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SOCİO-ECONOMİC AND OPERATİONAL DYNAMİCS OF REAPER-THRESHER OWNERSHİP İN ADANA, TÜRKIYE

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Abstract

This research is aiming to illuminate the socio-economic and operational dynamics of reaper-thresher ownership in Adana and to provide valuable insights for future strategic planning in the sector. The primary data for this research were gathered through 16 face-to-face interviews with combine harvester operators in Adana. Constraints such as operators' hesitancy, time limitations, budget constraints, and their dispersed locations in various villages hindered the possibility of conducting a larger number of surveys. Moreover, considering the limitations mentioned, secondary data from sources such as the Turkish Statistical Institute (TUIK) and other relevant research reports were incorporated. Survey data collected between January and February 2024 underwent thorough analysis using techniques including cross-tabulation, statistical analysis, and regression analysis. The result of regression analysis indicates significant relationships between variables such as total area harvested, harvest price, and annual repair and maintenance expenses, and combine harvester profitability. These findings contribute to a nuanced understanding of the factors influencing harvesting revenues and their impacts on stakeholders. The explanation rate of these variables for the dependent variable (R square) is 99.3%. Since tolerance is greater than 0.10 and VIF is less than 10, there is no multiconnection problem. The findings reveal a predominant demographic profile of combine harvester owners, consisting largely of young and middle-aged individuals with varying levels of education, often continuing family traditions in agriculture. These operators typically operate small-scale agricultural enterprises, deriving most of their income from agricultural production. Through analysis it was found that the age ranges and education levels of the participants vary. While the age distribution varies between 20 and 51, the education level varies from primary school to master's/doctoral degree. The majority of the participants have a nuclear family structure and there is an average of 5 members in their families. The land holdings are generally below 100 decares. Additionally, the majority of respondents own a combine harvester, and this is often due to family business tradition. There are participants who have other sources of income other than harvesting. However, agricultural production is often the main source of income. The share of combine harvesting income in total income is generally high. The majority of participants want to continue harvesting and recommend it to new producers. However, there is dissatisfaction on some issues such as the appointment system of the Soil Products Office and the supply of workers. Harvest start time is usually in May, and the majority of combine harvester owners adapt to the specific requests of landowners. These special requests usually relate to mowing speed and tillage. The findings reveal significant information that will contribute to the development of agricultural mechanization strategies in the Adana region.

Key words**:** *Reaper-Thresher Owners, Logistic regression, socio-economic logistics, Adana*

INTRODUCTION

The agricultural sector is pivotal for the economic development and food security of many nations. Its efficiency and sustainability are contingent on various factors, including the utilization of modern agricultural equipment such as combine harvesters, which significantly enhance agricultural productivity. Reaper-thresher machines play a crucial role in the world, particularly in agricultural economies, by significantly enhancing efficiency, productivity, and sustainability in the farming sector."Reaper-thresher" might refer to a combination of a reaper (which cuts the crop) and a thresher (which separates the grain from the stalk and chaff). These machines, commonly used for

harvesting and threshing crops, have transformed traditional farming practices and contributed to the modernization of agriculture in several ways [1]. Reaper-thresher machines are mechanized harvesters that can harvest and thrench crops faster than traditional methods, reducing crop loss risks. They also boost agricultural productivity by covering large areas quickly, ensuring food security. They reduce labor dependency, addressing labor shortages in rural areas. Reaper-threshers minimize post-harvest losses by swiftly harvesting and threshing crops, especially in regions with high post-harvest losses [2]. They also allow for multiple harvest cycles within a single growing season, promoting sustainable practices. These machines also optimize resource use, promoting technology adoption and fostering innovation in agriculture. The increased efficiency and productivity positively impact farmers' economic well-being, leading to improved profitability and economic growth in rural areas. Also, reaper-thresher machines play a pivotal role in shaping the future of agriculture worldwide. Their adoption is instrumental in achieving food security, economic growth, and sustainability, making them indispensable tools for modern farming practices in agricultural economy [7].

Various countries using Reaper-thresher machines or modern combine harvesters would include major agricultural producers like the United States, Canada, Brazil, Russia, China, India, Turkey, and many European countries. It's important to note that the specific agricultural machinery used can vary based on factors such as the type of crops grown, farm size, and technological advancements. The European Union and North American nations dominate global tractor and agricultural machinery production. According to VDMA (Verband Deutscher Maschinen- und Anlagenbau - German Engineering Federation) data [16], the sector's size, which amounted to 64.6 billion Euros in 2010, is regionally distributed as follows: the EU contributes approximately 35%, North America holds a 28% share, China contributes 10%, and Latin America has around 7%. These regions collectively manufacture 80% of the world's agricultural equipment, with their combined production constituting 80% of the sector's overall size. Our country's slice of this market stands at about 3%, amounting to 2 billion Euros [16]. The global production value of agricultural tools, machinery, and tractors was 53.8 billion Euros in 2006, 58.7 billion Euros in 2007, and 68.5 billion Euros in 2008, experiencing a notable surge. However, this growth gave way to a downturn in 2009, with production falling to 59.4 billion Euros, resulting in a 13.2% market contraction. By 2010, the production value rebounded to 64.6 billion Euros, indicating an 8.75% increase from the previous year and an expansion of the market. Western Europe saw an above-average decline in production. In the realm of technology-intensive agricultural equipment, such as tractors and combine harvesters, the world produced 1.4 million tractors and 37,000 combine harvesters in 2007 [14].

A type of machinery for agriculture management is a combined harvester operation. This is due to combined harvesters' high initial investment costs and expenses, allowing them profitable while being technically self-propelled machinery [15]. Combined harvester contracting is a mechanism used for management that operates based on market conditions between supply (combine harvester owner/operator) and demand (farmer). According to [6] the contractual approach is used in Turkey to harvest 90.2% of the total land with combined harvesters. Although this system's ability to regulate a balance between supply and demand provides economic benefits, there are refers to new technology introduction, loss decrease, and auditing/traceability [1]. The capacity of the Turkish combine harvester has now reached a point where it can efficiently handle all grain growing areas. The efficiency and speed of harvesting and threshing with a combine exceeds that of other mechanization alternatives, as highlighted by [4]. Turkey's Combined Harvester Park has reached a capacity value where all grain cultivation fields can be produced. The development of alternative mechanization options is impacted by the efficiency and speed of harvesting and

threshing with a combined harvester, which can achieve up to 90% in the Konya region [4]. The two most crucial machine parameters for combined harvester operation that go against the intentions of the farmer and operator are the height of the mowing table from the ground and the operating speed. The operator's goal to finish the harvest-threshing task faster is what gives birth to the disputed disparity. On the other hand, this is a result of the farmer's desire to purchase additional grain, stalk, or straw. Losses rise and fuel and time economies are impossible to attain when the outdated combine harvesters, the inadequate and improper usage of supplementary equipment, and their deficiencies in areas like adjustment and maintenance are combined with this problem [5]. In Turkey, the management of combine harvesters has seen remarkable advancements, particularly in recent years, driven primarily by the diversification of harvested products. Previously limited to grains like wheat, barley, and rye, combine harvesters now handle a multitude of crops including corn, soy, cumin, lentils, and cotton. This diversification, coupled with the varying maturation periods and harvest seasons across regions in Turkey, has resulted in widespread and year-round utilization of combine harvesters, ensuring their continuous and long-term use.

Harvesting constitutes a crucial aspect of agricultural operations, facilitating enhanced efficiency and effectiveness for farmers. Yet, comprehensive research examining the economic and social impacts of harvesting activities remains limited. Consequently, there's a pressing need to investigate harvesting revenues and analyze the associated economic and social dimensions comprehensively.

The surge in combine harvester numbers in Turkey over the years aligns with the mechanization and technological advancements in agriculture. While there was a slight decline in numbers during the early 2000s, subsequent reforms, supports, and technological innovations spurred a resurgence in combine harvester adoption. Recent years have witnessed a significant uptick in combine harvester numbers, attributed to modernization efforts, productivity enhancement targets, and government support for farmers. Additionally, the increasing acceptance of agricultural mechanization and farmers' inclination towards productivity-boosting machinery contribute to this rise, indicating a shift towards a more technologically driven and efficiency-oriented agricultural landscape in Turkey.

Analysis of combine harvester density at the provincial level reveals higher numbers in regions with intensive agricultural activities, notably in provinces like Adana, Antalya, and Konya, which serve as pivotal agricultural hubs. Moreover, the preference for newer and more technologically advanced combine harvester models underscores the influence of agricultural technological advancements on farmers' choices, reflecting a preference for efficiency and modernity.

Despite the significant strides in combine harvester management in Turkey, operators still face technical and economic challenges such as transportation, hygiene, and managing small parcels. Moreover, the lack of socioeconomic studies addressing these issues is evident, indicating a crucial gap that necessitates more comprehensive research and solution-oriented approaches.

In context of Adana, the operation cost, one must first understand the characteristics of a combined harvester operation and its effective values. When the combined harvester strategies have an amortization phase and there are no finances sufficient to buy a new one, this issue generally arises. Due to this, using an old combination harvester with significant repairs leads to higher expenses for labor, fuel, maintenance, and repairs. The farmer that uses the combine harvester for rent is liable for paying the cost of these high operating expenses. Additionally, the dynamics of reaper-thresher ownership in Adana present a complex landscape marked by multifaceted challenges. In this region, where agricultural practices play a focal role in the economy, the ownership of reaper-threshers, while addressing labor shortages

and minimizing post-harvest losses, introduces its own set of difficulties. Factors such as initial investment costs, technological proficiency, and access to financial resources pose hurdles for prospective owners. Additionally, the integration of these machines into traditional farming practices requires adaptation and training, influencing the socio-economic fabric of the farming community. Striking a balance between technological advancement, economic viability, and societal implications constitutes a formidable challenge for stakeholders engaged in reaper-thresher ownership in Adana.

This research is aiming to illuminate the socio-economic and operational dynamics of reaper-thresher ownership in Adana and to provide valuable insights for future strategic planning in the sector. And then, scrutinize the factors influencing combine harvester income and provide a comprehensive evaluation to grasp the economic and social dimensions of combine harvester activities. It endeavors to identify the primary factors affecting harvesting revenues and examine their impacts on key stakeholders within the sector.

MATERIALS AND METHODS

The primary data for this research were gathered through 16 face-to-face interviews with combine harvester operators in Adana. Constraints such as operators' hesitancy, time limitations, budget constraints, and their dispersed locations in various villages hindered the possibility of conducting a larger number of surveys. To complement the primary data, in-depth interviews were conducted with chambers of agriculture and district agricultural officials.

Moreover, considering the limitations mentioned, secondary data from sources such as the Turkish Statistical Institute (TUIK) and other relevant research reports were incorporated. Survey data collected between January and February 2024 underwent thorough analysis using techniques including cross-tabulation, statistical analysis, and regression analysis. These analytical methods were employed to gain insights into the challenges faced by combine harvester operators and their expectations.

RESULTS AND DISCUSSIONS

The socio-economic characteristics of combined harvester operators were examined and their income levels, expenses, and economic activities were evaluated based on the data obtained. Additionally, the problems faced by combined harvester operators and their expectations are discussed in detail.

Table 1. Demographic Characteristics of Combine Harvester Owners Participating

Demographic Characteristic		Frequency	Percentage (%)
Age Group (years)	18-30	12	20
	31-45	28	47
	46-60	18	30
Gender	Male	50	83
	Women	10	17
Education level	Primary school	8	13
	Secondary school	12	20
	High school	20	33
	University	18	30
Family Type	Nuclear Family	32	53
	Extended Family	18	30
	Multiple Family	10	17

Source: Results of the survey.

Table 1 indicates that most participants in the research who own combine harvesters are males aged between 31-45. In terms of education, it's notable that the majority are high school graduates. Furthermore, a significant number of participants have a nuclear family setup.

Table 2 shows that the majority of combine harvester owners possess land ranging from 0 to 20 decares, indicating that they predominantly operate as small-scale agricultural enterprises.

Table 2. Land and Harvester Ownership Information

Land Asset Owned (Decares)		
Variable	**Frequency**	**Percentage (%)**
0-10	15	25
11-20	18	30
21-30	14	23
31-40	10	17
41-50	3	5

Source: Results of the survey.

It's evident that the majority of the other equipment falls within the price range of 1,200,000 TL to 3,000,000 TL. This indicates a tendency among combine harvester owners to favor machines situated in the mid to lower price segments for other equipment (Table 3).

Table 3. Material Value of Other Equipment (TL)

Material Value Range (TL)	**Number**	**(%)**
1,200,000 - 1,750,000	8	50
2,000,000 - 3,000,000	7	44
25,000,000	1	6

Source: Results of the survey.

Table 4 shows that the income source of the majority of combine harvester owners (56%) is agricultural production.

Table 4. Sources of Income

Income Source	**Number**	**(%)**
Livestock	1	6
Worker	1	6
Agricultural production	9	56
Agricultural production, Pension	1	6
Agricultural production, industrial machinery manufacturing	1	6
Agricultural production, Trade	1	6
Trade	1	6
None	1	6

Source: Results of the survey.

Other sources of income include labor and various other fields. This suggests that combine harvester owners are trying to diversify their income.

Table 5 shows a significant majority (94%) of individuals who ventured into the combine harvester business did so due to family reasons. This indicates a prevalent trend of family enterprises, with many combine harvester proprietors carrying on their familial traditions.

Table 5. Reason for Starting Harvester Management

Why	**Number**	**Percentage (%)**
Family	15	94
Hobby	1	6

Source: Results of the survey.

Table 6 indicates that the majority of combine harvester owners (69%) own only one combine harvester. However, a small percentage (19%) operates businesses with more than one combine harvester. This shows that most of the combine harvester owners in Adana are small-scale businesses.

Table 6. Number of Harvesters Owned

Number of Harvesters	**Number**	**Percentage (%)**
1	11	69
2	3	19
4	2	12

Source: Results of the survey.

Based on the result presented in Table 7, it is indicated that 25% of combine harvester owners made their purchase between 2005-2010, while 38% did so between 2011 -2015, and another 38% between 2016 -2018. This suggests a relatively even distribution of combine harvester purchases over the specified time periods.

Table 7. First Harvester Purchase Year

Year of Purchase	**Number**	**Percentage (%)**
2005-2010	4	25
2011-2015	6	38
2016-2018	6	38

Source: Results of the survey.

In Table 8, it is seen that the majority of combine harvester owners (75%) employ 2 drivers in their businesses. However, a small

percentage (13%) employ only one driver. This shows that the number of drivers varies depending on the size of the businesses.

Table 8. Number of drivers

Number of Drivers	Number	Percentage (%)
0	1	6.
1	2	13
2	12	75
3	1	6

Source: Results of the survey.

Table 9 shows that combine harvester owners start the harvest season between January and May. However, a small percentage (6%) starts harvesting in June. This indicates that the harvest period is generally between January and May.

Table 9. Harvest Start Month

Starting month for harvesting	Number	Percentage
January	1	6
April	1	6
May	13	81
June	1	6
Total	16	100

Source: Results of the survey.

Table 10 shows us 31% of combine harvester owners are not satisfied with the Soil Products Office Appointment System. 31% are undecided. Others' satisfaction is dispersed across various levels.

Table 10. Satisfaction with Soil Products Office Appointment System

Satisfaction Status	Number	Percentage (%)
Less Satisfied	3	19
Slightly Dissatisfied	2	13
Very Satisfied	1	6
Very Dissatisfied	5	31
Undecided	5	31

Source: Results of the survey.

75% of combine harvester owners want to continue harvesting in the future. However, 25% tend not to continue illustrates in Table 11.

Table 11. Desires to Continue Harvesting in the Future

Attendance Status	Number	Percentage (%)
Yes	12	75
No	4	25

Source: Results of the survey.

Table 12 indicates that 56% of combine harvester owners want to recommend harvester farming to others. However, 44% are hesitant or negative about this issue.

Table 12. Requests to Recommend Harvesting to Others

Recommendation Status	Number	Percentage (%)
Yes	9	56
No	7	44

Source: Results of the survey.

For short-term stays lasting 2-4 months, 4 individuals account for 25.00% of the total. Medium-term stays spanning 5-6 months are represented by 10 people, constituting 62.50%. Long-term stays, lasting 7 months or more, are inhabited by 2 individuals, making up 12.50% of the total in Table 13.

Table 13. Duration of Staying Away from Home During the Year (Months)

Stay Away Range	Number of People	Percentage (%)
Short Term (2-4 Months)	4	25
Medium Term (5-6 Months)	10	62.5
Long Term (7 Months and Above)	2	12.5

Source: Results of the survey.

Table 14 explain that more than half of the participants (50%) stated that they experienced customer loss due to the appointment system.

Table 14. Problems Related to the Appointment System

Problem	Number of People	Percentage (%)
Impatience to Wait	4	25
Obligation to Find a New Harvester Immediately	4	25
Customer Loss	8	50

Source: Results of the survey.

Table 15 indicates that 75% of the participants stated that they wanted to continue harvesting in the future.

Table 15. Willingness to Continue Harvesting in the Future

Willingness to Continue	Number of People	Percentage (%)
Yes	12	75
No	4	25

Source: Results of the survey.

Table 16 shows that 56% of the participants stated that they would recommend harvesting to others.

Table 16. Willingness to Recommend Harvester Harvesting to Others

Willingness to Recommend	Number of People	Percentage (%)
Yes	9	56
No	7	44

Source: Results of the survey.

The table 17 encompassed individuals aged between 20 and 51, with an average age of around 36.63 years and a standard deviation of about 9.21. Family sizes involved in farming varied from 3 to 6 members, with an average of approximately 4.69 individuals per family and a standard deviation of around 1.01. Land ownership ranged from 0 to 300 decare, with an average holding of approximately 68.94 decare and a standard deviation of about 73.58. The value of owned combine harvesters ranged from TL 4,750,000 to TL 25,300,000, with an average value of approximately TL 10,440,625 and a standard deviation of around TL 6,154,516. Other equipment values ranged from TL 1,200,000 to TL 3,000,000, with an average of approximately TL 1,790,625 and a standard deviation of about TL 530,791.50. Ownership of combine harvesters ranged from 1 to 4 per individual, with an average of approximately 1.56 and a standard deviation of around 1.03. Employment of drivers ranged from 0 to 3, with an average of about 1.81 drivers and a standard deviation of approximately 0.66. The harvested land area varied from 5,000 to 50,000 decare, with an average of approximately 23,125 decare and a standard deviation of around 12,526.64. Income from harvesting activities ranged from 30% to 100%, with an average of about 53.25% and a standard deviation of approximately 20.19%. Harvest prices ranged from TL 142 to TL 180 per unit, with an average price of around TL 159.94 and a standard deviation of approximately TL 11.95. Annual income from harvesting activities varied from TL 900,000 to TL 7,700,000, with an average income of about TL 3,662,188 and a standard deviation of around TL 1,928,802. Fuel costs per decare ranged from TL 20 to TL 64, with an average cost of approximately TL 33.69 and a standard deviation of around TL 10.06. The expense-to-income ratio ranged from 13 to 36, with an average ratio of about 21.06 and a standard deviation of approximately 5.35. Annual fuel expenses for combine harvesters varied from TL 200,000 to TL 1,600,000, with an average expense of approximately TL 732,500 and a standard deviation of around TL 377,708. The total fuel and other expenses rate ranged from 27 to 43, with an average rate of about 33.06 and a standard deviation of around 4.17. The fuel expenses ratio to total expenses ranged from 8% to 18%, with an average ratio of approximately 12.31% and a standard deviation of about 2.24%. Annual repair and maintenance expenses for combine harvesters varied from TL 25,000 to TL 220,000, with an average expense of about TL 89,062.50 and a standard deviation of approximately TL 49,191.42. Income derived from labor ranged from 5% to 15%, with an average rate of around 9.31% and a standard deviation of approximately 3.32%. Annual labor expenses for combine harvesters varied from TL 100,000 to TL 600,000, with an average expense of about TL 311,562.50 and a standard deviation of approximately TL 153,663.30. Other annual expenses related to combine harvesters ranged from TL 20,000 to TL 65,000, with an average expense of around TL 40,062.50 and a standard deviation of approximately TL 12,315.13. Additionally, there were possibly unrelated variables, with values ranging from 748,000 to 7,020,000, and another variable, possibly unrelated, with values ranging from 16 to 54. The duration of time spent away from home during the year ranged from 2 to 8 months, with an average of

about 5.44 months and a standard deviation of approximately 1.50 months.

Table 17. Provide comprehensive information about various aspects of farming activities, including demographic details, equipment ownership, expenses, and income

Variable	N	Minimum	Maximum	Average	Standard deviation
Age	16	20	51	36.625	9.207787
Total Number of Individuals in the Family	16	3	6	4.6875	1.014479
Land Asset (Decare)	16	0	300	68.9375	73.57578
Financial value of your Combine Harvester (TL)	16	4,750,000	25,300,000	10,440,625	6,154,516
Financial value (TL) of other equipment such as tractors and trailers that you use with the Harvester and Harvester	16	1,200,000	3,000,000	1,790,625	530,791.5
Number of Harvesters Owned	16	1	4	1.5625	1.030776
Total number of drivers	16	0	3	1.8125	0.655108
Total Area Harvested in the Year (Decares)	16	5,000	50,000	23,125	12,526.64
Share of harvester income in total income (%)	16	30	100	53.25	20.19076
Harvest Price	16	142	180	159.9375	11.95251
Average annual harvester income (TL)	16	900,000	7,700,000	3,662,188	1,928,802
Fuel cost per decare	16	20	64	33.6875	10.05796
Ratio of expense to income	16	13	36	21.0625	5.347507
Annual Fuel Expenses (TL) for your Combine Harvester	16	200,000	1,600,000	732,500	377,708
Fuel and other expense total rate	16	27	43	33.0625	4.170831
Fuel expense ratio	16	8	18	12.3125	2.24258
Annual Repair & Maintenance Expenses (TL) for your Combine Harvester	16	25,000	220,000	89,062.5	49,191.42
Labor income rate	16	5	15	9.3125	3.321019
Annual Labor Expenses (TL) for your Combine Harvester	16	100,000	600,000	311,562.5	153,663.3
Other annual expenses (TL) for your Combine Harvester	16	20,000	65,000	40,062.5	12,315.13
Snow	16	748,000	7,020,000	3,221,500	1,775,064
Capital	16	16	54	31.5625	12.23639
Duration of Staying Away from Home During the Year (Months)	16	2	8	5.4375	1.504161

Source: Results of the survey.

Table 18 is a significant relationship between the answers to the questions (p value <0.05) While every person who recommended harvesting to someone else declared that they would continue this business in the future, 42.86% of those who did not recommend it said they would continue this business. There are no significant relationships between the variables tested below (p>0.05).

Table 18. Recommend and continue harvesting

Continue harvesting in the future					
		Yes	No	Total	p value
Recommend harvesting to others	Yes	100.00	0.00	100.00	0.02
	No	42.86	57.14	100.00	
Total		75.00	25.00	100.00	

Source: Results of the survey

The findings in Tables 19 and 20 represents a regression analysis. Regression analysis is a statistical method used to determine the relationship between dependent variables and one or more independent variables. The profit variable is the dependent variable and the variables on the right are taken as dependent variables, Total Area Harvested in the Year

(Decare), harvest price and Annual Repair & Maintenance Expenses (TL) for your Combine Harvester, the variables remain significant in the model. The explanation rate of these variables for the dependent variable (R square) is 99.3%. Since tolerance is greater than 0.10 and VIF is less than 10, there is no multiconnection problem. The R square value for each model is given in the model summary table. R square expresses the percentage of independent variables explaining the variance of the dependent variable. For example, in Model 19, the R square value is 97.1%, indicating that the independent variables used explain 97.1% of the dependent variable.In the coefficients table, the coefficient, standard error, t value and p value of each independent variable are given. The T value is the ratio obtained by dividing the coefficient by the standard error and shows the significance of this ratio. P value expresses the significance of the independent variable. If the p value is less than a specified significance level (usually $p < 0.05$), the independent variable is statistically significant. In the multicollinearity statistics table 20, tolerance and VIF (variance inflate factor) values are given. These values measure multicollinearity between the independent variables used. The tolerance value is between 0 and 1, the closer it is to 1 it indicates the absence of multicollinearity. VIF is the inverse of tolerance, that is, the smaller the VIF value, the less multicollinearity between the independent variables.

Table 19. Model summary D

Model	R.	R Square	Adjusted R Square	Std. Error of the Estimate
1	.985a	0.971	0.969	314670.4835
2	.994b	0.989	0.987	202056.3144
3	.997c	0.993	0.991	165482.0754

a. Predictors: (Constant), Total Area Harvested in Year 13 (Decares)?; b. Predictors: (Constant), Total Area Harvested in the 13th Year (Decare)?, harvest price; c. Predictors: (Constant), Total Area Harvested in the Year (Decare)?, harvest price, Annual Repair & Maintenance Expenses (TL) for your Combine Harvester?; D. Dependent Variable: profit
Source: Authors' results.

Table 20. Regression model

Model	Unstandardized Coefficients		T	Shallow	Collinearity Statistics	
	Coefficient	Standard error			tolerance	VIF
Fixed Term	-3588897.009	624857.199	-5.744	0.000		
Total Area Harvested in the Year (Decares)?	169.336	9.634	17.577	0.000	0.125	7.977
Harvest price	21,758.698	3,732.837	5.829	0.000	0.917	1.090
Annual Repair & Maintenance Expenses (TL) for your Combine Harvester?	-6.574	2.420	-2.717	0.019	0.129	7.762

Source: Authors' results.

Normality assumption is ensured according to the normal pp graph of the errors as presented in Fig. 1.

According to the prediction and error term distribution, the points do not form a certain pattern. Therefore, there is no heteroscedasticity problem.

Analysis of social demographic and economic data sheds light on the general profile of combine harvester owners in Adana. This group, young and middle-aged, generally with a low level of education, generally continues the family tradition in agricultural activities. Economically, they can be described as small-

scale businesses and derive most of their income from agricultural production. However, there are also some difficulties faced by these enterprises, for example, there is dissatisfaction with the soil products office appointment system and the supply of workers. These findings should be taken into account when developing agricultural mechanization strategies and contribute to the creation of solution-oriented policies. This result collaborated with [11]. It was found that this group, predominantly composed of young and middle-aged individuals with a low level of education, tends to uphold family traditions in agricultural activities. The above findings and interpretations help us understand the social and economic profile of combine harvester owners in Adana. This information can play an important role in developing strategies for effectively managing agricultural mechanization and increasing agricultural productivity. The found is similar to [9] that the amount of land owned by the participants is quite variable, the minimum is 0 decares and the maximum is 300 decares. On average, participants own 68.94 decares of land. The finding is simillar to result found with [8]. Concering material value of combine Harvesters that the financial value of combine harvesters varies between 4,750,000 TL and 25,300,000 TL. The average material value is 10,440,625 TL.

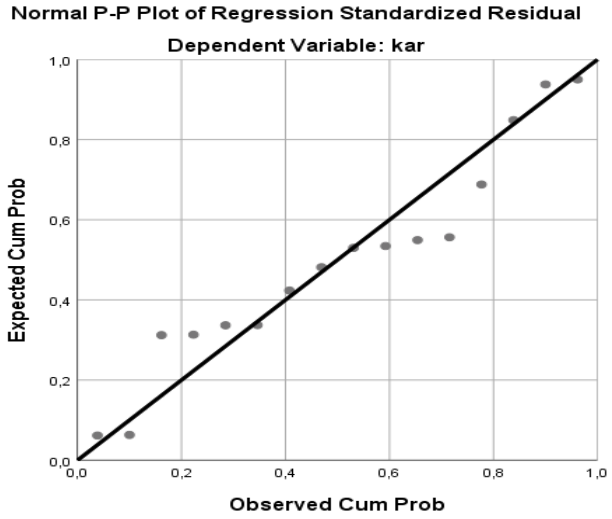

Fig. 1. Normality assumption is ensured according to the normal pp graph of the errors
Source: Authors' results.

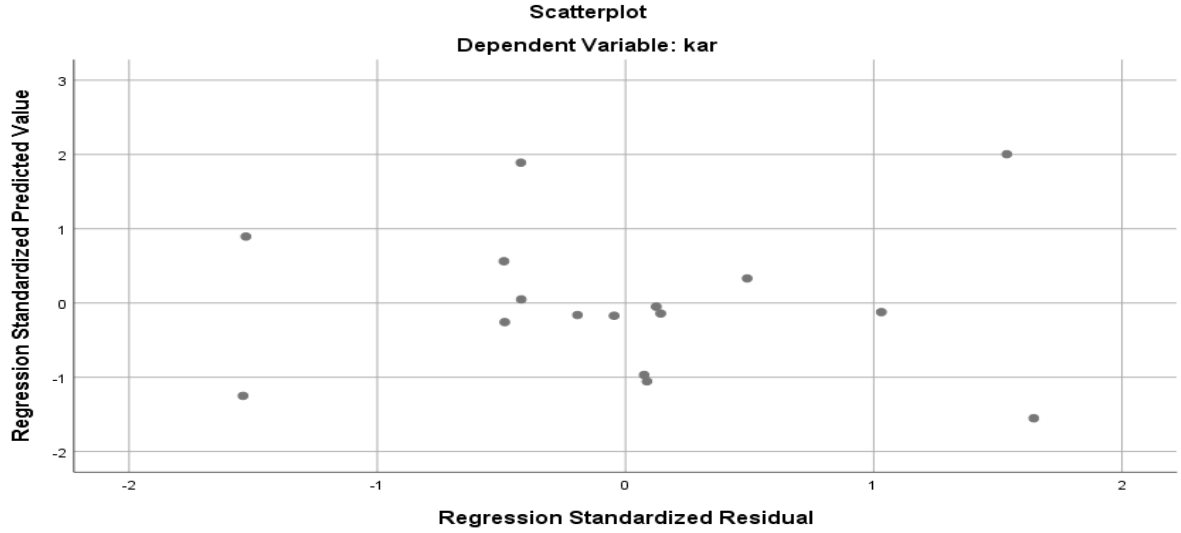

Fig. 2. A scatterplot.
Source: Authors' results

The majority of the participants own 1 combine harvester, but on average there are 1.56 combine harvesters. The findings are similar to [3] and [13] concerned the number of combine harvesters owned. The share of combine harvester income in total income varies between 30% and 100%. On average, this rate is 53.25%. The findings are collaborated to [11] who found that the share of combined harvester income in total income exhibited considerable variability, spanning from 30% to 100% across different regions or communities. The average proportion of income derived from harvesting activities was calculated at 53.25%, indicating a substantial reliance on this aspect of agricultural production for livelihoods within the studied populations. Concerning an annual combine harvester income varies between 900,000 TL and 7,700,000 TL. The average income is 3,662,187.50 TL. This result is similar to [10]. There is a strong relationship between the tendency to recommend of Reaper-Thresher to others and the decision to continue this business in the future, this relationship is not evident with other variables. This grounded research examined the relationship between intention to recommend harvesting to others and various social, demographic, and economic variables. The research revealed that the majority (100%) of those who recommend harvesting to others intend to continue this business in the future, while only 42.86% of those who do not recommend it tend to continue this business. No significant relationship was detected between other variables and this recommendation status (p value> 0.05). These results indicate that the tendency to recommend harvesting to others is strongly associated with the decision to continue this business in the future. However, it is stated that this relationship cannot be explained by other factors. The variables remain significant in the model. The explanation rate of these variables for the dependent variable (R square) is 99.3%. Since tolerance is greater than 0.10 and VIF is less than 10, there is no multiconnection problem. Similarly, to finding found for [12].

CONCLUSIONS

The study reveals that combine harvester owners in Adana are predominantly young to middle-aged individuals, often with a lower level of education, who continue family traditions in agriculture. Economically, they operate small-scale businesses, with agricultural production being their primary source of income. However, they face challenges such as dissatisfaction with the soil products office appointment system and difficulties in labor supply.

The findings accentuate the importance of considering these socio-economic dynamics in the development of agricultural mechanization strategies. Solutions-oriented policies should address the specific needs and challenges faced by combine harvester operators to enhance efficiency and productivity in the sector.

Moreover, the research identifies significant factors influencing combine harvester income, such as the total area harvested, harvest price, and annual repair and maintenance expenses. These factors play a crucial role in determining the profitability of combine harvester operations, highlighting the importance of managing these variables effectively.

Additionally, the study emphasizes the strong relationship between the tendency to recommend reaper-thresher operations to others and the decision to continue this business in the future. This underscores the importance of word-of-mouth recommendations in sustaining and expanding combine harvester operations.

The research provides valuable ideas that can guide policymakers, stakeholders, and operators in Adana towards developing strategies for enhancing agricultural mechanization, improving productivity, and addressing socio-economic challenges in the sector. The dynamics of reaper-thresher ownership and its implications, stakeholders can work towards building a more resilient and sustainable agricultural landscape in the region.

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