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General Characteristics of Konya Agricultural Machinery Manufacturing Industry

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HIGHLIGHTS

- The primary objective is to investigate general characteristics of Konya agricultural machinery manufacturing industry.
- Competitive power of the enterprises in international markets should be increased.

Abstract

A survey was conducted in this study to determine the general characteristics of the agricultural machinery manufacturing industry in the Konya region. To achieve this, 50 enterprises of various scales, considered representative of the sector, were selected and included in the study. When evaluating the enterprises based on size, it was found that 52% of them were small-scale enterprises. The average age of business owners is 53 years, with 35 years of industry experience, and 47% of them have primary school education. While a total of 1204 workers are employed in the enterprises participating in this study, there is an average of 24.5 workers per enterprise. Of the total personnel, 78.3% consisted of workers, followed by engineers with an average of 5.5%, accountants with 5.3%, marketers with 5% and technicians with 4%. Only 34% of enterprises cooperate with KOSGEB and 8% with TUBITAK in R&D and P&D activities. In addition, it was determined that 18% received consultancy from universities. Present findings shed light on the developments in the sector as well as understanding the situation of agricultural machinery manufacturing industry enterprises in the region.

Keywords: Agricultural machinery manufacturing industry, Agricultural machinery manufacture, Konya

1. Introduction

Agriculture is among the most important sectors in Türkiye and agricultural machinery manufacturing sector is a locomotive of this sector. According to 2022 data, agricultural production is carried out on an area of 23.8 million hectares in Turkey. About 69% of the total area is occupied by field crops, 31% by vegetables, ornamental plants, fruits and fallow lands (TUIK, 2022b).

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Agricultural mechanization plays a great role in reduction of labor needs in agricultural production. Agricultural mechanization is defined as the mechanization of plant and animal production activities using power sources and agricultural machinery.

Agricultural technologies and mechanization practices increase productivity in agricultural production and reduce total input costs. However, technology use in agriculture is affected by labor demand, climate parameters and land characteristics. Agricultural mechanization is an important tool for optimum use of input materials such as fertilizers, pesticides and seeds and provides significant contributions to yield and productivity (Özgüven ve ark., 2010).

With a land area of 1.78 million hectares, Konya constitutes about 7% of total agricultural lands of Türkiye (TUIK, 2022b). Agricultural machinery manufacturing sector is also highly important for Konya since the province is one of the important agricultural centers of the country.

Agricultural machinery manufacture in Konya is composed of manufacture of tractors, soil cultivation machines, planting machines, plant protection machines, fertilizing machines, harvest and threshing machines, irrigation machines, agricultural machinery sub-industry and spare parts, livestock mechanization machinery.

Majority of agricultural machinery companies operating in Konya province has quite a high export capacity and they export agricultural machinery to several countries. Agricultural machines produced by businesses operating in this sector are used both in Türkiye and around the world.

Agriculture is one of the largest export sectors in Türkiye and the agricultural machinery manufacturing sector of Konya constitutes an important part of this export. In short, Konya has an important place in the agricultural machinery manufacturing sector and this sector provides a significant contribution to agricultural sector and economy of the country.

2. Materials and Methods

Primary data obtained through questionnaire made with the agricultural machinery manufacturing enterprises of Konya constituted the primary material of this study. A questionnaire form was prepared to get relevant data from participating enterprises.

In 2022, 870 enterprises evaluated by the Central Bank of the Republic of Türkiye (CBRT) for the agricultural machinery manufacturing sector, 147 of them are joint stock companies and 721 of them are limited liability companies, 527 of which are micro, 265 are small, 63 are medium and 15 are large enterprises (TCMB, 2021).

Data of the Ministry of Agriculture and Forestry indicated that there were test reports of 797 enterprises (importer-manufacturer) in Türkiye between the years 2015-2020, 190 of them were operating in Konya province and Konya province was in the first place in terms of the number of enterprises that received test reports (Atasoy, 2021).

Questionnaires were applied through face-to-face meetings with managers of 50 different business of different scales, which are thought to represent the sector. Their working and production processes were observed by the researchers themselves and the necessary information and data were obtained. The data obtained through questionaries belong to the year 2022.

Within the scope of the questionnaires, questions were asked to gather information about the company, foreign trade, machinery and equipment inventory, number of employees and their competencies and problems encountered. Questionnaire forms were filled out based on the information provided.

With its rapidly developing and dynamic industry, Konya province has taken an important place in the industrial production of Türkiye. Parallel to development of the manufacturing industry; variety of industrial products has increased in the province and the product range that is subject to domestic and foreign trade has expanded.

In terms of the goods subject to trade in Konya province, agricultural and animal products continue to be important; agricultural machinery, automotive sub-industry, rubber-plastic products, shoes, furniture, agricultural products, iron-steel products, manufacturing machinery, textile-clothing, salt, aluminum, marble are industrial products that are the subject of trade (Özkul ve Güzel, 2020).

Konya province maintains its leading position in export of agricultural machinery, metalworking, metal casting, on-board equipment production, production and export of shotguns (Özkul ve Güzel, 2020).

In Konya province, there are 9 active and 2 still inactive organized industrial zones, 1 organized industrial zone at the establishment stage, 80 industrial sites and 2 industrial zones, 17 of which were built with the support of the Ministry of Industry and Technology. There are over 16.000 workplaces in industrial sites and approximately 114,000 people are employed (Anonymous, 2022a).

Providing suitable environments for investors at the investment and production stages, organized industrial zones, small industrial sites and other industrial sites in the form of collective workplaces are of great importance in the development of industry in Konya province.

Konya Agricultural Machinery Specialized Organized Industrial Zone held a site selection meeting for 313 ha area on 26/10/2017. Opinions of institutions have been completed, except for the Provincial Directorate of Agriculture and Forestry (it has been requested that the land be registered in the name of the Treasury by making a change in quality) and the establishment process is continuing (Anonymous, 2022a).

The largest agricultural machinery specialization Fair of Türkiye is also organized in Konya province. Konya Agriculture Fair has a total exhibition area of 90,000 m², of which 66,000 m² is closed in 7 different halls. In 2022, with the participation of 461 businesses and business representatives from 20 countries, it hosted 207.133 visitors from 90 countries and 81 provinces (Anonymous, 2023b).

The trend for foreign trade of Konya province for the years between 2013-2022 is presented in Figure 1.

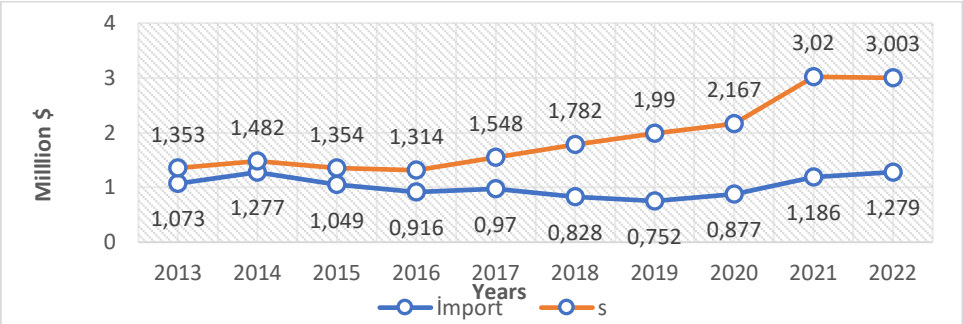

Figure 1. Foreign Trade Trend of Konya Province (2013-2022) (TUIK, 2022a)

According to foreign trade data of Türkiye for the year 2022; 3 billion dollars of 232.2 billion dollars export of the country were carrieda out by the businesses registered in Konya province. This value is the highest value reached by provincial exports.

Table 1. Foreign trade of Konya province based on top 10 countries (TUIK, 2022a)

Export		
Order	**Country**	**Ratio (%)**
1	Iraq	8.84
2	Germany	7.44
3	Russia	6.75
4	USA	5.84
5	Italy	3.5
6	Poland	3.19
7	Romania	2.71
8	Egypt	2.68
9	Israel	2.68
10	Algeria	2.61
	Total	46.2

Import		
Order	**Country**	**Ratio (%)**
1	China	23.6
2	Russia	11.6
3	Ukraine	6.71
4	Germany	4.42
5	South Korea	4.06
6	Italy	3.98
7	India	3.4
8	Saudi Arabia	2.78
9	Vietnam	2.44
10	Indonesia	2.33
	Total	65.3

Imports of Konya province showed an increasing trend until 2014 and then started to decrease. Provincial imports reached their highest value in 2014 with 1.3 billion dollars. According to the foreign trade data of 2022, 1,279 billion dollars of Türkiye's imports of 363 billion dollars were realized by businesses registered in Konya province(TUIK, 2022a).

Considering the foreign trade performance of the provinces in Türkiye in 2022; Konya ranks 12th with a 1.29% export share and 20th with a 0.38% import share. Konya province exports are mostly made to the European Union and Middle East countries and neighboring countries. Imports are made from South Korea, Russia and China. The foreign trade of Konya province on the basis of the first 10 countries is provided in Table 1. In 2022, the share of exports to the first ten countries in the foreign trade of Konya is 46.2%, while the share of imports is 65.3% (TUIK, 2022a).

The countries with the highest exports in 2022 are Iraq with 263.5 million dollars, Germany with 221 million dollars, the Russian Federation with 201.3 million dollars, the USA with 174 million dollars and Italy with 104 million dollars.

The countries with the highest imports are respectively ordered as China with 328.7 million dollars, Russian Federation with 162.3 million dollars, Ukraine with 93.5 million dollars, Germany with 61.6 million dollars and South Korea with 56.6 million dollars.

3. Results and Discussion

Agricultural machinery manufacturing enterprises participating into the survey in the Konya Region were evaluated based on the number of employees and classified as micro-scale, small-scale, medium-scale and large-scale enterprises.

Micro-enterprise: Businesses that employ less than ten people annually and whose annual net sales revenue or financial balance sheet does not exceed five million Turkish Liras. Small business: Businesses that employ less than 50 people annually and whose annual net sales revenue or financial balance sheet does not exceed fifty million Turkish Liras. Medium-scale enterprise: Businesses that employ less than 250 people per year and whose annual net sales revenue or financial balance sheet does not exceed two hundred and fifty million Turkish Liras. Large enterprise: Businesses that employ more than 250 people and whose annual net sales revenue or financial balance sheet exceeds two hundred and fifty million Turkish Liras (Anonymous, 2023a).

Agricultural machinery manufacturing enterprises participating into the survey in the Konya Region were evaluated based on the number of employees and it was determined that 32% were composed of micro-scale, 52% small-scale, 14% medium-scale and 2% large-scale enterprises.

Established in 1978, Turkish Agricultural Equipment and Machinery Manufacturers Association (TARMAKBİR) is an important non-governmental organization for the agricultural machinery manufacturing industry with its sector meetings, training projects and university-industry cooperations. It has 195 members in Türkiye and most of its members operate in Konya province (Anonymous, 2023c).

The membership status of the surveyed enterprises is presented in Figure 2. All of the businesses are registered with the Konya Chamber of Commerce. It was determined that 47% of the enterprises are also registered with the Konya Chamber of Industry. It was also determined that 12.5% of Micro-Scale enterprises, 54% of Small-Scale enterprises and all Medium-scale enterprises are registered with Konya Chamber of Industry. Only 30% of the enterprises are members of the Turkish Agricultural Equipment and Machinery Manufacturers Association.

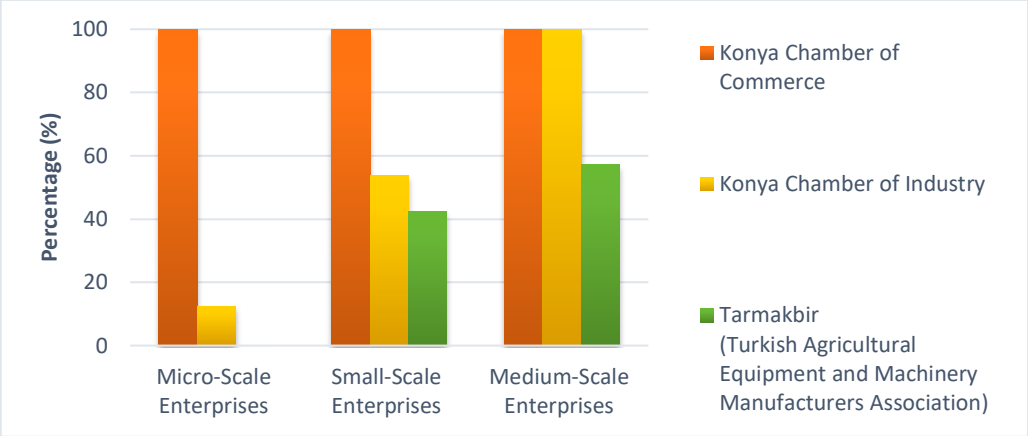

Figure 2. Membership status of surveyed enterprises to chambers and associations

In general, 90% of agricultural machinery manufacturing enterprises are operated with equity capital and 10% benefit from financial credit systems. This situation is shown in Table 2. It was determined that 20% of the enterprises benefiting from the financial credit system used 10% loans in their capital, 20% used 20% loans and 60% used 50% loans in their capital.

Table 2. Benefiting from Financial Credit Systems

	%	Number of Enterprises
Using credit in enterprise capital	10	5
Not-using credit in enterprise capital	90	45

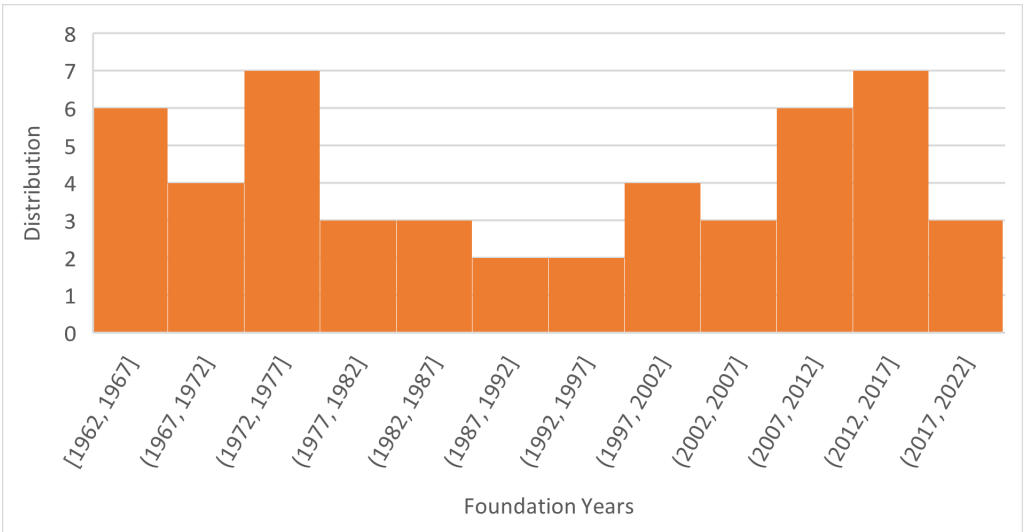

Figure 3. Frequency distribution of the enterprises based on foundation years

Establishment of agricultural machinery manufacturing enterprises of Konya province date back to 1692 and frequency distributions of the enterprises based on foundation years are presented in Figure 3.

Table 3. Corporate status of businesses

	%	Number of Enterprises
Non-corporate	46	23
Corporate	54	27

In terms of corporate status of the participating enterprises, it was determined that 46% of the enterprises are non-corporate and 54% are corporate enterprises. This situation is shown in Table 3. According to table 4,

it has been determined that 55% of the partnerships are between siblings, 22% are father-son/daughter partnerships, 18% are non-family partnerships and 5% are joint partnerships.

Table 4. Partnership status of the enterprises

	%	Number of Enterprises
Father – Son/Daughter	22	6
Siblings	55	15
Spouse	5	1
Non-family	18	5

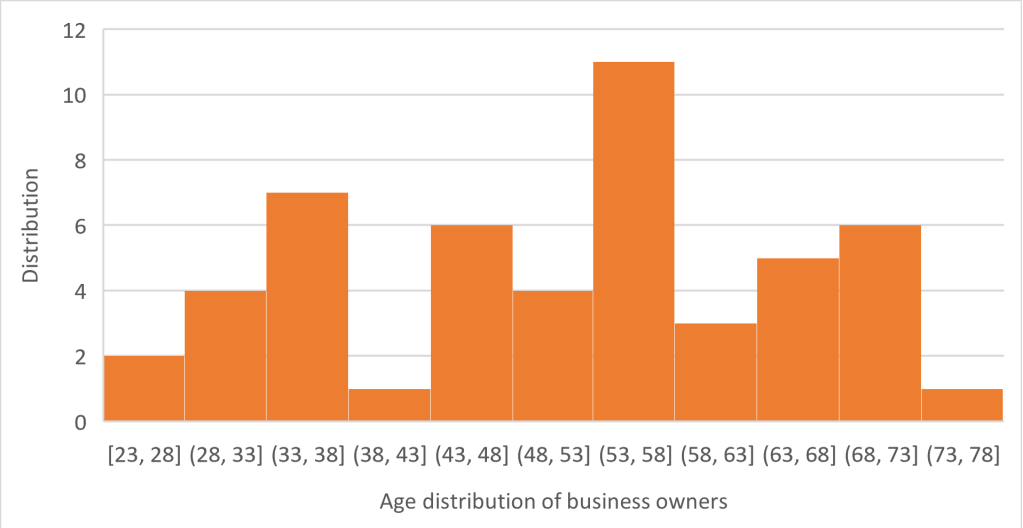

Figure 4. Frequency distribution of enterprises based on owner's age

Frequency distribution of agricultural machinery manufacturing enterprises based on owner's age is presented in Figure 4. It was determined that the average age of business owners was 53, the youngest business owner was 23 and the oldest was 78.

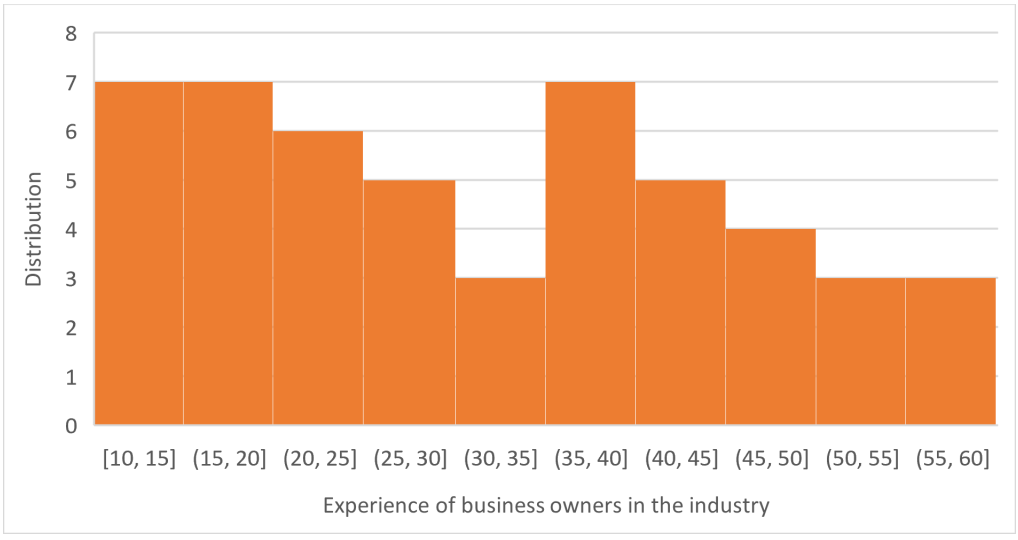

Figure 5. Frequency distributions of the sector experiences of the business owners

The frequency distributions of the sector experiences of the business owners are presented in Figure 5. It was determined that the average experience period was 35 years. The average sector experience was 33 years in micro-scale enterprises, 30 years in small-scale enterprises and 42 years in medium-scale enterprises.

When the agricultural machinery manufacturer business owners are examined in terms of education level, it was determined that 46% of the business owners were primary school graduates, 10% were secondary school

graduates, 24% were high school graduates, 12% had an undergraduate degree and 6% had graduate degree. It is given in Table 5.

Table 5. Educational level of business owners

	Primary School	Secondary School	High School	Undergraduate	Graduate
Micro-scale	7	4	4	1	
Small-scale	11	1	8	4	2
Medium-scale	6	-	-	1	1
Total	23	5	12	6	3
%	46	10	24	12	6

When the agricultural machinery manufacturing enterprises are evaluated in general, it was determined that 20.4% of the enterprises have professional managers, while 79.6% of them do not have professional managers. According to Table 6, while there are no professional managers in micro-scale enterprises, 19.3% of small-scale enterprises and 71.4% of medium-sized enterprises have professional managers.

Table 6. Professional administrator status of the enterprises

	Micro Scale	Small Scale	Medium Scale	Total %
Number of enterprises	-	5	5	10
%	-	19.3	71.4	20.4

It was determined that 40% of the enterprises are operating in rented facilities and 60% of them own their buildings. According to Table 7, it was determined that the rental rate was 56% in micro-scale enterprises, 30% in small-scale enterprises and 50% in medium-sized enterprises.

Table 7. Rental/ownership status of enterprise facilities

	Rental	Owner	Total
Micro Scale	9	7	16
Small Scale	8	18	26
Medium Scale	4	4	8
%	40	60	100

The average closed area is 4654 m^2 and the open area is 4740 m^2. The average closed area is 1216 m^2 in the micro-scale enterprises, 4275 m^2 in in the small-scale enterprises and 13430 m^2 in the medium-scale enterprises. The average open area is 1930 m^2 in the micro-scale enterprises, 4191 m^2 in the small-scale enterprises and 12000 m^2 in the medium-scale enterprises. It was determined that 12.5% of micro-scale enterprises do not have open space.

Workers constitute 78% of the total personnel working in the agricultural machinery manufacturing sector. As can be seen in Table 8, when all manufacturing enterprises are evaluated, it was seen that total number of workers is 1204. It was also determined that 101 workers were employed in micro-scale enterprises, 537 workers in small-scale enterprises and 566 workers in medium-scale enterprises. Number of workers per enterprise was determined as 6.3 workers in micro-scale enterprises, 20.6 workers in small-scale enterprises and 80.8 workers in medium-scale enterprises.

Table 8. Worker/Staff ratio of the enterprises

	Micro Scale	Small Scale	Medium Scale	Total
Total number of employees	137	704	695	1536
Total number of workers	101	537	566	1204
Worker/Staff Ratio (%)	73.7	76.2	81.4	78.3
Number of workers per facility	6.3	20.6	80.8	24.5

Number of workers is followed by engineers with 5.5%, accounting with 5.3%, marketers with 5% and technicians with 4%. Engineers (85) are composed of mechanical engineers with 56.5%, agricultural machinery engineers with 29.4%, mechatronics engineers with 5.9%, industrial engineers with 5.9% and electrical engineers with 2.4%.

Table 9. Distribution of engineers employed in enterprises

	Mechanical Engineer	Agricultural Machinery Engineer	Industrial Engineer	Mechatronics Engineer	Electrical Engineer
Micro Scale	7	-	-	-	-
Small Scale	22	11	-	-	-
Medium Scale	25	11	6	5	2

Estimated labor productivity for production varied between 40 - 70% on average. While the estimated labor productivity in micro-scale enterprises is 61.56% on average, it is 48.8% in small-scale enterprises and 57.14% in medium-scale enterprises.

It was determined that 43% of the malfunctions in production were due to workmanship, 43% of them due to materials along with workmanship and 14% of them only due to materials. Likewise, it was determined that 50% of the malfunctions in production of micro-scale enterprises and 57.7% of malfunctions in production of the small-scale enterprises were due to material and workmanship. On the other hand, in medium-scale enterprises, it was determined that the malfunctions were only due to workmanship with a high rate of 57.1%.

When businesses are evaluated in terms of their licensed software, it was seen that all businesses have at least one accounting software. As can be seen in Table 10, accounting software per enterprise was 1.06 in micro-scale enterprises, 1.15 in small-scale enterprises and 3.43 in medium-scale enterprises. It was also seen that number of design (CAD-CAM) software per enterprise is 0.63 in micro-scale enterprises, 1.5 in small-scale enterprises and 5.86 in medium-scale enterprises.

Table 10. Number of licensed software of the enterprises

	Micro Scale		Small Scale		Medium Scale		Total	
Type of Software	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Design Software	10	0.63	39	1.5	41	5.86	90	1.8
Accounting Software	17	1.06	30	1.15	24	3.43	71	1.4
Other Software	1	0.06	10	0.38	18	2.57	29	0.6

Number of workbenches of agricultural machinery manufacturers and workbenches per enterprise are provided in Table 11. There are 491 gas metal arc welding machines, 206 drill benches, 124 CNC lathes, 93 Eccentric Press benches, 86 Band saw benches, 80 Universal lathes in the enterprises. Number of the mentioned benches per enterprise is higher than the other benches. Per enterprise, there are 10.02 gas metal arc welding machines, 4.20 drill benches, 2.53 CNC lathes, 1.9 lathes, 1 Eccentric Press machine, 1.76 Band saw benches, 1.63 Universal lathes.

1

Table 11. Workbenches of the enterprises

		Micro Scale	Workbench Enterprise	Small Scale	Workbench Enterprise	Medium Scale	Workbench Enterprise	Total Benches	Total Bench Enterprise
Benches	**Type**	**Number**	**Ratio**	**Number**	**Ratio**	**Number**	**Ratio**	**Number**	**Ratio**
Welding	Gas-metal arc	83	5.19	258	9.92	150	21.43	491	10.02
	Electric arc	11	0.69	26	1.00	2	0.29	39	0.80
	Oxygen	12	0.75	17	0.65	3	0.43	32	0.65
	Spot	4	0.25	24	0.92	7	1.00	35	0.71
	Robotic	3	0.19	12	0.46	10	1.43	25	0.51
	Other	2	0.13	0	0.00	0	0.00	2	0.04
Drill		41	2.56	122	4.69	43	6.14	206	4.20
Universal Lathe		26	1.63	39	1.50	15	2.14	80	1.63
Mill		11	0.69	11	0.42	7	1.00	29	0.59
Saw	Circular	0	0.00	1	0.04	0	0.00	1	0.02
	Band	22	1.38	48	1.85	16	2.29	86	1.76
Press	Hydraulic	11	0.69	21	0.81	7	1.00	39	0.80
	Eccentric	19	1.19	49	1.88	25	3.57	93	1.90
	Press Brake	7	0.44	16	0.62	13	1.86	36	0.73
	CNC	2	0.13	10	0.38	0	0.00	12	0.24
CNC	Lathe	11	0.69	81	3.12	32	4.57	124	2.53
	Mill 3 axial	5	0.31	23	0.88	16	2.29	44	0.90
	5 Axes and more	0	0.00	0	0.00	2	0.29	2	0.04
Guillotine Shears		7	0.44	14	0.54	4	0.57	25	0.51
Borwerk Benches		2	0.13	0	0.00	2	0.29	4	0.08
Shaper		3	0.19	5	0.19	1	0.14	9	0.18
Pipe Bending	Mechanic	2	0.13	12	0.46	1	0.14	15	0.31
	CNC	0	0.00	0	0.00	0	0.00	0	0.00
Laser Cut		1	0.06	11	0.42	7	1.00	19	0.39
Plasma Cut		3	0.19	12	0.46	3	0.43	18	0.37

2

It was determined that 49% of businesses renew their products every year. It was also determined that 50% of micro-scale enterprises, 42.3% of small-scale enterprises and 71.4% of medium-scale enterprises renew their products every year.

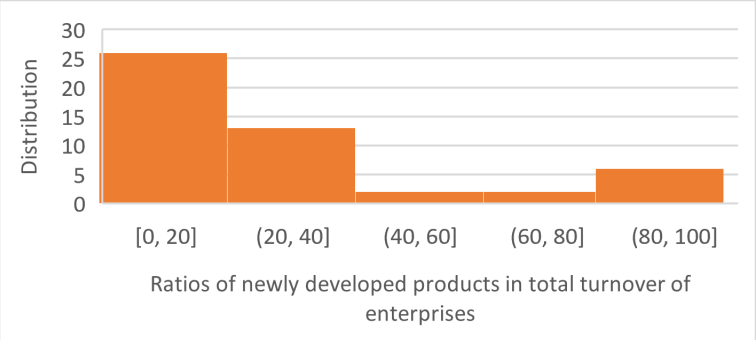

Figure 6. Ratios of newly developed products of enterprises in total turnover

Of the agricultural machinery manufacturing enterprises, 53% stated that the ratio of their newly developed products (last 3 years) in the total turnover ranged between 0 - 20%, 26.5% stated the ratio as between 20-40% and 20.5% stated as 40% or more.

Agricultural machinery manufacturing enterprises stated that the ratio of the budget allocated for R&D to the total budget is 6.02% on average. Such a ratio is 6.5% in micro-scale enterprises, 3.07% in small-scale enterprises and 8.5% in medium-scale enterprises.

It was determined that 24.5% of the agricultural machinery producing enterprises prefer imported materials, 26.5% prefer domestic materials and 49% prefer suitable materials regardless of any source of origin. It was determined that only 8.15% of the enterprises made a search from the websites while 73.5% preferred the material supply with references.

Of the participant enterprises, 57.1% stated that they could not make cost analysis of the products they produce. It was determined that 50.2% of micro enterprises, 65.3% of small enterprises and only 42.8% of medium-scale enterprises can perform cost analysis.

Table 12. Serial Production Works of the Enterprises

	Serial Production Works	
	Yes	**No**
Micro Scale	-	16
Small Scale	5	21
Medium Scale	5	2

According to table 12, while 79% of the enterprises stated that they did not have any works for serial productions, 21% stated that they had works for serial productions. While there is no work for serial production in all micro-scale enterprises, it was observed that 80% of small-scale enterprises and 71% of medium-scale enterprises have works for serial productions.

When the enterprises are examined in terms of their quality management systems, it was determined that only 55.1% of them have a quality management system and 55% of the enterprises that have a quality management system cannot fully implement the system.

When the enterprises producing agricultural machinery are evaluated in terms of the projects they carry out with institutions such as KOSGEB and TUBITAK and the number of consultancy received from universities, only 34% of these enterprises have cooperations with KOSGEB for R&D and P&D activities, 8% with TUBITAK. It was also determined that 18% of them received consultancy from universities.

Table 13. Industrial Property Documents Owned by Enterprises and KOSGEB, TUBITAK Collaboration Status

	Micro Scale	Small Scale	Medium Scale
Number of enterprises with cooperations with TUBITAK	-	2	2
Number of enterprises with cooperations with KOSGEB	5	7	5
Number of enterprises with cooperations with Universities	2	5	2
Number of enterprises with Patent Registrations	3	3	1
Number of enterprises with Utility Model Registrations	8	19	5
Number of enterprises with Industrial Design Registrations	3	2	4
Number of enterprises without any Industrial Property Documents	8	4	2

It was determined that 71% of medium-scale enterprises carry out R&D and P&D projects with institutions such as KOSGEB and TUBITAK, while 60% of these enterprises carry out KOSGEB and 40% both KOSGEB and TUBITAK projects, they also receive consultancy services from universities. When the medium-scale enterprises are evaluated considering their intellectual and industrial property documents, it was seen in Table 13 that 71% have utility model, 57% industrial design and 14% patent certificate.

It was also determined that 42.3% of small-scale enterprises carry out various projects with KOSGEB and TUBITAK, 72.7% of these enterprises cooperate with KOSGEB, 9% both KOSGEB and TUBITAK at the same time, 9% only with TUBITAK. It was determined that 54 of them received consultancy services from universities during these collaborations. When small-scale enterprises are evaluated considering their intellectual and industrial property documents, it was seen in Table 13 that 73% have utility models, 11.5% have patents and 7.7% have Industrial Design certificates.

It was observed that 31% of micro-scale enterprises carry out various projects with KOSGEB and 12% receive consultancy services from universities. When micro-scale enterprises are evaluated considering their intellectual and industrial property documents, it was seen in Table 13 that 50% have utility model, 18.75% have industrial design certificate and 18.75% have patent certificate.

Table 14. Distribution of Industrial Property Documents Owned by Enterprises and KOSGEB, TUBITAK Collaborations

	Micro Scale	Small Scale	Medium Scale
Number of TUBİTAK Projects		2	2
Number of KOSGEB Projects	4	8	5
Number of Consultancies from universities		6	2
Total number of collaborative projects	4	16	7
Number of Patent Registrations	3	7	10
Number of Utility Model Registrations	21	55	13
Number of Industrial Design Registrations	8	5	41
Total number of Intellectual and Industrial Property Documents	31	67	44

When the companies producing agricultural machinery are evaluated in terms of the projects they carry out with institutions such as KOSGEB and TUBITAK, number of consultancies received from universities and intellectual property certificates, it was determined that they carry out various projects TUBITAK (4 projects) and KOSGEB (17 projects) and 8 of them receive consultancies from universities. Table 14 shows that there are 31 intellectual property certificates in micro-scale enterprises, 67 in small-scale enterprises and 44 in medium-scale enterprises. It was determined that there are 3 patent certificates in micro-scale enterprises, 7 patents in small-scale enterprises and a total of 10 patent certificates in medium-scale enterprises. While Micro and Small-scale enterprises have the most Utility model certificates, medium-scale enterprises have the most Industrial design certificates.

Table 15. Quality positioning of the products of the enterprises in the International Markets

	Degree of Quality in International Markets		
	1st Quality (%)	2nd Quality (%)	3rd Quality (%)
Micro Scale	31.30	37.50	31.20
Small Scale	15.40	76.90	7.70
Medium Scale	28.60	57.10	14.30
Total Ratio (%)	22.40	61.30	16.30

Participant enterprises generally define their product quality as the 2nd quality with a rate of 61.3% in the international markets. Table 15 shows that while 76.9% of enterprises that define their products as 2nd quality are small-scale and 57.1% are medium-sized enterprises, only 37.5% of micro-scale enterprises define their products as 2nd quality.

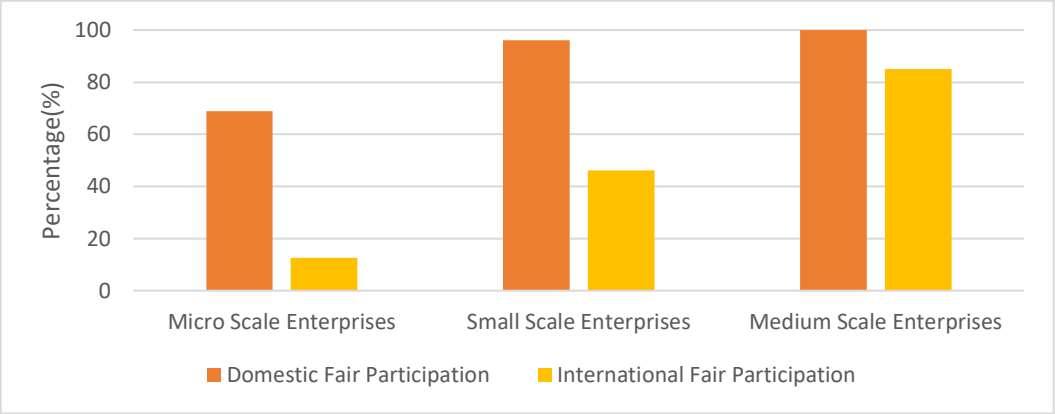

Figure 7. Participation status of enterprises in Domestic-Overseas Fairs

The participation status of agricultural machinery manufacturers in domestic fairs is shown in Figure 7. While 31.2% of micro-scale enterprises did not participate in domestic fairs, all medium-scale enterprises participated in domestic fairs. It was determined that 4% of small-scale enterprises do not participate in domestic fairs. It was also determined that 87.5% of micro-scale enterprises and 53.8% of small-scale enterprises do not participate in foreign fairs. It was observed that 85% of medium-scale enterprises participated in international fairs. It was found that especially the organizations held in Germany, Italy and Bulgaria are predominant in the participation of foreign fairs.

When the businesses are examined in terms of the management of their websites, it was determined that 75% of them receive service from another company for website management and 69.6% of these businesses control the website for more than 6 months.

In general, 98% of the enterprises producing agricultural machinery export directly or indirectly. About 93% of micro-scale enterprises and all of the small and medium-scale enterprises export. Exported countries include Russia, Turkic Republics, Middle East, North African countries and European countries such as Romania and Moldova.

Participant enterprises stated that for agricultural machinery manufacturing sector to reach a much better place in international markets, efforts should be made to reduce production costs and effective government supports should be carried out. Additionally, micro-scale enterprises stated that a corporate management system should be adopted. Small-scale enterprises and medium-scale enterprises stated that access problems to the ports should be eliminated, domestic quality assessment should be made between enterprises and studies on smart agriculture systems should be carried out.

4. Conclusions

When the general situation of the agricultural machinery manufacturers in Konya Region is examined, it was seen that about 84% of the enterprises consist of micro and small-scale enterprises, 90% of the enterprises work with their own capital and do not benefit from the banking credit systems. Such a case is largely resulted from the socio-cultural status of the business owners and religious belief. Therefore, businesses are expected to encounter various problems in financing.

About 46% of the enterprises are corporate businesses. Such a case brings about fragmentation and downsizing of the enterprises. Therefore, it becomes difficult to make forward-looking and growth-related decisions.

Average age of the business owners is 53 years and the average of their experience in the sector is 35 years. Such a case indicated that they started manufacturing at a young age and chose it as a profession. Although this situation is important in terms of professional experience, it caused the education level of business owners to decrease.

Business owners are managers at the same time, therefore, about half of the businesses do not have professional managers. Ratio of university-graduate business owners is 15%, therefore, they may have problems in terms of future planning.

Enterprises employ engineers with a ratio of 5.5% and technicians with a ratio of 4% in total personnel, therefore, employment support should be provided by organizations such as KOSGEB and İŞKUR, especially for small-scale enterprises.

It was seen that the adequacy level of the manufacturing technology owned by the agricultural machinery manufacturing enterprises is low. When the bench park of the enterprises is examined, it is necessary to increase the competitiveness of especially micro and small-scale enterprises, to renew the technologies and to modernize the enterprises.

Lack of R&D departments, quite a low number of projects and products developed with different institutions and resultant low numbers of intellectual property certificates revealed that they have difficulty in following the developments in the sector and cannot establish future scenarios.

It was seen that micro and small-scale enterprises are affected by the negative effects occurring in the country and have financial problems. However, they export at a rate of 80% and such a case caused them to be less affected by some negativities that will occur in the domestic market.

It was observed that especially micro and small-scale enterprises do not have sufficient corporations with organizations such as KOSGEB and TUBITAK for R&D projects. Therefore, micro and small-scale enterprises should be directed to organizations such as KOSGEB and TUBITAK for their R&D activities.

About 61.3% of businesses define their products as second quality in international markets. Especially small and medium-scale companies position their products as 2nd quality and such a case can be explained by high participation rate of these enterprises in foreign fairs and the problems experienced in production. On the other hand, micro-scale enterprises define their products as 1st quality since they don't participate foreign fairs much, thus are unable to compare their products with international competitor enterprises. It is necessary to increase the participation rate of micro and small enterprises into foreign fairs to follow international markets, competitors, innovations and practices.

Agricultural machinery manufacturers can promote their products and brands in different international fairs held in Turkey. Due to the capacities and costs of these fairs, the access of micro and small enterprises is not possible at a sufficient level.

While there are especially large and medium-scale enterprises in Konya Agriculture, Agricultural Mechanization and Field Technologies Fair, which is described as the largest agricultural machinery and technologies specialization fair of Türkiye, participation of micro and small-scale enterprises in this fair

cannot reach a sufficient level. In this sense, it is necessary to increase the capacity of the fairground and especially the micro and small enterprises should be supported for their participation into this fair.

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References

Anonymous (2022a). Konya Sanayi Siteleri, https://www.konyadayatirim.gov.tr/konya-da-yatirim/yatirim-bolgeleri/sanayi-siteleri: [Eylül, 15].

Anonymous (2023a). KOBİ Tanımı, https://www.kosgeb.gov.tr/site/tr/genel/detay/8173/kobi-tanimi-guncellendi: [Nisan 28].

Anonymous (2023b). Konya Tarım Fuarı, https://www.konyatarimfuari.com/: [Mayıs 16].

Anonymous (2023c). Tarmakbir Hakkında, https://tarmakbir.org/hakkimizda: [Mayıs 20].

Atasoy Z (2021). Türkiye'de Deney Kurumlarının Yaptığı Tarım Alet ve Makine Deneyleri Hakkında Bir Değerlendirme. 33. Ulusal Tarımsal Mekanizasyon ve Enerji Kongresi. Isparta / Türkiye**:** 87-93.

Özgüven M, Türker U, Beyaz A (2010). Türkiye'nin tarımsal yapısı ve mekanizasyon durumu, *Gazi Osman Paşa Üniversitesi Ziraat Fakültesi Dergisi*, 28: 2, 89-100.

Özkul H, Güzel B (2020). Konya İl Sanayi Durum Raporu, *T.C. Sanayi ve Teknoloji Bakanlığı*.

TCMB (2021). Sektör Bilançoları İstatistikleri, https://www3.tcmb.gov.tr/sektor/#/tr/C/283/tarim-ve-ormancilik-makineleri-imalati:

TUIK (2022a). Dış Ticaret İstatistikleri, www.tuik.gov.tr: [Ocak, 9].

TUIK (2022b). Türkiye Tarım Alanı Istatistikleri, www.tuik.gov.tr: [Ocak 9].