	27,63
India	168.500.000	21,89
Indonesia	81.382.000	10,57
Bangladesh	48.980.000	6,36
Vietnam	42.763.682	5,56
Others	215.356.111	27,98
Total	769.657.791	100,00

Source: FAO,2019a.

The total proportional share of China, India, and Indonesia in the global paddy production amount is 60%. This ratio reaches 72,01% when Bangladesh and Vietnam are taken into consideration (FAO, 2019a).

4.1.4. Global Paddy Productivity Values

In the time period between 1998 and 2017, the global paddy productivity average increased to 4,602 tons/ha from 3,816 tons/ha (FAO, 2019a). Turkey's paddy productivity for the same time period reached 8,219 tons/ha from 5,260 tons/ha. In other words, Turkey's paddy productivity increased by 56,25% while the world's productivity increased by 20,59% (Table 5).

Table 5: Change of Paddy Productivity in Turkey and the World

Year	Turkey	World	Difference	
	(ton/ha)	(ton/ha)	(ton/ha)	(%)
1998	5,260	3,816	1,444	37,84
1999	5,232	3,897	1,335	34,26
2000	6,049	3,887	2,162	55,61
2001	6,102	3,950	2,152	54,46
2002	6,019	3,863	2,156	55,82
2003	5,723	3,954	1,769	44,75
2004	7,001	4,030	2,971	73,72
2005	7,066	4,085	2,982	72,99
2006	7,027	4,119	2,909	70,62

2007	6,908	4,227	2,681	63,42
2008	7,572	4,292	3,280	76,41
2009	7,777	4,345	3,431	78,96
2010	8,690	4,336	4,354	100,41
2011	9,056	4,463	4,593	102,91
2012	7,354	4,529	2,825	62,38
2013	8,138	4,494	3,644	81,08
2014	7,486	4,523	2,962	65,49
2015	7,941	4,590	3,351	73,00
2016	7,927	4,577	3,351	73,21
2017	8,219	4,602	3,617	78,60

Source: FAO, 2019a.

4.1.5. The Most Productive Countries in Paddy Production

According to FAO data of 2017 (Table 6), paddy productivity was over 8,500 tons/ha in Australia, Egypt, and Uruguay. In terms of Turkey, paddy productivity was almost two times more than the world's average (FAO, 2019a).

Table 6: The First Five Countries in terms of Paddy Productivity

Country	Productivity (ton/ha)
Australia	9,821
Egypt	9,302
Uruguay	8,500
USA	8,415
Turkey	8,219
World (average)	4,602

Source: FAO, 2019a.

In the season of 2017/18, even though there was a slight decrease in paddy productivity compared to the previous year, global paddy productivity increased by 7% in the last decade. The most productive countries in paddy production respectively are Australia, Egypt, Uruguay, and USA. In terms of comparing the countries in paddy productivity for the last decade; Brazil (19%), India (9%), Turkey (8%), Myanmar (6%), and Pakistan (6%) are the countries in which paddy productivity increased the most. Egypt (-12%), Argentina (-3%), and Japan (-1%) are the countries where paddy productivity decreased the most (TOB, 2017).

4.1.6. Rice Consumption in the World

Global rice consumption decreased in the season of 2017/18. However, the rice production amount increased over 1 million tons, and reached 487 million tons due to the

population increase in Asia and Sub-Saharan Africa. About 56% of all global consumption occurred in China, India, and Sub-Saharan Africa. Compared to the previous season, the countries which increased their consumption rates respectively in 2017/18 were; Sub-Saharan Africa (15%), Egypt (8%), Thailand (7%), Vietnam (7%), and India (6%). The countries which decreased their consumption rates respectively were; Brazil (3%), USA (3%), and South Korea (1%). While the main reason for an increase in consumption is growth in population; the reason for the decrease in some developing countries is mostly due to changes in consumption behaviors caused by an increase in welfare (TOB, 2017).

4.1.7. World Rice Trade

In the last decade, the global rice trade grew by 57%. During the last ten years the exportation volumes in India and Myanmar significantly increased respectively by 474% and by 222%. In the season of 2017/18, China had the highest rice exportation increase with 28%. China was followed by Vietnam (12%), Pakistan (99%), and India (7%). Due to a sudden drop in production in the season of 2017/18, trade volume shrunk by; 22% in USA, 18% in Brazil, 14% in Uruguay, and 12% in Thailand (TOB, 2017).

During the season of 2017/18, the biggest rice exportation countries were; India (26%), Thailand (22%), and Vietnam (14%). The proportional share of India and Thailand in rice exportation decreased by 2%. On the other hand, Vietnam's rice exportation increased by 2%, and Pakistan and China increased by 1%. In the same season, while the proportional rate of importation in Bangladesh (94%), Philippines (8%), Saudi Arabia (5%), and EU (3%) increased; there was a decrease in Iran (-20%), and China (-1%).

In the last decade, the countries that increased their rice importation ratio the most were; China (1302%), Bangladesh (888%), Sub-Saharan Africa (60%), EU (55%), and Saudi Arabia (26%). On the other hand, the Philippines' importation ratio decreased by 42% due to an increase in domestic rice production over the last ten years (TOB, 2017).

During the season of 2017/18, the biggest rice importation countries were; China (11%), Bangladesh (5%), Saudi Arabia (3%), and Iran (3%) (TOB, 2017). Rice trade information about Turkey and the world is given in Table 7.

Table 7: Rice Trade Information of Turkey and the World (2016)

	Import		Export	
	Amount (ton)	Value (000USD)	Amount (ton)	Value (000USD)

Turkey	220.251	116.207	57.244	40.445
World	38.224.624	21.269.128	40.266.459	20.510.311
Turkey's Ratio (%)	0,58	0,55	0,14	0,20

Source: FAO, 2019b.

According to FAO data of 2016, the global rice trade value was 21 billion USD. Turkey's proportional share in global import was 55,0%, and was 0,20% in export.

4.2. Paddy Production and Trade in Turkey and in the Research Area

4.2.1. Paddy Production in Turkey and in the Research Area

According to TSI data of 2018, the paddy producton area size in Turkey was 120.000 ha, the total production amount was 940.000 tons, and productivity per unit area was 7,824 ton/ha. Edirne city holds 40% of Turkey's total paddy production area, and provides 44% of Turkey's total paddy production amount. The proportional share of the first five cities in paddy production was 82%, and was 83% of the total production amount (Table 8).

Table 8: Paddy Production in Turkey (2018)

Cities	Production Area Size (ha)	Ratio (%)	Production Amount (ton)	Ratio (%)	Productivity (ton/ha)
Edirne	48.593,2	40,45	410.681	43,69	8,451
Samsun	18.056,4	15,03	133.221	14,17	7,378
Balıkesir	15.292,0	12,73	114.939	12,23	7,516
Çanakkale	8.346,8	6,95	63.049	6,71	7,554
Çorum	7.595,2	6,32	60.354	6,42	7,946
Others	22.258,8	18,53	157.756	16,78	7,087
Turkey	120.142,4	100,00	940.000	100,00	7,824

Source: TSI, 2019.

In terms of the research area of Çanakkale Province, the proportional share in total paddy production area size of Turkey was 6,95%, and was 6,71% in production amount. District distribution of paddy production in Çanakkale Province were as follows; Biga with 78%, Gelibolu with 8%, Ezine with 7%, and the central district with 6% (Table 9).

Table 9: Paddy Production in Çanakkale City (2018)

District	Production Area Size (ha)	Ratio (%)	Production Amount (ton)	Ratio (%)	Productivity (ton/ha)
Biga	6.515,0	78,05	48.975	77,68	7,517
Gelibolu	630,0	7,55	5.032	7,98	7,987
Ezine	635,0	7,61	4.654	7,38	7,329
Central District	526,3	6,31	4.080	6,47	7,752

Yenice	205,0	0,25	158	0,25	7,707
Lapseki	200,0	0,24	150	0,24	7,500
Total	8.346,3	100,00	63.049	100,00	7,554

Source: TSI, 2019.

The paddy productivity average of Çanakkale in 2018 was 7.550 ton/ ha. Compared to Turkey's average (7.820), the productivity level of Çanakkale was less by 9,65%. The average productivity of Biga, which is the biggest district in the province in terms of paddy production amount, was 7.510 ton/ha which is below the province average (7.550 ton/ha).

4.2.2. Paddy Production and Trade inTurkey

In recent years, most of Turkey's paddy importation was from USA, Russia, Bulgaria, Portugal, and Greece. According to TSI data of 2016/17, the self-sufficiency rate of Turkey in rice was 69,9%. In 2017, Turkey's rice importation amout was around 149.000 tons, and the exportation amount was 49.000 tons (TOB, 2017).

Table 10: Turkey's Rice Trade (2015-2017)

Years	Import			Export		
	Amount (ton)	Value (000USD)	Average Price (USD/ton)	Amount (ton)	Value (000USD)	Average Price (USD/ton)
2015	119.830	78.026	651	24.065	23.122	961
2016	73.046	36.826	504	45.812	35.956	785
2017	148.608	77.687	523	49.072	36.488	744

Source: TOB,2017.

According to Table 11, Turkey's paddy trade values were close to its rice trade values in 2017. Turkey's paddy importation value was around 59 million USD in 2017, and the exportation value was not at a significant level.

Table11: Turkey's Paddy Trade (2015-2017)

Years	Import			Export		
	Amount (ton)	Value (000USD)	Average Price (USD/ton)	Amount (ton)	Value (000USD)	Average Price. (USD/ton)
2015	188.905	86.585	458	437	362	830
2016	202.464	73.731	364	49	64	1.322
2017	165.052	58.675	355	614	169	275

Source: TOB,2017.

Turkey's paddy production amount for 2017 was 900.000 tons, however, 136,4 million USD were spent on paddy and rice importation. In the same year, Turkey's paddy exportation value was 36,7 million USD (TOB, 2017).

4.2.3. Turkey's Self-Sufficiency Level in Rice

According to TSI data, Turkey's rice consumption amount per person for the last decade reached 9,40 kg from 8,68 kg. In the same time period, the self-sufficiency level reached 69,90% from 60,46% (TOB, 2017). Country wide rice consumption as a food product reached 750.000 tons from 613.000 tons (Table 12).

Table 12: Turkey's Rice Consumption, Stock Change, and Self-Sufficiency Level by Years

Market Period (*)	Domestic Usage (ton)	Seed Usage (ton)	Consumption As Food (ton)	Losses (ton)	Stock Change (ton)	Consumption Per Person (kg)	Self-Sufficiency Level (%)
2007/2008	636.651	11.268	612.874	12.510	-36.324	8,68	60,46
2008/2009	591.436	19.900	556.993	14.543	3.165	7,79	75,66
2009/2010	736.347	19.351	702.517	14.497	4.882	9,68	60,50
2010/2011	563.376	19.800	526.974	16.602	116.857	7,15	90,70
2011/2012	734.131	19.880	696.877	17.375	-132.565	9,33	72,80
2012/2013	601.296	14.367	569.941	16.988	92.068	7,50	86,90
2013/2014	667.701	13.271	637.055	17.375	152.343	8,30	80,10
2014/2015	754.189	13.306	724.860	16.023	-8.095	9,33	65,40
2015/2016	781.757	13.903	750.094	17.761	-97.655	9,53	69,90
2016/2017	781.862	13.927	750.074	17.761	-59.322	9,40	69,90

Source: TOB,2017.
(*): Market period includes the time period between September and August.

Between the time periods of 2007/08 and 2016/17, the highest rice consumption per person was in 2009/10 with 9,68 kg, The highest self-sufficiency level was in 2010/11 with a ratio of 90,70%. As a general evaluation according to Table 12, there is a significant gap in rice production in Turkey, and this gap is attempting to be filled by rice and paddy importation (TOB, 2017).

4.3. Research Findings

4.3.1. Research Area

The research area of Çanakkale city is located in the Southern Marmara Region in Turkey. Within the study, 74 surveys were carried out with paddy enterprises that were determined according to the sampling method. Age average of the producers was found as

51,78 years old, household size was found as 4,27, and 59,46% of the producers' education level was found as 8 years or below.

4.3.2. Vegetative Production Activities of the Enterprises

In the research area, it was determined that paddy, wheat, sunflower, and maize were produced at a significant level. Vegetative production area size was 2.378,3 ha in total; and amoung the other crops paddy was found as the most common product by 43,99%, wheat production was second by 21,18%, sunflower was third by 10,89%, maize was fourth by 9,25%, and silage maize was fifth by 3,08% (Table 13).

Table 13: Vegetative Production Pattern in the Research Area

	1st Layer		2nd Layer		3rd Layer		4th Layer		5th Layer		Total	
Products	Area Size (ha)	Ratio (%)	Area Size (ha)	Ratio (%)	Area Size (ha)	Ratio (%)	Area Size (ha)	Ratio (%)	Area Size (ha)	Ratio (%)	Area Size (ha)	Ratio (%)
Paddy	14,9	18,84	32,5	31,65	118,9	45,87	291,1	53,25	588,7	42,33	10.461	43,99
Wheat	11,4	14,41	25,7	25,02	62,1	23,96	100,7	18,42	303,8	21,85	503,7	21,18
Sunflower	16,8	21,24	18,6	18,11	3,5	1,35	41,4	7,57	178,8	12,86	259,1	10,89
Maize	12,2	15,42	4,3	4,19	13,7	5,29	53,0	9,69	136,8	9,84	220,0	9,25
Silage Maize	5,1	6,45	3,7	3,60	22,3	8,60	9,0	1,65	33,2	2,39	73,3	3,08
Tomato	9,1	11,50	1,7	1,66	7,5	2,89	12,0	2,19	27,0	1,94	57,3	2,41
Olive	0,0	0,00	4,1	3,99	1,9	0,73	1,2	0,22	43,5	3,13	50,7	2,13
Barley	1,0	1,26	2,7	2,63	9,0	3,47	16,0	2,93	21,5	1,55	50,2	2,11
Clover	2,4	3,03	0,0	0,00	3,2	1,23	6,3	1,15	14,2	1,02	26,1	1,10
Vetch	1,9	2,40	0,0	0,00	5,1	1,97	6,3	1,15	5,0	0,36	18,3	0,77
Pepper	2,7	3,41	1,7	1,66	0,5	0,19	0,6	0,11	10,1	0,73	15,6	0,66
Peach	0,0	0,00	1,5	1,46	1,5	0,58	0,6	0,11	11,2	0,81	14,8	0,62
Oat	0,0	0,00	2,5	2,43	1,2	0,46	3,5	0,64	6,5	0,47	13,7	0,58
Apple	0,0	0,00	0,0	0,00	0,0	0,00	0,0	0,00	9,5	0,68	9,5	0,40
Vine	1,3	1,64	1,8	1,75	2,7	1,04	1,7	0,31	0,0	0,00	7,5	0,32
Walnut	0,0	0,00	1,6	1,56	2,1	0,81	1,0	0,18	0,0	0,00	4,7	0,20
Italian Grass	0,0	0,00	0,0	0,00	2,5	0,96	0,0	0,00	0,0	0,00	2,5	0,11
Caramba	0,0	0,00	0,0	0,00	0,7	0,27	1,0	0,18	0,0	0,00	1,7	0,07
Cherry	0,0	0,00	0,3	0,29	0,0	0,00	1,3	0,24	0,0	0,00	1,6	0,07
Quince	0,0	0,00	0,0	0,00	0,0	0,00	0,0	0,00	0,8	0,06	0,8	0,03
Forage Pea	0,0	0,00	0,0	0,00	0,5	0,19	0,0	0,00	0,0	0,00	0,5	0,02
Melon	0,0	0,00	0,0	0,00	0,3	0,12	0,0	0,00	0,0	0,00	0,3	0,01
Almond	0,3	0,38	0,0	0,00	0,0	0,00	0,0	0,00	0,0	0,00	0,3	0,01
Total	79,1	100,00	102,7	100,00	259,2	100,00	546,7	100,00	1.390,6	100,00	2.378,3	100,00

In the first group, the sunflower production area was larger than the paddy production area, and in the fourth group, the proportional share of paddy in the vegetative production pattern was more than 50%.

Paddy production area size in the research area was determined as 1.046,1 ha in total for 2018, which was less than in 2016 and 2017. In other words, the paddy production area size decreased by 17,90% between 2016 and 2018 (Table 14). The main reasons producers stopped producing paddy were determined as; low sale prices, difficulties in paddy marketing, and high input prices.

Table 14: The Change in Paddy Production Area Size in the Research Area Between 2016 and 2018

Enterprise Groups	The Number of Units	Production Area Size (ha) (2016)	Production Area Size (ha) (2017)	Production Area Size (ha) (2018)
1	9	14,4	14,1	14,9
2	9	17,7	19,8	32,5
3	17	91,0	93,2	118,9
4	20	251,7	252,2	291,1
5	19	899,4	823,5	588,7
Total	74	1.274,2	1.202,8	1.046,1

The paddy productivity average of the research area was determined as 7,852 ton/ha. While the highest productivity was in the fifth group, the lowest productivity was in the first group

Table 15: Information about Paddy Production in the Enterprises

Enterprise Groups	Area (ha)	Production (ton)	Productivity (ton/ha)
1	14,9	109,090	7,322
2	32,5	248,360	7,642
3	118,9	930,530	7,826
4	291,1	2.245,940	7,715
5	588,7	4.679,865	7,947
Total	1.046,1	8.213,785	7,852

According to TSI data of 2018, the paddy productivity average of Turkey was 7,824 ton/ha, and was 7,554 ton/ha for Çanakkale City. In other words, the average productivity of the research area was higher than both the city and the country averages.

4.3.3. Paddy Gross Output Value of the Enterprises

Paddy Gross Output Values (GOV) of the enterprises in the research area are given in Table 16. It was determined that productivity and product sale prices were affective on GOV.

Table 16: Paddy Gross Output Values

Layers	Area Size (ha)	Production Amount (ton)	Productivity (ton/ha)	Total Paddy GOV (USD)	Average GOV (USD/ha)
1	14,9	109,090	7,322	55.699,64	3.738,24
2	32,5	248,360	7,642	126.668,47	3.897,50
3	118,9	930,530	7,826	503.436,89	4.234,12
4	291,1	2.245,940	7,715	1.172.056,62	4.026,30
5	588,7	4.679,865	7,947	2.498.700,36	4.244,45
Total	1.046,1	8.213,785	7,852	4.356.561,98	4.164,57

According to Table 16, the highest GOV was in the fifth group and the lowest GOV was in first group. Within the research area, the average paddy GOV for 2018 was calculated as 4.164,57 USD/ha.

4.3.4. Input Usage and Cost in Paddy Production

The input usage averages of the research area are given in Table 17.

Table 17: Input Usage for Unit Area in Paddy Production in Çanakkale City

Production Process	Process Month	Number of Applications	Manpower (dk./ha)		Material (kg-gr-cc-lt/ha)	Type of Material	Explanatio
			Human	Machine			
(A) Soil Preparation and Planting							
Plowing (deep)	November	2--3	262,0	262,0	61,50	diesel (lt/ha)	Plow
Second Plowing	March-April	2--3	170,0	170,0	25,40	diesel (lt/ha)	Gobble
Canal Preparation	April	1	424,0	424,0	78,00	diesel (lt/ha)	Laser-Levelin
Seeding Labor (hand)	April	1	227,0	0,00	0,000	manpower (min/ha)	min./ha
Seeding Labor (spreader)	April	1	156,0	156,0	6,30	diesel (lt/ha)	min./ha
Harrow	April	2--3	159,0	159,0	19,50	diesel (lt/ha)	Harrow
Total			1.398,0	1171,0			
(B) Care Works							
Fertilization	April	2	434,0	162,0	3,15	diesel (lt/ha)	min./ha
Fertilization	May-June	2				diesel (lt/ha)	
Foliar Fertilization	May-June	1			0,92	diesel (lt/ha)	Pulverizer
Pesticide Application (Herbicide)	May-June	3	218,0	218,0	2,27	diesel (lt/ha)	
Pesticide Application (Fungicide)	June	1			1,72	diesel (lt/ha)	

Pesticide Application (İnsecticide)	June	2			1,24	diesel (lt/ha)	
Irrigation	May-August	-	6,34	6,34	79,60	manpower(hour/ha)	USD/ha
Total			731,1	459,5			
(C) Harvest							
Harvest	Oct.-Sept.	1	154,0	154,0	53,50	diesel (lt/ha)	ha (combine harvester)
Transportation	Oct.-Sept.	1	266,0	266,0	4,27	USD/ton	ha
Drying	Oct.-Sept.	1	0,00	0,00	19,96	USD/ton	ha
Total			419,0	419,0			
(D) Various Inputs							
Seed (hand+spreader)	April	1	0	0	217,9	kg/ha	(hand:49 ent.; 455,4 ha; spre 25 ent.; 590,7
Chemical Fertilizer							
Base Fertilizer (pure)	April	1	0	0	162,80	kg/ha	(all enterprise
2nd Fertilization	May-Jun-July	1	0	0	108,00	kg/ha	(all enterprise
3rd Fertilization	May-Jun-July	1	0	0	77,80	kg/ha	(55 ent.; 861,2
4th Fertilization	May-Jun-July	1	0	0	22,00	kg/ha	(13 ent.; 227,5
5th Fertilization (foliar fer.)	May-Jun-July	1	0	0	0,94	lt/ha	(39 ent.; 612,7
Pesticide (fung.)	May-Jun-July	1	0	0	1,34	lt/ha	(54 ent.; 776,7
Pesticide (herb.-narrow leaved)	May-Jun-July	1	0	0	3,05	lt/ha	(65 ent.; 891,3
Pesticide (herb.-narrow leaved)	May-Jun-July	1	0	0	1,22	lt/ha	(45 ent..; 531, ha)
Pesticide (herb.-broad leaved)	May-Jun-July	1	0	0	2,66	lt/ha	(68 ent..;902 h
Pesticide (herb.-broad leaved)	May-Jun-July	1	0	0	1,94	lt/ha	(53 ent.;631,1
Pesticide (ins.)	May-Jun-July	1	0	0	0,46	lt/ha	(43 ent.; 519,3
Irrigation Cost (Cooperation)	April-Sept.	1	0	0	191,51	USD/ha	(59 ent.;920,6
Irrigation Energy Usage	April-Sept.	1	0	0	2.186,00	KW/ha	Irrigation Ene

Paddy production costs according to enterprise size are given in Table 18.

Table 18: Paddy Production Costs in the Research Area

Production Process	Process Month	Number of Applications	Cost Per Unit Area (USD/ha) Layers					
			1	2	3	4	5	Average
(A) Soil Preparation and Planting								
Plowing (deep)	November	2--3	131,18	127,97	139,69	139,64	136,46	140,94
Second Plowing	March-April	2--3	85,03	81,94	88,20	85,30	79,82	82,40
Canal Preparation	April	1	180,64	146,28	152,90	154,41	163,32	159,87
Seeding Labor (hand + spreader)	April	1	15,61	13,10	13,99	16,37	17,97	16,88
Harrow	April	2--3	52,21	49,40	42,96	43,65	40,47	42,09
Total			464,66	418,69	437,75	439,36	438,00	442,18
(B) Care Works								

Fertilization	April	2	33,94	35,90	33,03	33,97	31,03	32,27
Fertilization	May-June	2	16,39	14,36	13,88	22,34	18,53	18,89
Foliar Fertilization	May-June	1	4,70	3,74	7,82	8,55	8,89	8,46
Pesticide Application (Herbicide)	May-June	3	34,57	30,60	48,48	52,90	40,80	43,52
Pesticide Application (Fungicide)	June	1	12,36	7,04	5,26	4,65	5,50	5,39
Pesticide Application (İnsecticide)	June	2	6,10	13,67	23,52	12,45	6,77	10,47
Irrigation	May-August	-	225,95	223,79	175,30	164,48	154,17	162,63
Total			334,01	329,09	307,30	299,35	265,70	281,63
(C) Harvest								
Harvest	Sep.-Oct.	1	137,59	136,91	139,20	140,20	143,41	141,76
Transportation	Sep.-Oct.	1	30,45	34,61	34,90	32,56	33,67	33,48
Drying	Sep.-Oct.	1	136,75	152,85	151,67	145,48	165,72	157,68
Bagging	Sep.-Oct.	1	70,33	71,62	73,72	69,42	69,93	70,27
Total			375,12	395,99	399,49	387,66	412,72	403,19
(D) Various Inputs								
Seed (hand+spreader)	April	1	195,17	195,70	186,97	201,85	192,05	194,36
Chemical Fertilizer								
Bottom Fertilizer (pure)	April	1	95,52	88,24	97,57	84,68	90,49	89,67
1st Fertilazation	May-Juy	1	63,70	77,51	75,83	65,66	71,71	70,56
2nd Fertilazation	May-July	1	39,73	35,75	31,80	72,50	64,85	61,96
3rd Fertilization	May-July	1	5,84	2,38	7,35	17,68	13,07	13,27
4th Fertilization (foliar fer.)	May-July	1	5,21	2,85	5,72	19,67	14,25	14,30
Pesticide								
Pesticide (fung.)	May-Jun-Jul	1	42,60	30,16	21,58	21,00	19,00	20,53
Pesticide (herb.-narrow leaved)	May-Jun-Jul	2	40,20	47,68	60,18	67,59	81,67	73,67
Pesticide (herb.-broad leaved)	May-Jun-Jul	2	62,54	120,29	89,36	75,55	56,17	67,42
Pesticide (ins.)	May-Jun-Jul	1	3,63	7,86	9,82	4,65	3,43	4,63
Irrıgation Cost (Cooperation)	April-Sep.	1	82,25	59,11	42,12	71,18	98,13	94,12
License	April	1	4,54	4,54	5,92	7,71	11,80	9,67
Irrigation Energy Usage	April-Sep.	8-10	222,18	239,47	250,15	217,97	163,14	191,51
Total (USD/ha)			**863,10**	**911,54**	**884,36**	**927,70**	**879,75**	**905,66**
Total Cost (A+B+C+D) (USD/ha)			**2.036,90**	**2.055,32**	**2.028,89**	**2.054,07**	**1.996,21**	**2.032,67**
Circulating Capital Interest (%2,75) (USD/ha)			56,01	56,52	55,79	56,48	54,90	55,90
Total Variable Cost (D) (USD/ha)			**2.092,90**	**2.111,83**	**2.084,68**	**2.110,54**	**2.051,11**	**2.088,57**
General Administrative Expenses (%3) (USD/ha)			62,79	63,36	62,54	63,32	61,52	62,65
Ground Rent (USD/ha)			751,83	752,54	795,88	748,09	750,27	754,95
Total Fixed Expenses (E)			**814,63**	**815,90**	**858,42**	**811,42**	**811,80**	**817,60**

(USD/ha)							
Final Total Cost (D+E) (USD/ha)		**2.907,53**	**2.927,73**	**2.943,10**	**2.921,96**	**2.862,90**	**2.906,17**

The proportional share of variable costs in the final total cost was 71,87%, and was calculated as 28,13% for fixed expenses. The highest proportional share in the final total cost was found as ground rent with 25,98%. This was followed respectively by; soil preparation with 15,22%, harvest (including drying and bagging, and transportation) with 13,87%, irrigation water and irrigation energy usage cost with 9,83%, fertilization cost with 8,59%, and pesticide cost with 5,72%.

The monetary value average of inputs in paddy production was calculated as 905,66 USD/ha and was found lowest in the first group, and highest in the fourth group. The total cost average for unit area was 2.906,17 USD/ha. According to the enterprise size; this value was lowest in the fifth group, which was the largest enterprise group, and was highest in the third group.

In the research area, average paddy productivity was 7,852 tons/ha, the average sale price was 529,95 USD/ton, and the GOV for unit area was calculated as 4.161,03 USD/ha. The cost per ton was found as 370,24 USD. The gross profit value average was 2.072,47 USD/ha, and while this value was lowest in the first group, it was highest in the fifth group. Net profit values were found similar to the gross income values (Table 19).

Table 19: Gross and Net Profit Values of Paddy Production in Çanakkale City

Criterions	Layers					
	1	**2**	**3**	**4**	**5**	**Average**
Productivity (ton/ha)	7,32	7,64	7,83	7,72	7,95	7,85
Product Sale Price (USD/ton)	509,98	509,98	540,83	522,69	533,58	529,95
GOV (USD/ha)	3.733,83	3.897,22	4.232,69	4.032,74	4.241,65	4.161,03
Cost (USD/ha)	2.907,53	2.927,73	2.943,10	2.921,96	2.862,90	2.906,17
Cost (USD/ton)	397,46	382,94	375,68	379,31	359,35	370,24
Gross Profit (USD/ha)	1.640,93	1.785,39	2.147,99	1.922,18	2.190,56	2.072,47
Net Profit (USD/ha)	826,30	969,49	1.289,56	1.110,76	1.378,75	1.254,85

In this part of the study, some values that were found within the study such as; income, cost, gross profit, net profit, and cost/benefit ratio are compared with the previous studies about paddy production.

In the research that was carried out in Gulian State in Iran, data were collected from 105 paddy producers. According to research results; production cost per unit area was 3.156 USD/, gross profit was 1.642 USD/ha, net profit was 940 USD/ha, and cost/benefit ratio was

found as 1,29. Also, management and economic performance of the enterprises which were larger than 1 ha was found higher than the smaller scale enterprises (Pishgar-Komleh et.al, 2011).

In a study that was completed in Nigeria, data from 105 paddy producers were economically analyzed. In the study, income for unit area was found as 227,50 USD/ha and variable expenses were found as 126,10 USD/ha. The proportional share of labor cost in the production cost was 54%, gross profit was 101,40 USD/ha, and net profit was calculated as 98,55 USD/ha. Also, compared to other products, paddy production was found more profitable in the research area (Bwala et. al., 2018).

In a study carried out in Bangladesh on 140 paddy enterprises; paddy total income was 82.195 BDT, total cost was 59.994 BDT, gross profit was 25.468 BDT, net profit was 22.201 BDT, and cost-benefit ratio was found as 1.37. Also, cost-benefit ratio was found higher (1,43) in large scale enterprises (Akter et. al., 2019).

In a research conducted country wide in Turkey in 1996, data were collected from 294 paddy producers in 98 settlements. According to the research results, input usages in paddy production per unit area were found as follows; seed usage was 120-200 kg/ha, chemical fertilizer was 220-280 kg/ha, and herbicide usage was found as 30.860 cc/ha. Within the study, total cost was found between 1.287,60 USD and 2.189,20 USD/ha and paddy cost was found between 0,33 kg/USD and 0,40 kg/USD. The highest costs respectively were ground rent, pesticide, and chemical fertilizer. According to enterprise size; the lowest cost was found as 0,33 USD/kg in the enterprises which were 10 hectares and above, and the highest cost was found as 0,39 USD/kg in small enterprises which were 1 hectare or below. Furthermore, income of paddy per unit area was found as 702 USD/ha. This value was; 687 USD/kg for sugar beet, 197 USD/ha (hand picking) and 368 USD/ha (machinery harvest) for maize, and 234 USD/ha for sunflower. According to these findings, paddy was found to be the most profitable product compared to other products which grow in irrigated farming areas (Gaytancıoğlu and Sürek, 2001).

In a study carried out in Etah Province of India on 100 paddy producers, total paddy cost was found as 20.651,54 Rs (variable costs: 12.513 Rs., fixed expenses: 8.183,21 Rs.). Proportional distribution of costs were as follows; labor force was 34,60%, ground rent was 30,26%, animal manure and chemical fertilizers were 12,32%, energy cost was 5,57%, and irrigation/plant protection costs were 2,50% (Kumar, 2009).

In a study conducted in Malaysia, the cost-benefit ratio in paddy production was found as 1,68 with subsidies included, and was calculated as 1,37 without subsidies. The production

value per unit area was 9.150 RM and the production cost was found as 6.658,18 RM. Proportional distribution of costs were respectively as follows; ground rent was 39,05%, chemical fertilizer was 17,68%, machinery cost was 12,44%, pesticide cost was 10,37%, labor force was 9,23%, and labor cost was 7,27% (Muazu et.al., 2014).

In comparsion to the studies summarized above; paddy production cost for unit area in Çanakkale city (2.906,17 USd/ha) was found to be less (3.156 USD/ha), and gross profit and net profit were found higher than the values of Iran. Also, the cost-benefit ratio of the research (1,43) was higher than the study in Iran (1,29) (Pishgar-Komleh et.al., 2011).

Production cost, income, variable costs, gross profit, and net profit values were found higher than the study carried out in Nigeria (Bwala et.al., 2018). The other studies which were conducted in Bangladesh, India, and Malaysia were not included in the comparison, because local money currencies were used in those studies. In addition, the cost-benefit ratio of the research (1,43) was found closer to the ones in Malaysia and Bangladesh (1,37) (Muazu et.al., 2014; Akter et.al., 2019).

In a study carried out in Turkey, paddy production cost (0,33 USD/kg) was found closer to this research (0,37 USD/kg). Also, there were resemblances in both studies in terms of input usages (Gaytancıoğlu and Sürek, 2001).

Ground rent was found as the highest cost factor in paddy production in Çanakkale (25,89%). This ratio varied between 24,10% and 38,80% in Turkey, and was 39,05% for Malaysia; these ratios show parallelism with this research (Muazu et.al., 2014). In addition, findings about ground rent and fertilizer cost are very close to the study that was carried out in India (Kumar, 2009).

Subsidies provided for paddy in 2018 are given in detail in Table 20. According to the table, defficiency payments have the biggest share amoung other subsidies. Area based subsidy amount per unit area (diesel fuel, fertilizer, certified seed) was 94,37 USD/ha in total.

Table 20: Subsidies for Paddy (2018)

Subsidies	Unit	Unit Price
Diesel Fuel	(USD/ha)	72,60
Fertilizer	(USD/ha)	7,26
Defficiency	(USD/ton)	18,15
Certified Seed (Usage)	(USD/ha)	14,52
Certified Seed (Production)	(USD/ton)	45,37
Organic Production	(USD/ha)	54,45
Good Agricultural Practices	(USD/ha)	18,15
Soil Analysis	(USD/sample)	7,26

Source: TOB, 2019a. Tarımsal destekler. (erişim:https://www.tarimorman.gov.tr/Konular/Tarimsal-Destekler, 17.05.2019)

4.3.5. Effects of Agricultural Subsidies on GOV and Production Cost in the Research Area

According to the research results; there was an increase in GOV by 5,69% an increase in gross profit by 11,33%, and a decrease in production costs by 8,15% when area based subsidies (Diesel fuel, fertilizer, certified seed usage) and defficiency payments were included. Considering average values of the enterprises in the research area; gross profit per unit area was 2.072,47 USD, net profit was 1.254,85 USD, and the sale price average was calculated as 529,95 USD/ton. According to the gross profit value, it could be said that paddy production is a highly profitable agricultural activity in the research area (Table 21).

Table 21: Effects of Agricultural Subsidies on GOV, Cost, and Gross Profit in the Research Area

Criterions	Layers					
	1	2	3	4	5	Average
Subsidies						
Defficiency Payment (*)	132,89	138,69	142,03	140,02	144,28	142,50
Diesel Fuel Subsidy (**)	79,85	79,85	79,85	79,85	79,85	79,85
Certified Seed Usage Subsidy	14,52	14,52	14,52	14,52	14,52	14,52
Total Subsidy	227,26	233,07	236,41	234,39	238,66	236,88
Effect on Cost						
Cost	2.907,53	2.927,73	2.943,10	2.921,96	2.862,90	2.906,17
Total Cost.-Total Subsidy	2.680,27	2.694,66	2.706,70	2.687,57	2.624,26	2.669,31
Ratio (%)	-7,82	-7,96	-8,03	-8,02	-8,34	-8,15
Effect on GOV						
GOV	3.733,83	3.897,22	4.232,69	4.032,74	4.241,65	4.161,03
GOV+Total Subsidy	3.961,09	4.130,29	4.469,09	4.267,13	4.480,31	4.397,89
Ratio (%)	6,09	5,98	5,59	5,81	5,63	5,69
Effect on Gross Profit						
Gross Profit	1.640,93	1.785,39	2.147,99	1.922,18	2.190,56	2.072,47
Gross Profit+Total Subsidy	1.868,17	2.018,46	2.384,41	2.156,57	2.429,20	2.309,33
Ratio (%)	13,85	13,05	11,01	12,19	10,89	11,43
Effect on Net Profit						
Net Profit	826,30	969,49	1.289,56	1.110,76	1.378,75	1.254,85
Net Profit+Total Subsidy	1.053,56	1.202,56	1.525,99	1.345,17	1.617,40	1.491,72
Ratio (%)	27,50	24,04	18,33	21,10	17,31	18,88

(*): Multiplication of productivity per unit area (ton/ha) and subsidy value per unit (18,45 USD/ton).
(**): Considered as 79,86 USD/ha which is the total value of diesel fuel subsidy per unit area (72,60 USD/ha) and fertilizer subsidy per unit area (79,86 USD/ha).
(***): Considered as 14,52 USD/ha which is the certified seed usage subsidy value.

In a study, producers' behaviours about paddy supply depending on different agricultural policies were examined. Within the study, all the coefficients about policies were

found statistically significant which indicates that agricultural policies have effects on paddy supply. Considering unconditional elasticites; paddy supply amount was predicted to increase by 2,2% if defficiency payments increased by 10%, and supply amount was predicted to increase by 4,1% if input subsidies increased by 10%. Besides, if target price and single payment policies were put into practice, paddy supply amount was predicted to increase respectively by 2,4% and by 1,7%. According to the conditional elasticites that were calculated; paddy supply amount was predicted to increase by 0,7% if defficiency payments increased 10%, supply amount was predicted to increase by 1,3% if input subsidies increased 10%, and if target price and single payment policies were in practice, paddy supply amount was predicted to increase respectively by 0,8% and by 0,5% (Yavuz et.al., 2016).

4.3.6. Input Usage in Paddy Production

4.3.6.1. Labor Force Usage in Paddy Production

Labor and machinery usage values per unit area (ha) in paddy production are given in Table 22. According to the research results, around 120 hours of labor and machinery usage were needed in order to produce 7,852 ton/ha of paddy.

Table 22: Labor and Machinery Usage Values in Paddy Production (min/ha)

Operation	(Labor/Machinery)	1	2	3	4	5	Average
Deep Ploughing (plow)	Labor (min/ha)	230,0	280,0	238,8	266,5	284,7	262,0
	Machinery (min/ha)	230,0	280,0	238,8	266,5	284,7	262,0
Duplexing (gobble)	Labor (min/ha)	162,2	210,0	156,5	167,5	170,0	170,1
	Machinery (min/ha)	162,2	210,0	156,5	167,5	170,0	170,1
Channeling	Labor (min/ha)	452,2	396,7	502,9	434,5	343,2	424,3
	Machinery (min/ha)	452,2	396,7	502,9	434,5	343,2	424,3
Seeding	Labor (min/ha)	205,6	242,1	241,4 (14*)	215,0 (12*)	231,7(6*)	227,4(50*)
	Machinery (min/ha)	0,00	0,00	140,0 (3*)	163,8 (8*)	154,6(13*)	155,8(24*)
Harrow/Roller	Labor (min/ha)	130,0	152,2	176,5	159,5	158,4	158,6
	Machinery (min/ha)	130,0	152,2	176,5	159,5	158,4	158,6
Fertilization	Labor (min/ha)	416,7	444,4	402,4	496,0	398,9	433,6
	Machinery (min/ha)	165,6	172,2	170,6	148,0	162,6	162,0
Pesticide Spraying	Labor (min/ha)	248,9	258,9	174,1	186,0	256,8	218,0
	Machinery (min/ha)	248,9	258,9	174,1	186,0	256,8	218,0
Irrigation	Labor (min/ha)	120,9	109,3	86,9	68,2	51,7	79,7
	Machinery (min/ha)	120,9	109,3	86,9	68,2	51,7	79,7
Harvest	Labor (min/ha)	143,3	148,9	144,7	152,5	169,5	153,5
	Machinery (min/ha)	143,3	148,9	144,7	152,5	169,5	153,5
Transportation	Labor (min/ha)	322,2	261,1	326,5	265,0	186,8	265,5

	Machinery (min/ha)	322,2	261,1	326,5	265,0	186,8	265,5
Total	Labor (hour/ha)	**159,4**	**149,2**	**126,3**	**107,2**	**88,4**	**118,3**
	Machinery (hour/ha)	**151,8**	**140,6**	**120,8**	**100,6**	**83,2**	**112,5**

(*): The number of enterprises

4.3.6.2. Input Usage in Paddy Production

In the research area, paddy production amount per unit area was found as 7,852 ton/ha. In order to reach average productivity value; 217,9 kg of seed, 371,5 kg of pure manure, 10,7 lt of pesticide, and 262,6 lt of diesel fuel, were needed per hectare. Also required were 2.186 KW of electricity for irrigation, and 120 hours of machinery and labor force per hectare (Table 23).

Table 23: Input Usage in Paddy Production

Inputs	Unit	Layers					
		1st Layer	2nd Layer	3rd Layer	4th Layer	5th Layer	Average
Seed	(kg/ha)	215,7	226,9	212,1	215,7	219,7	217,9
Fertilizer	Pure Fertilizer (kg/ha)	351,5	334,6	366,5	375,9	372,9	371,5
	Total Fertilizer Amount (kg/ha)	1.031,9	1.031,1	1.036,2	1.115,4	1.108,3	1.098,6
Pesticide	(lt/ha)	9,5	14,9	12,5	11,6	9,6	10,7
Diesel Fuel	(lt/ha)	308,5	262,3	278,5	272,1	253,6	262,6
Electricity	(KW/ha)	2.613,6	2.736,9	2.830,7	2.458,4	1.879,8	2.186,0

5. Conclusions and Recommendations

Turkey has an important agricultural potential in the world with its unique ecological properties. As it is in other countries, Turkey is aiming to shape agricultural production with different policies and subsidies. The agricultural subsidy amount is not going beyond 0,5% of the national income, despite that this amount is resolved to be 1% by the agricultural laws of Turkey. Turkey is a self-sufficient country in some agricultural products; meanwhile, it's an importer country in other products such as rice, due to the supply amount not meeting the demand.

According to FAO data of 2016, the global foreign trade value of rice was around 21 billion USD. Turkey's proportional share in this value was 0,55% in import, and 0,20% in export. Although Turkey's paddy production amount was around 900.000 tons in 2017 (equal to 550.000 tons of rice), in the same year the paddy and rice import value was 136,4 million USD.

According to TSI data of 2018, the research area of Çanakkale provides around 7% of Turkey's paddy production amount. The base of the research was data from 74 paddy enterprises which were chosen by means of the Stratified Sampling Method.

Enterprises within the research are commonly growing paddy, wheat, sunflower, and maize. The vegetative production area size in 2018 was 2.378,3 ha in total, and paddy was the main product by 43,99% which produced 8.813,875 tons of paddy in a 1.046,1 ha area. In the research; the average paddy production area size was 14,14 ha, average productivity was 7,852 ton/ha, the paddy GOV average was 58.872,46 USD, the product sale price average was 529,95 USD/ton, and paddy income per unit area was found as 4.164,57 USD/ha.

In the research area the subsidy utilization rate was; 92% in deficiency payments, 91% in diesel fuel and fertilization subsidies, and only 69% in certified seed usage subsidy which indicates that producers don't have enough awareness about certified seed usage.

Paddy production cost per unit area was 2.906,17 USD/ha, gross profit was 2.072,47 USD/ha, net profit was 1.254,85 USD/ha, and the cost/benefit ratio was calculated as 4,43. Paddy was found more profitable compared to the gross profit values of other field crops grown in Çanakkale.

In the research, it was calculated that GOV could be increased by 5,69%, gross profit could be increased by 11,33%, and costs could be decreased by 8,15% if subsidies are fully utilized.

Paddy production is an intensive farming activity which requires a high level of input usage. In order to produce 7,852 tons/ha of paddy; 217,9 kg seeds, 371,5 kg pure fertilizer, 10,7 lt agricultural pesticide, and 262,6 lt disesel fuel were needed per hectare. Also required were 2.186 KW electricity for irrigation, and 120 hours of manpower and machine power per hectare. These values indicate that paddy production requires more capital compared to other products.

Despite producers' perspectives being mostly positive about paddy production, there are some obstacles that prevent the extension of paddy production areas. Such obstacles are; an increase in input prices in recent years, insufficient capital, and a low amount of subsidy payments.

In order to increase the paddy production amount in Çanakkale city; subsidies such as diesel fuel, fertilizer, and deficiency payments should be revised according to present conditions, and certified seed usage should be extended. In addition, taking financial and legal precautions about product trade is important to provide the producers with an environment of trust.

6. References

AKTER, T.; PARVIN, T.; MILA, F.A.; NAHAR,A. Factors determining the profitability of rice farming in Bangladesh. *J Bangladesh Agril Univ. v*. 17, n. 1, p. 86–91.2019.

ALEMDAR, T.; SEÇER, A.; DEMİRDÖĞEN, A.; ÖZTORNACI, B.; AYKANAT, S. Çukurova Bölgesinde Başlıca Tarla Ürünlerinin Üretim Maliyetleri ve Pazarlama Yapıları. GTHB Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü (TEPGE) (Proje No: Ç.Ü.-ZF2011BAP7). TEPGE Yayın No: 230. Haziran. Ankara. 134 s. (access: http://arastirma.tarim.gov.tr/tepge/Lists/Duyuru/Attachments/10/CukurovaBolgeBaslicaTarlaMaliyetPazarlamaYap%C4%B1.pdf).2014.

AZARPOUR, E.; MORADİTOCHAEE, M. A Comparative Study on Energy Use and Cost Analysis of Rice Varieties Under Traditional and Semi-Mechanized Farming Systems in North of Iran. Biomass Now, Sustainable Growth and Use (Edited by Miodrag Darko Matovic), Intech Open, Published: April 30th 2013.

BWALA,M.A.; ANIOBI, U. J. Profitability analysis of paddy production: A case of agricultural zone 1, Niger State Nigeria. Journal of Bangladesh Agricultural University. *J. Bangladesh Agril Univ* v. 16, n. 1, p. 88–92. 2018

CAN, V.; BAYTEKİN, H. Çanakkale'de Çeltik Tarımı Sorunları ve Çözüm Önerileri. Çanakkale Tarımı Sempozyumu (Dünü, Bugünü ve Geleceği). 10-11 Ocak 2011, Çanakkale. s.87-94. 2011.

ÇİÇEK, A.; ERKAN, O. Tarım Ekonomisinde Araştırma ve Örnekleme Yöntemleri. GOP Ün. Ziraat Fak. Yay. No:6,Tokat. 1996.

ERDEM, B. Trakya Bölgesi'nde Buğday, Ayçiçeği ve Çeltiğin Üretim ve Pazarlama Sorunlarının Analizi**.** Namık Kemal Ün. Fen Bil. Enst. Tarım Ekonomisi Anabilim Dalı. (Basılmamış Doktora Tezi). 127 s. 2012.

FAO. Bitkisel üretim istatistikleri. (access: http://www.fao.org/faostat/en/#data/QC, 29.04.2019).2019a.

FAO. Bitkisel ve hayvansal ürünler ticareti istatistikleri. (access: http://www.fao.org/faostat/en/#data/TP, 30.04.2019).2019b.

GAYTANCIOILU , O; SÜREK, H. Input use and production cost in rice cultivation in Turkey. In : Chataigner J. (ed.). Research strategies for rice development in transition economies. Montpellier : CIHEAM, 2001. p. 95-104 (Cahiers Options Méditerranéennes; n. 50, access: http://om.ciheam.org/om/pdf/c50/03400009.pdf).2001.

GÜNGÖR, H.; SEMERCİ, A. Edirne İli Çeltik Üretiminde Verimlilik Analizleri. *MPM Verimlilik Dergisi*, S.2000/2, Ankara, s.191-204.2002.

GÜNGÖR, B. Trakya'da Tarımsal Yapı, Üretim ve Başlıca Ürünlerde Verimlilik Analizleri. Namık Kemal Ün. Fen Bil. Enst. Tarım Ekonomisi Anabilim Dalı. (Basılmamış Yüksek Lisans Tezi). 107 s. 2007.

İNAN,İ.H.Tarım Ekonomisi ve İşletmeciliği. İdeal Kültür&Yayıncılık. İstanbul. 415 s. 2016.

IGC. Five-year baseline projections of supply and demand for wheat, maize (corn), rice and soyabeans to 2022/23. International Grains Council. London, England. 32 p. (access:https://www.igc.int/en/markets/marketinfo-forecasts.aspx, 27.04.2018).2017.

KUDAL,G.Ç.Edirne İlinde Çeltik Üretim ve Destekleme Politikalarının İncelenmesi. Çanakkale Onsekiz Mart Üniversitesi Fen Bilimleri Enstitüsü Tarım Ekonomisi Anabilim Dalı. Yüksek Lisans Tezi. Çanakkale. 45 s.2019.

KUMAR, V. An Economic Analysis of Cost of Production of Paddy in Different Farm Size Groups. *Plant Archives v. 9, n.* 1, p. 197-198. 2009.

MUAZU, A.; YAHYA, A.; ISHAK, W.I.W.; KHAİRUNNİZA-BEJO,S. Machinery Utilization and Production Cost of Wetland, Direct Seeding Paddy Cultivation in Malaysia. *Agriculture and Agricultural Science Procedia v. 2, n. 2014, p. 361–369.* 2014.

OĞUZ, C.; KARAKAYACI,Z. Tarım Ekonomisinde Araştırma ve Örnekleme Metodolojisi. Atlas Akademi Yayınları. Sert. No.:15833. Konya. s.68. 2017.

ÖZKAN, B.;YILMAZ, İ.Tek Yıllık Bitkiler İçin Maliyet Hesaplamaları: Mevcut Durum, Sorunlar Ve Öneriler. *Tarım Ekonomisi Dergisi, Sayı 1999/4: 64-80*. 1999.

PISHGAR-KOMLEH, S.H.; SEFEEDPARI, P.; RAFIEE, S. Energy and economic analysis of rice production under different farm levels in Guilan province of Iran. *Energy v.* 36, p. 5824-5831. 2011.

SEAL, A.; BERA, R.; CHOWDHURY, R.R.; MUKHOPADHYAY, K.; MUKHERJEE, S. Productivity, Energy Use Efficiency and Economics of Organic Scented Rice Cultivation in Sub-Humid Agroecosystem. *Asian Research Journal of Agriculture 3(4): 1-11*.2017.

SEMERCİ, A. Trakya'da Tarımsal Yapı ve Başlıca Ürünlerde Verimlilik Analizleri. Trakya Üniversitesi Fen Bil. Enst. Tarım Ekonomisi Anabilim Dalı. (Basılmamış Doktora Tezi), Edirne, 249 s. 1998.

SEMERCİ, A.; EVEREST, B.;TAN, S. Türkiye'de Çeltik Ekim Alanları, Üretim Miktarı ve Verim Değerlerinde Meydana Gelen Değişimlerin İncelenmesi. International Balkan and Near Eastern Social Sciences Congress Series XI. IBANESS Congress Series, March 09-10, 2019 Tekirdağ, Turkey, pp.107-113.2019.

SEZER, İ.; AKAY, H.; ÖNER, F.; ŞAHİN, M. Çeltik Üretim Sistemleri. *Türk Bilimsel Derlemeler Dergisi v.* 5, n. 2, p. 6-11.2012.

ŞAPALOĞLU, A. Pirinç Üretim - Tüketim Zincirinde Pazarlama Kanallarının Yapısı ve Pirinç Pazarlama Marjları: Edirne İli Örneği. Namık Kemal Ün. Fen Bil. Enst. Tarım Ekonomisi Anabilim Dalı. (Basılmamış Yüksek Lisans Tezi). 157 s. 2015.

TCMB. The Central Bank of the Republic of Turkey. (Indicative Exchange Rates Announced at 15:30 on 10/31/2018 by the Central Bank of Turkey, erişim: https://www.tcmb.gov.tr/kurlar/kurlar_tr.html, erişim tarihi:15.10.2019). 2019.

TOB. 2016 Yılı Hububat Sektör Raporu. Toprak Mahsulleri Ofisi Genel Müdürlüğü. 61 s. (access:http://www.tmo.gov.tr/Upload/Document/hububatsektorraporu2016.pdf, 27.04.2018). 2017.

TOB. Tarımsal Destekler (fark ödemesi destekleri). Tarım ve Orman Bakanlığı. (access: https://www.tarimorman.gov.tr/Konular/Tarimsal-Destekler/Fark-Odemesi-Destekleri. Erişim tarihi: 16.04.2019). 2019a.

TÜİK. Veritabanı/Tarım/Bitkisel Üretim İstatistikleri. (tahıllar üretim bilgileri). (access: https://biruni.tuik.gov.tr/medas/?kn=92&locale=tr, 05.05.2019). 2019.

YAMANE, T. Temel Örnekleme Yöntemleri. Literatür Yayınları (çev. A. Esin). İstanbul, s.528. 2010.

YAVUZ, G.G.; MİRAN, B.; GÜRER, B.B.; YÜKSEL, N.Y.; DEMİR, A. Buğday, Dane Mısır ve Çeltik Üretiminde Fark Ödemesi Desteklerinin Etkisi. GTHB TEPGE Yayın No: 266, Ankara. 168 s. 2016.

YILMAZ, İ. Tarım İşletmelerinde Sabit Sermaye Faiz Masrafının Hesaplanması. *Çukurova Üniversitesi Ziraat Fakültesi Dergisi*, v. 12, n. 1, p. 187-194. 1997.

YILMAZ, İ.; YILMAZ, S. Pamukta Üretim Maliyeti Hesaplama Yöntemlerinin Karşılaştırılması. *Tarım Ekonomisi Dergisi, Sayı 1999/4: p. 43-52*. 1999.

7. Acknowledgements

This research was financially supported by Çanakkale Onsekiz Mart Üniversity, Scientific Research Projects Coordination Unit (Project No: FBA-2018-2605), and it was technically supported by Republic of Turkey, Ministry of Agriculture and Forestry, Çanakkale Directorate of Provincial. I would like to thank Assist. Prof. Dr. Bengü EVEREST for the support during the survey research.