

COST AND PROFITABILITY OF CHICKPEA PRODUCTION IN USAK PROVINCE, TURKEY

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Abstract

This study aims to determine the economic analysis of chickpea production of farmers in Usak. In 2018, chickpea production of Usak province accounted for about 4.32% of Turkey's chickpea production. Based on the data obtained from the Farmer Registration System in Central, Banaz, and Ulubey district, it was determined that 77 farmers producing chickpea should be interviewed. The data obtained from the farms' chickpea production were obtained by face-to-face interviews with the farmers of the producer questionnaire developed by these researchers. The data of the study was obtained in 2018. According to the research findings, the average production cost per decare (da) was calculated to be 661.01 TRY. The share of variable costs was 80.98% within the production costs, and the share of fixed costs was 18.02%. It was determined that the kilogram sale price of chickpea was 4.65 TRY. The gross production value (GPV) of chickpea in the region was calculated as 952.33 TRY/da, gross profit 417.06 TRY/da, and net profit 291.32 TRY/da. The kilogram cost of chickpea in the region was 3.23 TRY. The relative profit was determined as 1.44 units. As a result of the research, as the chickpea production areas increase, the fixed costs per decare decrease, and the variable costs increase. In addition, it was determined that the relative profit value was low in enterprises with high production costs per kilogram.

Key words: chickpea, economic analysis, production cost, profitability, Turkey

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of the most important legumes grown in Turkey, ranking first among the pulse crops in the production area in production.

World chickpea production increased 88.2% times from 8.0 million in 2004 to 15.1 million tons in 2020. In Turkey, it increased by 15% from 0.548 million tons to 0.630 million tons in the same period [6]. Turkey ranks second in the world in chickpea production volume and used to account for 4.2% of the world's chickpea production.

Chickpea production in Turkey also accounted for approximately 4.2% of the overall chickpea production in the world. While chickpea production in Turkey in 2004 met 7.4% of the production in the world, its share decreased to 4.2% in 2020. While Turkey's chickpea area was approximately 5.8% of the chickpea area in the world in 2004, its share decreased to 3.4% in 2020 (Fig. 1). In 2004, the chickpea production of

Usak province met approximately 7.7% of Turkey's production. This value decreased to 2.3% in 2020 (Fig. 2).

Although the chickpea production area in Usak did not change in 2011, its production share decreased to 1.6%. As a result of heavy rain in Usak in 2011, approximately 80% of chickpea production was damaged. As of 2017, chickpea production area and production amount are decreasing in Usak province.

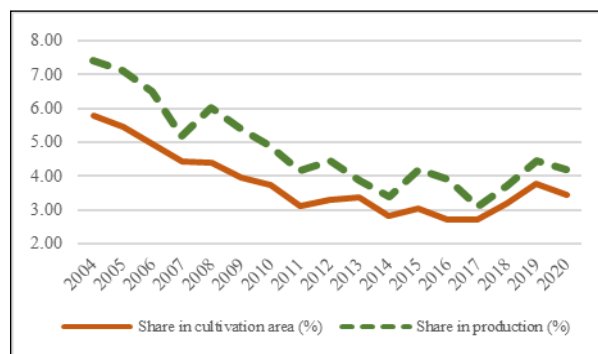


Fig. 1. The share of Turkey chickpea cultivation area and production in world (%)

Source: [6].

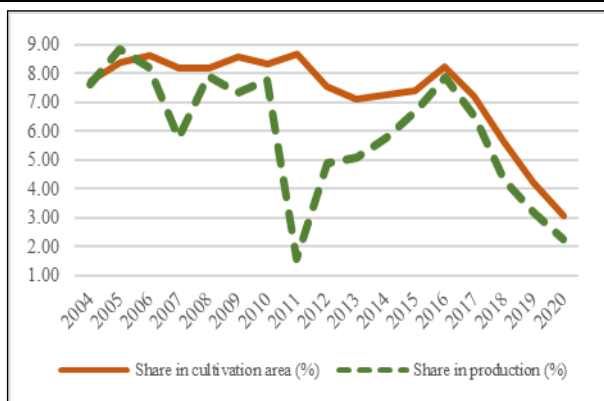
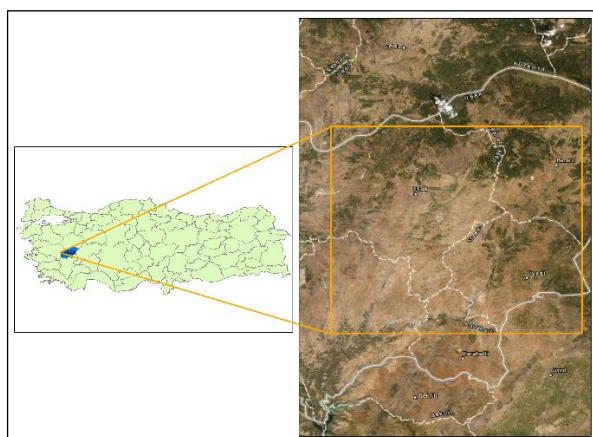


Fig. 2. The share of Usak province in Turkey chickpea area and production (%)
 Source: [13].

As a result of the literature review, it was determined that there are many studies on the technical structure of chickpea production [1] [4] [5], but there are fewer studies on its economic analysis [8]. In this study, the cost and profitability of farms chickpea cultivation farms in Usak province were analysed.

MATERIALS AND METHODS

The study's primary material was comprised of original data obtained via face-to-face survey method from 77 chickpea production farms at the Central, Banaz, and Ulubey districts of Usak province.



Map 1. Location map of the study areas
 Source: Own calculation.

Survey data belongs to the 2018 production period. In the 2018 production year when the

data were collected, Usak province has 5.64% chickpea production area and 4.32% chickpea production in Turkey. Central, Banaz, and Ulubey districts constitute 86.58% of the chickpea production area and 87.83% of the chickpea production quantity of Usak province [13]. For this reason, these districts were chosen as the research area.

In addition, similar previous studies, reports, and statistics on the subject were also used. The research area was given in Map 1. The total number, size, and addresses of chickpea production farms were obtained from the Usak Directorate of Provincial Agriculture and Forestry. Neyman Method was used to determine the sample volume of the survey. The number of samples was calculated with the formula given below [14].

$$n = \frac{(\sum N_h S_h)^2}{N^2 D^2 + \sum N_h S_h^2} \quad (1)$$

where:

- n: Sample size,
- N: Total number of units in the population,
- N_h: Number of units in group h,
- S_h: Standard deviation of group h,
- S_h²: Variance of group h,
- D²: d²/z²,
- d²: Allowed error from population average,
- z²: Value of the allowed safety limit in the distribution table.

The producers participating in the research were divided into four groups according to their land size area. According to this, the farms were divided into four groups as “I group (less than 7.50 decares; 23 farms), II group (7.50-15.00 decares; 15 farms), III group (15.01-30.00 decares; 17 farms), and IV group (>30.01 decares; 22 farms)”. Within the total number of farms, the share of farms group I was 29.87%, the share of II farms group was 19.48%, the share of III farms group was 22.08% and the share of IV farms group was 28.57% (Table 1).

Table 1. Sample size

Groups	Chickpea cultivated area*	Number of farms	Percent
I	<7.50	23	29.87
II	7.51-15.00	15	19.48
III	15.01-30.00	17	22.08
IV	30.01<	22	28.57
Total		77	100.00

*1 decare = 0.1 hectares

Source: Own calculation.

The data obtained from the identified farms through questionnaires were uploaded to the computer and evaluated in tables by making statistical software calculations.

Gross production values, net profit, gross profit, and relative profit values for chickpea production were calculated. Gross production value (GDP) multiplied by yield and selling price; gross profit was calculated by subtracting total variable costs from GDP, net profit was calculated by subtracting total production costs from GDP and relative profit was dividing GDP by total production costs [2] [7].

The unique product budget analysis method was used to calculate costs. Total costs were the sum of variable and fixed costs. Variable costs elements; machine rental cost, temporary labour cost, fertilisation cost, pesticide cost, seed cost, marketing cost, and interest of working capital. In calculating the working capital interest, half of the interest rate (6%) applied by Ziraat Bank (state bank) for crop production was used. Fixed costs elements; land rent cost, permanent-family labour cost, and administrative expenses (3% of variable costs) [2] [7]. The exchange rate for 2018 was 1 (\$) USA Dollar = 4.82 (TRY) Turkish Lira.

RESULTS AND DISCUSSIONS

Table 2 presents some social-economic-technical information about chickpea production. The average age of the interviewed farmers was 46.79 years. The average age of farmers was 48.26 years in the I farm group, 48.07 in the II farm group, 49.18 years in the III farm group, and 42.55 years in the IV farm group. It was determined that there were younger farmers in the IV farm group. The average education level of

the farmers was 7.87 years. The average education level of farmers was 6.09 years in the I farm group, 5.93 in the II farm group, 7.29 years in the III farm group, and 11.50 years in the IV farm group. The lowest level of education was determined to be in farm group II and the highest level of education was determined to be in farm group IV. The average household size of the farmers was 3.78 person. The average household size of farmers was calculated as 4.00 years in the I farm group, 3.80 in the II farm group, 3.65 years in the III farm group, and 3.64 years in the IV farm group. It was determined as the chickpea production area was increased, the farmers' average household size decreased. The experience time of the farmers in agriculture production was found to be 26.91 years. The farmers' average agriculture production experience was calculated as 29.48 years in the I farm group, 27.73 in the II farm group, 28.65 years in the III farm group, and 22.32 years in the IV farm group. The highest experience time of the farmers in agriculture production was at the III farm group. The experience time of the farmers in chickpea production was found to be 25.25 years. The farmers' average experience in chickpea production was calculated as 28.48 years in the I farm group, 26.73 in the II farm group, 27.76 years in the III farm group, and 18.97 years in the IV farm group. The average chickpea cultivated area of the farms in the groups was determined as 4.84 decare for I group farms, 11.13 decare for II group farms, 22.53 decare for III group farms, 73.73 decare for IV group farms, and 29.66 decare for average all farms. Parcels numbers of chickpea production were 2.39 per. Approximately 13.80 kg of seeds were used in chickpea production. The average of farms with non-agricultural income was 30.43% in

the I farm group, 13.13% in the II farm group, 5.88% in the III farm group, 13.64% in the IV farm group, and 16.88% in all farms. The lowest non-agricultural income was at the III farm group, and the highest non-agricultural income was at the I farm group. The tendency to continue producing chickpea was 3.61 on the average of farms and it was determined that farmers tend to continue production.

Farmers reported that their level of knowledge about chickpea production was between low and medium (2.74). Farmers also reported that their satisfaction with chickpea production was close to medium (2.87). The lowest knowledge/satisfaction level was in the first group, and the highest knowledge/satisfaction level was in the fourth group.

Table 2. Some social-economic-technical indicators of farms

Indicators	Farm groups				Farms Average
	I	II	III	IV	
Age (year)	48.26	48.07	49.18	42.55	46.79
Education level (year)	6.09	5.93	7.29	11.50	7.87
Household (person/family)	4.00	3.80	3.65	3.64	3.78
Experience in agriculture production (year)	29.48	27.73	28.65	22.32	26.91
Experience in chickpea production (year)	28.48	26.73	27.76	18.91	25.25
Chickpea cultivated area (average decare)	4.84	11.13	22.53	73.73	29.66
Parcel numbers of chickpea cultivated area (per)	1.26	1.93	2.65	3.68	2.39
The seed used amount per decare (kg)	14.21	13.95	13.99	13.71	13.80
Non-agricultural income (%)	30.43	13.33	5.88	13.64	16.88
The tendency to continue growing chickpeas*	3.13	3.33	3.47	4.41	3.61
The level of knowledge in chickpea cultivation**	2.43	2.47	2.76	3.23	2.74
The level of satisfaction in chickpea cultivation**	2.39	2.60	2.88	3.55	2.87

*Likert Scale: 1 = Absolutely not thinking; 2 = Does not think; 3 = Undecided; 4 = Thinking; 5 = Definitely thinking

**Likert Scale: 1 = Very low; 2 = Low; 3 = Medium; 4 = High; 5 = Very high

Source: Own calculation.

The production costs of chickpea producing farms were examined under two separate items. These are fixed costs and variable costs. Fixed costs are not dependent on the volume of production but are available on farms. In other words, it does not change according to the production volume. Variable costs are the costs that increase or decrease according to the production volume. This cost depends on whether the product is made or not [10].

Seed cost, marketing cost, machinery rents, fertilisation cost, temporary labour costs, pesticide cost, and working capital interest constituted the variable costs elements.

The average variable costs of the farms engaged in chickpea production were calculated as 15,876.24 TRY. This value varied between 2,005.10 TRY and 42,422.45 TRY in the groups. The interest of working capital (3,663.75 TRY) has the highest share among the variable costs. This was followed by seedling cost (3,558.49 TRY), marketing cost (3,175.02 TRY), machine rental cost

(2,595.88 TRY), fertiliser costs (1,329.92 TRY), temporary labour costs (1,156.30 TRY), and pesticide cost (396.88 TRY).

Fixed costs elements of farms producing chickpeas; permanent and family labour cost, land rent, and general administrative expenses. The average fixed costs of the farms engaged in chickpea production were calculated as 3,729.35 TRY. This value varied between 1,043.33 TRY and 8,146.70 TRY in the groups. Land rent cost (2,261.63 TRY) has the highest share among the fixed costs. This was followed by permanent-family labour cost (991.43 TRY) and general administration expenses (476.29 TRY). According to the farm's size groups, total production costs were calculated as an average of 19,605.59 TRY. This value was calculated as an average of 3,048.43 TRY in the I group, 6,321.73 TRY in the II group, 13,656.88 TRY in the III group and 50,569.15 TRY in the IV group (Table 3).

Table 3. Production costs in farms (TRY/farms)

Production Costs	Farm groups				Farms average
	I	II	III	IV	
Cost (TRY/farms)					
Seed cost	368.91	918.00	2,221.71	9,726.36	3,558.49
Marketing costs	229.13	569.67	1,609.99	9,240.52	3,175.02
Machinery rental cost	314.89	962.33	2,089.41	6,485.68	2,595.88
Fertilisation cost	513.15	515.13	978.06	3,011.23	1,329.92
Temporary labour cost	73.26	280.67	774.41	3,180.68	1,156.30
Pesticide cost	43.04	74.00	395.29	988.18	396.88
The interest in working capital	462.72	995.94	2,420.66	9,789.80	3,663.75
<i>Total variable cost (A)</i>	<i>2,005.10</i>	<i>4,315.74</i>	<i>10,489.53</i>	<i>42,422.45</i>	<i>15,876.24</i>
Land rent	513.18	941.19	1,723.25	5,405.85	2,261.63
Permanent-family labour cost	470.00	935.33	1,129.41	1,468.18	991.43
General administration expenses	60.15	129.47	314.69	1,272.67	476.29
<i>Total fixed cost (B)</i>	<i>1,043.33</i>	<i>2,005.99</i>	<i>3,167.35</i>	<i>8,146.70</i>	<i>3,729.35</i>
Total production costs (A+B)	3,048.43	6,321.73	13,656.88	50,569.15	19,605.59

Source: Own calculation.

According to the per decare, total production costs were calculated as an average of 661.01 TRY for all groups. This value varied between 567.99 TRY and 685.87 TRY in the groups.

The share of variable costs was 80.98% in total production cost. This value was calculated as 65.77% in the I farm group, 68.27% in the II farm group, 76.81% in the III farm group, and 83.89% in the IV farm group. This value varied between 387.76 TRY and 575.38 TRY in the groups. The most important cost elements among variable costs were the interest of working capital (18.69%), seedlings cost (18.15%), marketing cost (16.19%), and machinery rental cost (13.24%).

The share of fixed costs was 19.02% in total production cost. This value was calculated as 34.23% in the I farm group, 31.73% in the II farm group, 23.19% in the III farm group, and 16.11% in the IV farm group. As the chickpea cultivated area increases, the share of fixed costs in total costs decreases. The most important cost elements among fixed costs were the land rent cost (11.54%), permanent-family labour cost (5.06%), and general administrative expenses cost (2.43%) (Table 4).

In another study [3] conducted in 2016 in Kütahya province Central, Çavdarhisar, Dumlupınar, and Gediz districts, the total variable cost per decare was found as 190.89

TRY (67.59%) and total fixed cost 91.53 TRY (32.41%). Seedlings costs (29.90%), machinery rental cost (21.72%), and land rent cost (20.27%) were found as the essential costs. The reason for the difference in production costs per decare in TRY is that the dollar exchange rate was low in 2016 when the study was conducted. The exchange rate for 2016 was 1 (\$) USA Dollar = 3.02 (TRY) Turkish Lira.

In another study [12] conducted in India in the Kabirdham district of Chhattisgarh, the share of variable cost per decare was found as 72.57% and the share of fixed cost 27.43%. Human labour costs (26.42%), land rent cost (23.39%), machinery rental cost (15.13%), and seedlings costs (14.58%) were found as the essential costs.

In another study [11] conducted in India in Madhya Pradesh state, the share of variable cost per decare was found as 50.30% and the share of fixed cost 49.70%. Labour costs (31.51%), land rent cost (28.78%), and input cost (24.60%) were found as the essential costs.

In another study [9] conducted in India in the Kawardha district of Chhattisgarh, the share of variable cost per decare was found as 66.45% and the share of fixed cost 33.55%. Labour costs (38.33%), land rent cost (30.82%), and seedlings costs (12.75%) were found as the essential costs.

Table 4. Production costs per unit area in farms

Production Costs	Farm groups (da)				Farms average
	I	II	III	IV	
Cost (TRY per decare)					
Seed cost	76.22	82.48	98.61	131.92	119.98
Marketing costs	47.34	51.18	71.46	125.33	107.05
Machinery rental cost	65.06	86.46	92.74	87.97	87.52
Fertilisation cost	106.02	46.28	43.41	40.84	44.84
Temporary labour cost	15.14	25.22	34.37	43.14	38.99
Pesticide cost	8.89	6.65	17.55	13.40	13.38
The interest of working capital	95.60	89.48	107.44	132.78	123.52
<i>Total variable cost (A)</i>	414.28	387.76	465.58	575.38	535.27
Land rent	106.03	84.56	76.49	73.32	76.25
Permanent-family labour cost	97.11	193.25	233.35	19.91	33.43
General administration expenses	12.43	11.63	13.97	17.26	16.06
<i>Total fixed cost (B)</i>	215.56	180.23	140.58	110.49	125.74
Total production costs (A+B)	629.84	567.99	606.16	685.87	661.01
The share in the production costs (%)					
Seed cost	12.10	14.52	16.27	19.23	18.15
Marketing costs	7.52	9.01	11.79	18.27	16.19
Machinery rental cost	10.33	15.22	15.30	12.83	13.24
Fertilisation cost	16.83	8.15	7.16	5.95	6.78
Temporary labour cost	2.40	4.44	5.67	6.29	5.90
Pesticide cost	1.41	1.17	2.89	1.95	2.02
The interest of working capital	15.18	15.75	17.72	19.36	18.69
<i>Total variable cost (A)</i>	65.77	68.27	76.81	83.89	80.98
Land rent	16.83	14.89	12.62	10.69	11.54
Permanent-family labour cost	15.42	34.02	38.50	2.90	5.06
General administration expenses	1.97	2.05	2.30	2.52	2.43
<i>Total fixed cost (B)</i>	34.23	31.73	23.19	16.11	19.02
Total production costs (A+B)	100.00	100.00	100.00	100.00	100.00

Source: Own calculation.

Table 5 presents the cost and profitability status of chickpea production. Production costs, gross product value, gross profit, net profit, relative return, chickpea production cost per kilogram, and net profit per kilogram were calculated to reveal the farms' cost and profitability. These indicators enable enterprises to demonstrate their success. Enterprises make plans for the future by considering these success criteria.

In chickpea production, the gross production value per decare was found to be 952.33 TRY in the average of the enterprises. This value is the lowest in the II farm group with 547.44 TRY per decare. IV farm group had the highest value with 1,089.08. This value was calculated as 573.41 TRY in the I farm group and 660.06 TRY in the III farm group.

The average gross profit of the enterprises was calculated as 417.06 TRY per decare. Gross profit per decare in small-scale enterprises was at the lowest level with 159.13 TRY and 159.68 TRY. It was calculated that this value varies between

159.13 TRY and 513.70 TRY in farms groups. Gross profit was increasing as the scale of the farms increased.

The average net profit of the enterprises was calculated as 291.32 TRY per decare. It was calculated that this value varies between -56.43 TRY and 403.21 TRY in farms groups. Net profit per decare in small-scale enterprises was negative. This value is the lowest in the I farm group and II farm group. Net profit was increasing as the scale of the farms increased.

The yield of chickpea per decare ranged between 107.40 kg and 229.82 kg in the farms' groups. The chickpea yield was 204.59 kg per decare in the average of the enterprises. Therefore, increasing the scale of the enterprises in the region will increase the chickpea yield.

The cost of 1 kg of chickpea of the farms was calculated as 3.23 TRY. This value was 5.86 TRY per kilogram in the I farm group, 4.71 TRY per kilogram in the II farm group, 3.73 TRY per kilogram in the III farm group, and 2.98 TRY per kilogram in the IV farm group.

As the chickpea production area increased in the enterprises, the unit product cost also decreased.

The selling price of 1 kg of chickpea varies between 4.06 TRY and 5.34 TRY in farms width groups. It was calculated as 4.65 TRY in the average of the enterprises.

The net profit of 1 kg of chickpea varies between -0.52 TRY and 1.76 TRY in farms width groups. It was calculated as 1.42 TRY in the average of the enterprises. Net profit per kilogram of the first and second farm groups was determined as negative.

The relative profit was calculated as 0.91 in the I farm group, 0.96 in the II farm group, 1.09 in the III farm group, and 1.59 in the IV farm group. The chickpea relative profit was calculated as 1.44 in the average of the

enterprises. It was determined that 44 TRY profit was obtained for each 100 TRY production cost in chickpea production. In addition, as the chickpea production areas increased, the relative profit value also increased. Approximately 42.86% of the chickpea farms in the region made a loss.

In another study [3] calculated the cost of chickpea production per decare was 282.42 TRY, 580.72 TRY gross production value, 2.87 TRY per kilogram chickpea cost, 5.89 TRY per kilogram selling price, 298.30 TRY net profit, 389.83 TRY gross profit, and 2.06 TRY relative profit. According to this study, the relative profit value was found to be low in our study. This is due to the fact that the sale price of chickpeas in our study was low.

Table 5. Cost and profitability in chickpea production

Production Costs	Farm groups (da)				Farms average
	I	II	III	IV	
1. Total GPV per decares (TRY) (6x8)	573.41	547.44	660.06	1,089.08	952.33
2. Variable cost per decares (TRY)	414.28	387.76	465.58	575.38	535.27
3. Gross profit per decares (TRY) (1-2)	159.13	159.68	194.48	513.70	417.06
4. Total production costs per decares (TRY)	629.84	567.99	606.16	685.87	661.01
5. Net profit per decares (TRY) (1-4)	-56.43	-20.55	53.90	403.21	291.32
6. per decares yield (kg)	107.40	120.69	162.61	229.82	204.59
7. Per kilogram cost (TRY) (4/6)	5.86	4.71	3.73	2.98	3.23
8. Per kilogram selling price (TRY)	5.34	4.54	4.06	4.74	4.65
9. Per kilogram net profit (TRY) (7-8)	-0.52	-0.17	0.33	1.76	1.42
10. Relative profit (1/4)	0.91	0.96	1.09	1.59	1.44

Source: Own calculation.

In Figure 3, the chickpea production area and kilogram cost of chickpea 77 chickpea producers interviewed were given.

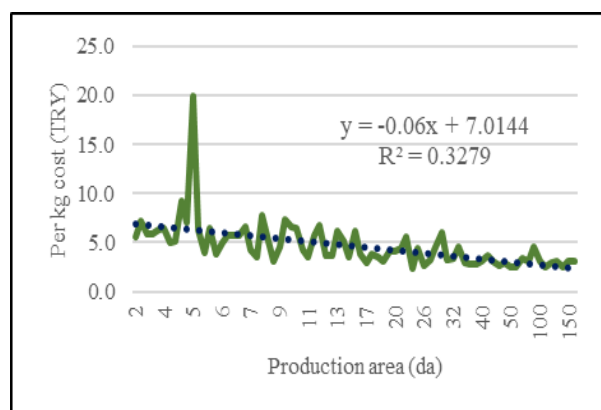


Fig. 3. Per kg cost values according to chickpea production areas

Source: Own calculation.

The kilogram cost of chickpea varies between 2.30 TRY and 19.86 TRY according to the size of the enterprises.

It was determined that the kilogram cost of chickpeas has a fluctuating downward trend. In addition, as chickpea production areas increase, chickpea cost per kilogram decreases.

In Figure 4, the chickpea production area and relative profit of 77 chickpea producers interviewed were given. Relative profit values vary between 0.40 units and 2.61 units according to the size of the enterprises. It was determined that the relative profit values of the interviewed chickpea enterprises showed a fluctuating upward trend. In addition, as the chickpea production areas increase, the relative profit value also increases.

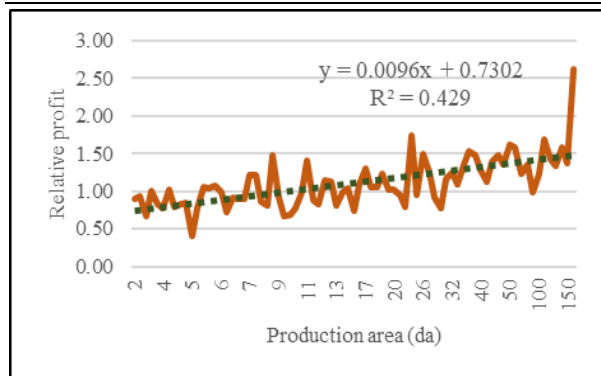


Fig. 4. Relative profit values according to chickpea production areas

Source: Own calculation.

CONCLUSIONS

As a result of this research, in which the cost and profitability analysis of chickpea production in Usak province, it was determined that the chickpea farms' total production costs, 80.98% were variable, and 18.02% were fixed costs. Of the variable costs, 18.69% was working capital interest expense, 18.15% was seed costs, 16.19% was marketing costs, 13.24% was machinery rental costs, 6.78% was fertiliser costs, 5.90% was temporary labour costs and 2.02% was pesticide costs. Of the fixed costs, 11.54% was land rent costs, 5.06% was permanent-family labour costs and 2.43% was general administration expenses. From chickpea farms divided into four different groups, it was determined that large-scale groups are economically more profitable than small-scale groups. The low chickpea yield of small-scale enterprises is due to the lack of organization among the farmers. When farms make their production in cooperation and organization, they can both increase yield and market their products easily. Reducing the cost of inputs that farmers use to produce chickpeas will encourage farmers to chickpeas produce. Especially small-scale chickpea enterprises in the region should be able to obtain cheap inputs in order to continue their production.

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