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Input use and production cost in rice cultivation in Turkey

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Introduction

Although, all geographical regions in Turkey ecologically are suitable for rice cultivation and grain yield Per unit area is higher than the world average. The rice production in Turkey is not enough for the domestic consumption.

Rice consumption in Turkey started to increase after the second part of 1980 and it reached around 6 kg Per capita in the last years. Rice production drastically decreased at the same period, owing to two factors; a drought occurred between 1985 and 1994, resulting in a shortage of irrigation water; and there was protection against rice imports, for example, in the form of taxes, such production was lifted or reduced in 1984, thus allowing low-cost rice imports. Domestic production costs were higher than the price of imported rice and so the farmers abandoned rice cultivation in some regions, both because of the shortage of irrigation water and because of high production costs. Therefore, rice imports increased in the last decade, it was around 30.000 tons Per year before 1980's, however, it became more than 200.000 tons Per year in the last years (Sürek, 1998). According to the data of 1997, more than 50% of rice consumption supplied by importing from abroad (Gaytancioilu, 1997). In general, rice is imported from United state, Egypt, Italy, Spain, and Tayland etc.

The objectives of this study were to examine the input use and to determine production cost at the farmer level in the rice growing regions.

I – Material and method

1. Material

The data for this study have been collected from primary and secondary sources. In order to find out the dimensions and the characteristics of rice farm in the regions, the information has been gathered from the rice growers.

The information obtained from the rice growers throughout the country was the primary data source of the research. Generally, the major part of this information has been gained from the farmers by interviewing face to face.

The literature published on rice production, consumption, and economy were utilized as secondary data source. Some data have also produced from various state organisations such as TMO (a state establishment buying agricultural crops from the farmers), DIE (State Statistics Institute), and The Ministry of Agriculture.

2. Methods

There was 54.499 ha rice growing area in 1996 in Turkey (Anonim, 1997). The research was conducted in the rice growing areas of Edirne, Samsun, Çorum, Sinop, Kastamonu, Balıkesir, Çanakkale, Diyarbakır, and Mardin provinces in 1996, these provinces had 91.3% of total growing area and 92.7% of rice production in 1996. In order to take the suitable number of examples from the rice farmers, the information for the number of farmer and growing area was taken from the extension service of each province. The regions where the study conducted, were Thrace, south Marmara, Black Sea, and South-eastern Anatolia.

Except Edirne, the provinces included in this research had farms which were difference in size. Thus, "Simple Random Sampling" for Edirne and "Layered Sampling" for the other provinces were used, respectively.

The research was carried out in 56 village areas of Edirne, and 42 village areas of the other provinces. According to the data of 1996, only Edirne had 42% of total rice production area of Turkey. While, the other provinces included in this study had 49% of it. Three rice producers were taken from each district, therefore, total 294 farmers in 98 districts answered the questionnaires.

A data base was created in Excel computer program to be analysed the data obtained from 294 questionnaires. After computerizing the data, they were assessed at the regional base. Thus, it could be possible to make separately interpretation for each region.

Rice production cost was found out for each village and each farm. The production costs were classified separately according to regions and farm size.

II – Results and discussion

The data that have been obtained through the questionnaires, were evaluated under several subheadings, such as agricultural input use, labour use, rice marketing, production cost, and the problems of rice production.

1. Agricultural input use

A. Seed

In general, the farmers use the domestic produced seed. The seed rate is 120-130 kg Per ha in south-eastern Anatolia and it is between 180 and 200 kg Per hectare in the other regions. As it seen in Table 1, Baldo and Rocca varieties are grown in Thrace and south Marmara regions, whereas, Ribe, Krasnodarsky-424, and Serhat-92 varieties are cultivated in the Black region.

The farmers change seed for certified seed every three years. However, some farmers have difficulties in supplying certified seed. Thus, they supply their seed from neighbouring farm.

Table 1. The varieties cultivated in the regions is 1996

Regions	Variety (%)							Total
	Baldo	Rocca	Ribe	Krasnodarsky	Veneria	Serhat-92	Other	
Thrace	62.4	37.6	-	-	-	-	-	100.0
South Marmara	89.0	11.0	-	-	-	-	-	100.0
Black Sea	4.0	24.7	28.4	27.7	-	10.2	5.0	100.0
South-eastern Anatolia	-	-	-	-	-	-	100.0	100.0
General	38.5	32.3	9.2	10.0	2.3	4.6	3.1	100.0

B. Fertilizer

There were great differences among the regions in terms of the fertilizer use. For example, while, diammonium phosphate and ure fertilizers were used in Black Sea region and 20.20.0, 15.15.15 compound and ammonium nitrate were applied in south Marmara. However, ammonium sulfate, ammonium nitrate, and 20.20.0 compound fertilizers were used in Thrace region. The majority of the farmers cultivate the crop without applying fertilizer in the south-eastern Anatolia.

In order to know that how much fertilizer were used by the farmers, a question was asked to them "How much fertilizer do you use Per hectar?" It was found out that there was a great difference in nitrogen fertilizer use between recommended and applied rate (Table 2). It was two times higher than the recommended dosage in Thrace and Black Sea regions. This creates lodging and poor grain quality problems. On the other hand, it increases the production cost.

Furthermore, it adversely affects the country economy and the environment.

Table 2. The amount of applied fertilizers in the regions (active substance kg/ha)

Regions	N		P		K	
	Recommended	Applied	Recommended	Applied	recommended	Applied
Thrace	160-180	313	60-80	106	-	42
S. Marmara	160-180	202	60-80	35	-	28
Black Sea	160-180	329	80-100	187	-	-
S. Anatolia	140-160	39	70-90	9	-	-
General	160-180	291	60-100	125	-	39

C. Herbicide

In general, three kinds of herbicides, *monilate*, *thiobencarb*, and *propanil*, are used in rice cultivation in Turkey. The recommended doses and actual used rates of herbicide were given in Table 3. The farmers apply the thiobencarb and propanil at the recommended rate, however, there were very high differences between recommended and applied doses for monilate. Also, there were differences in the amount of applied herbicide among the regions. Rice is cultivated without herbicide application in south-eastern Anatolia. Herbicide application in high dosage increases the production cost and creates environmental pollution as well.

Table 3. The herbicides used in rice cultivation (active substance as cc/ha)

Regions	Molinate		Thiobencarb		Propanil	
	Recommended	Applied	Recommended	Applied	Recommended	Applied
Thrace	5 000	9 500	5 000-8 000	7 000	9 000-15 450	17 850
S. Marmara	5 000	9 680	5 000-8 000	Not used	9 000-15 450	13 670
Black Sea	5 000	5 970	5 000-8 000	5 500	9 000-15 450	15 960
S. Anatolia	5 000	No use	5 000-8 000	No use	9 000-15 450	No use
General	5 000	8 020	5 000-8 000	6 280	9 000-15 450	16 560

Source: Recommended doses have been prepared from the bulletin of Yücer, M.M., 1995 "Agricultural Chemicals" (TST Association).

D. Credit requirement

Rice cultivation in Turkey is more costly than the other many crops. The farmers spend a lot of money to grow rice. Therefore, they always need credit from soil preparation to harvest. According to the results of this research, 88.6% of rice farmers use credit. On the other hand, 92.4% of credit users stated that the

credit was not sufficient. As it seen in table-4, the majority of the farmers need credit to supply inputs, such as seed, fertilizer, and herbicide etc. And they also use credit for soil preparation and planting. The need at harvesting is not as much as the other period.

Table 4. The credit using time of the rice producers

Regions	Input Supply (%)	Soil preparation and planting (%)	Harvest (%)	No idea (%)	Total (%)
Thrace	65.5	25.3	5.4	3.7	100.0
South Marmara	71.4	28.6	-	-	100.0
Black Sea	77.6	12.2	-	10.2	100.0
South-eastern Anatolia	25.0	-	75.0	-	100.0
General	59.1	24.9	12.1	3.9	

E. Labour use

Labour demand for rice farming is more than the other crops as well. The machine is not used as widely in rice cultivation as for other crops in Turkey. Beside, the machine use, the labour is employed in rice cultivation from soil preparation to harvest (Table 5).

The family labour force was used in all rice growing regions for seeding, fertilizing, and herbicide application. Since, farm size was smaller in Black Sea and south-eastern Anatolia than Thrace and Southern-Marmara regions. Using the family labour force was much more than the hired labour in these regions. On the contrary, the hired labour was employed more than family labour force in Threca and southern-Marmara.

Table 5. The Sources of labour employed in rice cultivation

Regions	Family	Family + hired labour	Hired labour	Total
Thrace	10.0	70.0	20.0	100.0
S. Marmara	-	71.4	28.6	100.0
Black Sea	52.0	26.0	22.0	100.0
South-eastern Anatolia	62.5	27.5	-	100.0
General	28.5	49.9	20.8	100.0

F. Machinery use

According to the results of this research, 47% of the farmers had suitable equipment for rice cultivation (Table 6). The percentage of machinery use changes among the regions while it was more than 55% in Thrace and south Marmara, and.

Table 6. Machinery use in rice cultivation

Regions	Suitable equipment (%)	No suitable equipment (%)	Total
Thrace	55.4	44.6	100.0
S. Marmara	57.1	42.9	100.0
Black Sea	30.8	69.2	100.0
South-eastern Anatolia	-	100.0	100.0
General	47.6	53.4	100.0

30% in Black Sea regions respectively. There was no machinery use in south-eastern Anatolia.

2. Rotation in rice cultivation

Recommended rotation system in rice is as 2 or 3 years rice and 2 years the other crop cultivation. However, the results of this study showed that rice was cultivated without rotation for a long time in the same field (Table 7).

Table 7. Rotation in rice cultivation

Regions	Average rotation time (year)	Explanations
Thrace	6.3	Rice cultivation in same field for 3 to 15 year
S. Marmara	4.3	Rice cultivation in same field for 2 to 6 year
Black Sea	24.1	Rice cultivation in same field for 3 to 40 year
South-eastern Anatolia	17.1	Rice cultivation in same field for 2 to 30 year

The Black Sea region had the longest average rotation time (24 years). In some area, rice has been grown for 40 years at the same fields and rotation time various between 3 and 40 years in this region. The south-eastern Anatolia had the second longest average rotation time (24 years).

The rotation was applied more frequently in Thrace and south Marmara than the other rice growing regions. The reasons for not applying rotation are:

- Rice is a high income crop in irrigated areas.
- It is very difficult and expensive investment to change rice field for the other crops.
- Rice is a more profitable crop in the fields where salinity and alkalinity problems are.

A. Rice production cost

Rice production cost was determined in all villages included in this study in 1996. The cost of one kg rough rice was calculated and also the share of each input was studied as well (Table 8).

The land rent had the highest share in production cost. its percentage various between 24.1% and 38.8% among regions. There is a certain amount of area in Turkey for rice cultivation. However, there are many farmers who are eager to produce rice. It increases demand for rice field and makes very expensive land rent.

South-Marmara region had the cheapest rice production cost (0.30 US\$/kg) and Thrace and Black Sea regions follow it with 0.33 US\$/kg. Because of low grain yield Per hectare, the most expensive production cost was in south-eastern Anatolia.

The rice production cost various depending on farm size. It was higher in small farms than in larger farms (Table 10).

Table 8. Rice production costs in the regions in 1996

Expenses	Expenses spent per hectare (US \$)							
	Thrace	%	S. Marmara	%	Black Sea	%	S. Anatolia	%
Field Rent	700.0	31.9	500.0	24.5	500.0	24.10	500.0	38.8
Licence (Hygienic precautions)	2.8	0.1	3.0	0.1	1.5	0.07	2.5	0.2
Fertilizer	150.0	6.9	135.0	6.6	110.0	5.30	41.3	3.2
Fertilizing labour	15.0	0.7	7.5	0.4	20.0	0.90	5.0	0.4
Seed	120.0	5.5	80.0	3.9	90.0	4.30	48.0	3.7
Water	75.0	3.4	75.0	3.7	80.0	3.90	50.0	3.9
Irrigation labour	25.0	1.1	35.0	1.7	50.0	2.40	50.0	3.9
Chemicals	200.0	9.1	200.0	9.8	150.0	7.20	-	-
Agrical. Chemic. Labour	20.0	0.9	30.0	1.5	40.0	1.90	-	-
Ploughing	80.0	3.7	100.0	4.9	75.0	3.70	-	-
Preparation of levees	70.0	3.2	100.0	4.9	75.0	3.70	-	-
Preparation of canals	50.0	2.3	50.0	2.4	50.0	2.40	-	-
Sowing	10.0	0.5	20.0	0.9	10.0	0.50	5.0	0.4
Harvesting	100.0	4.6	100.0	4.9	150.0	7.40	120.0	9.3
Drying	20.0	0.9	50.0	2.4	60.0	2.90	30.0	2.3
Bagging	20.0	0.9	50.0	2.4	20.0	0.90	20.0	1.6
Transfer to threshing area	15.0	0.7	25.0	1.2	40.0	1.80	40.0	3.1
Transfer to store	10.0	0.5	25.0	1.2	50.0	2.40	30.0	2.3
Transfer to market	10.0	0.5	6.5	0.3	17.5	0.80	30.0	2.3
Guarding fees	5.0	0.2	5.0	0.2	15.0	0.70	15.0	1.2
Bag and rope expenses	32.0	1.4	15.0	0.7	30.0	1.40	10.0	0.8
Other expenses	5.0	2.3	50.0	2.3	50.0	2.40	50.0	3.9
TOTAL	1 779.8	-	1 662.0	-	1 688.2	-	1 046.8	-
Normal interest of expenses (20%)	356.0	163.	332.4	162.0	337.6	165.00	209.4	163.0
General admin. exp. (3%)	53.4	24.	49.9	24.0	51.0	25.00	31.0	24.0
General total of expenses	2 189.2	100.	2 044.3	100.0	2 076.5	100.00	1 287.6	100.0
Yield per hectare (kg)	6 610		6 720		6 310		3 250	
Production cost of one kg rice (\$/kg)	0.33		0.30		0.33		0.40	

Table 10. The production costs classified according to farm size (US \$/kg)

Farm size (Ha)	Farm (no)	Lowest	Highest	Average	95% confidence limit	
					Low limit	High limit
0-1.0	18	0.39	0.42	0.39	0.39	0.40
1.1-2.5	27	0.37	0.41	0.38	0.38	0.39
2.6-5.0	18	0.34	0.38	0.36	0.35	0.36
5.1-10.0	22	0.32	0.38	0.35	0.34	0.36
More than 10	13	0.27	0.36	0.33	0.31	0.34
General	98	0.27	0.42	0.37	0.36	0.37

B. Rice marketing

In general, the rice crop is bought by miller and TMO from the farmers as rough rice. After processing in the milling factory, they sell it in food market as milled rice. Also some farmers have their rough rice milled in processing factory, after then, they sell it themselves in the market as milled rice (11).

Most of rough rice is bought by the miller (67.7%), TMO follows it. The millers have high influence on determining rough rice price in the market. TMO buys rough rice to subsidize the farmers during harvesting time. The subsidization price is determined by the government.

Most of the farmers sell their crop just after harvesting, however, some of them store the crop for a few months to sell with a good price. Generally, small size farms sell the crop during harvesting, because they need cash money for paying credit debt and their family need. Large farm owners may store some of their crop for 3-5 months.

Table 11. Rice marketing in 1996

Regions	Miller (%)	TMO (%)	Milled by the grower (%)	Total
Thrace	73.2	23.2	3.6	100.0
S. Marmara	78.6	14.3	7.1	100.0
Black Sea	57.8	25.0	19.2	100.0
South-eastern Anatolia	75.0	-	25.0	100.0
General	67.7	17.7	14.6	100.0

C. The reason for rice cultivation

Although some farmers were not satisfied with rice price determined by the government, they have been continued to grow rice. The reasons for this:

- their fields have been prepared to grow rice, and
- rice has higher gross income Per unit area than the alternative crops.

To get the farmers' idea about rice cultivation, a question asked to them "why do you grow rice ?" and their answers were given in Table 12.

63.8% of the rice farmers in Turkey are satisfied with rice gross income.

They think that rice gives a good gross income. Even though, some farmers are not happy about rice income, they continue to grow rice because their fields prepared for rice cultivation and their equipment are only suitable for rice farming. To change this situation for the other crops is very difficult due to high investment cost.

When the rice net profit compared with other irrigated alternative crops, as it seen in Table 13, rice brings higher net profit from the unit area. Sugar beet follows it.

Table 12. The Reason for rice cultivation

Regions	Good Income (%)	Suitable Field and equipment (%)	Total
Thrace	64.3	35.7	100.0
S. Marmara	71.4	28.6	100.0
Black Sea	59.6	41.4	100.0
South-eastern Anatolia	74.8	25.2	100.0
General	63.8	36.2	100.0

Table 13. The production costs and selling prices of the competitor crops to rice in 1996 (US \$/kg)

Crop	Production costs	Selling prices	Net profit per hectare (\$)
Rice	0.33*	0.47*	702
Sugar beet	0.03	0.04	687
Manually harvested corn	0.16	0.18	197
Combine harvested corn	0.13	0.18	368
Irrigated sunflower	0.25	0.33	234

* Rice production and selling cost are the averages of 294 producers included in this study.

D. Problems of rice Productions

The results of this study stated that the most important problems faced in rice cultivation were:

- Water shortage
- Low imported rice price
- Expensive or costly input use
- Unprofitable rice price

The farmers considered that the most influential problem for rice production was to use expensive or costly input, as it mentioned before, they also use inputs in excessive dosage, such as fertilizer and herbicide. It aggravates this situation (Table 14).

The second important problem was low imported rice price. Domestic production cost were higher than the price of imported rice. Therefore, to compete with imported rice was very difficult. The farmers may not sell rice with desired or expected price due to competition.

Table 14. The problems of rice production

Regions	Expensive input (%)	Low imported rice price (%)	Unprofitable rough rice selling price (%)	Water shortage (%)	Total
Thrace	23.2	30.4	12.5	33.9	100.0
S. Marmara	14.3	42.9	35.7	7.1	100.0
Black Sea	57.8	13.5	26.9	1.8	100.0
South-eastern Anatolia	37.5	-	50.0	12.5	100.0
General	36.6	24.4	22.9	16.1	100.0

An other constrain was water shortage, the rice growing area in Turkey is fluctuating depending upon available irrigation water. Rice is grown under continuous irrigation with full water control. The crop can suffer from drought or water shortage owing to other causes. The reasons for this problem are:

- ❑ farmers sow rice over too wide an area when rice price are very high and profitable, thus, there is insufficient irrigation water for good growth; and
- ❑ low water accumulation in dams or less river flow owing to low rainfall.

In order to produce rice, the farmers spend too much money, and they think rice a very high profitable crop, thus, they always expect to sell rice with a high profitable cost. Even though, 22.2% of producers considered that rice cost was not profitable. Rice still is a high income crop in some irrigated areas, there is no an other alternative crop to it.

Conclusion

There were a great differences among the regions in terms of the fertilizer use. In general, the farmers applied nitrogen in excessive dosage, there was a high difference between recommended and applied rate. The farmers also use herbicides in high rate as well. These increase the production cost and create environmental problems.

Rice production in Turkey is more costly than the other many crops. Therefore, majority the rice farmers always need credit from soil preparation to harvest.

The machine is not used as widely in rice cultivation as for other crops in Turkey. Only 47.6% of the farmers have suitable equipment for rice farming. Thus, the labour is employed from soil preparation to harvest. The family labour force is used in all rice growing regions.

Recommended rotation system in rice is as 2 to 3 years and 2 years the other crop cultivation. However, the results of this study showed that rice was cultivated without rotation for a long time in the same field.

South-Marmara region had the cheapest rice production cost (0.30 US \$/kg) and Thrace and Black sea regions follow it with 0.33 US \$/kg. Because of low grain yield Per hectare, the most expensive production cost was calculated in south-eastern Anatolia.

Most of rice crop is bought by miller and TMO from the farmers as rough rice. Also, some farmers have their rough rice milled in processing factory and then they sell it in the market as milled rice.

63.8% of the rice farmers in Turkey are satisfied with rice gross income. Even though, some farmers are not happy about it, they continue to grow rice, because their fields prepared for rice cultivation and their equipment are only suitable for rice farming.

Rice brings higher net profit than the other irrigated crops.

The results of this research stated that the most important problems faced in rice cultivation were; water shortage, low imported rice price, expensive or costly input use, and unprofitable rice price.

As a results, the rice growing area is fluctuating in Turkey due to some constrains, such as water shortage, low imported rice price, and expensive production cost.

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