3rd World Conference on Technology, Innovation and Entrepreneurship (WOCTINE)

Research and Development Approaches and Implementation Issues in Agricultural Machinery Sector; Konya Case

Şule ERYÜRÜK[a]*, Barış Samim NESİMİOĞLU[b], Hüseyin Oktay ALTUN[c], Hulusi AÇIKGÖZ[c], Semih YUMUŞAK[d], Hüseyin Bekir YILDIZ[e], Ahmet ÇALIK[f], Ozan İbrahim Ethem BAĞRIYANIK[a]

[a]KTO Karatay University, Faculty of Engineering, Dept. of Industrial Engineering, Konya, 42020, Turkey

[b]KTO Karatay University, Faculty of Engineering, Dept. of Mechatronic Engineering, Konya, 42020, Turkey

[c]KTO Karatay University, Faculty of Engineering, Dept. of Electrical and Electronical Engineering, Konya, 42020, Turkey

[d]KTO Karatay University, Faculty of Engineering, Dept. of Computer Engineering, Konya, 42020, Turkey

[e]KTO Karatay University, Graduate School of Natural and Applied Sciences, Konya, 42020, Turkey

[f]KTO Karatay University, Graduate School of Social Sciences, Konya, 42020, Turkey

Abstract

In Turkey, agricultural manufacturing plays a big role in industry as a sector and can produce almost all categories of agricultural equipment. When considered agricultural machinery sector, it is ranked as the 5th biggest machinery sector in Turkey, covering 7% of the total exports and in domestic market, agricultural machinery sector is ranked as 4th sector. From a regional point of view, it can be stated that İstanbul, Ankara, İzmir, Konya, Aydın, Manisa and Balıkesir regions are prominent in the sector in terms of both manufacturing volume and number of employments. However, when it comes to contribute and implement new technological developments, Turkey cannot perform adequately considering export-import balance. Most of the imports are especially the equipment possessing high technology. The lack of following trend technologies becomes a potential threat on the sector. A demand analysis questionnaire was conducted to understand the demands of SME's in agricultural machinery sector, which is the target group of 'Smart Technologies, Development, Design and Prototyping Center' that is planned to establish within our university. In this study, results of the survey that was implemented to capture current state of the overall approach to R&D applications and demand analysis in agricultural machinery sector in Konya, Turkey. In addition to the current picture, main impediments in process of technological transformation are confirmed by the results of demand analysis survey for the region. The demand analysis clearly revealed that almost 60% of the companies participating in the

* Corresponding author. Tel.:+ 90 4441251 Fax: +90 332 202 00 44

  E-mail address: sule.eryuruk@karatay.edu.tr

survey believe that there are problems in the current state of the sector; whereas another additional 10% considers the future of the sector being in jeopardy. Main problems are defined as Lack of skilled labour, Insufficient R&D activities by considering low awareness of R&D and SMEs' inability to develop and conduct R&D projects and Lack of effective University-Industry Collaboration.

1. Introduction

The aim of this paper is to measure the expectations of the firms in agriculture machinery sector in Konya and define the possible needs of the Smart Technologies Design, Development and Prototyping Center (STEDEC), which are aimed to be established under the leadership of KTO Karatay University. In this context, demand analysis was conducted. The analysis designed to define 4 different aspects;

- General R & D and export information of firms in Konya
- Current problems of the sector and future expectations
- Budget planned to be allocated to R & D activities from a specially designed R&D center (STEDEC) for Smart technology adaption in agricultural machinery sector
  and
- Expectations from STEDEC which should serve as a center to leverage the Technology Readiness Level (TRL) of agricultural machinery firms whilst adapting smart technologies.

1.1. Measuring R&D and Innovation

In the beginning, definition of "Research and Experimental Development (R&D)" should be expressed. It comprises creative work undertaken on a systematic basis to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. The term R&D covers three activities: basic research, applied research and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any application or use in view. Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed [3].

Innovation is globally seen as a vital creator of economic growth for both developing and developed countries. However, it is an inherently risky activity, so R&D is one among many innovation activities and carries its own risks. R&D is important for its role in the process of technology absorption and adaptation.

Measuring R&D remains crucial for some powerful reasons. The most obvious is that one should know the magnitude of the inputs to R&D and their focus in various industries. Then another reason provide indirect benefits, is that the act of measuring R&D may encourage the surveyed organizations to improve their awareness and management of R&D activities. What is the best way or a generic model to measure R&D is a question cannot have only one answer. Considering several studies and manuals shows how to establish a generic model questionnaire, it should be recognized that circumstances and practices vary greatly across appliers and that there is no single way to achieve a sound and reliable R&D survey [1].

1.2. Smart Technology and Agricultural machinery sector

Smart technology adaptation is an important R&D related activity in agricultural machinery sector. In general, almost every type of product is evolving to sophisticated systems which may monitor its environment or regulate its own condition, with a software to control product functions, optimize its performance, or decide autonomously[12].

There are agricultural platforms named Precision agriculture (PA) and Agriculture 4.0, which aim to produce "more food from less land in a sustainable manner with affordable prices." This can be achieved by an improved mechanization. The conventional agricultural machines must be replaced with the ones that includes smart and connected technologies. It seems the new smart and connected agricultural machines should shape the future of farming in the way of expectations of the new era for agriculture.

Small and medium-sized enterprises (SMEs) in developing countries are facing difficulties to be able to adjust to new global challenges. These challenges include;

1) lacking proper guidance and research activities to facilitate the new technological advancements on their products,

2) difficulty in reaching expensive high-tech research capital,

3) insufficient financial resources,

4) too few or insufficiently qualified personnel,

5) lack of time of the key persons who are preoccupied with day-to-day work,

6) inadequacy of advanced technical know-how,

7) limited scientific search capabilities and

8) inability to analyze the changing rules of the market and adapting to these transformations properly [2].

Hence, SMEs of a developing industry need a structured, well-formulated and systematic support and adjust to the innovative solutions to keep and increase their competitiveness in the global market. The lack of this support and adjustment, critical to SMEs' core business, is an obstacle to strengthening of their innovation capacities [4].

To give an overview about the agricultural machinery sector, the products produced in agricultural machinery sector are classified under the Code 28.30 as "Production of Agricultural and Forestry Machinery" in Revised 2 of the Statistical Classification of Economic Activities (NACE Rev.2) in the European Community. Under this definition, products are divided into 4 main groups including 54 sub-groups given below;

● Tractors,
● Agricultural machinery and equipment,
● Milking and cooling equipment,
● Stock farming machinery and equipment.

In the field of agricultural equipment and machines, new products can be added to the portfolio in parallel with the sectoral and technological development trends.

In Konya province, enough supplies and services can be provided including production of rolled steel shape, raw and semi-finished plastic products, hydraulic systems, fasteners, laser cutting and machining for raw materials, semi-finished and finished products that agricultural equipment and machinery manufacturers should supply. Sufficient activities related to the medium to high technology such as bearings, pneumatics, paint and electro-mechanical systems cannot be delivered within the region which are needed by the manufacturers of agricultural equipment and machines, as raw materials, semi-finished products and finished products [5]. They can produce 90% of the semi-finished and final production inputs in a tractor manufacturing process and 100% of other agricultural machinery production inputs [8][9][10].

The production activities in Konya province related to agricultural equipment and machines are concentrated mostly in Konya city center and a few at some districts. There are 7 activities in the districts of Konya province including Akşehir, Çeltik, Ereğli, Karapınar and Kulu [11]. Konya is one of the leading regions in Turkey in the agricultural machinery sector, contributing 135 operating SMEs to the field (Konya Chamber of Commerce Database, 2017). These SMEs produce approximately 65% of the overall Turkish agricultural machinery production. They are also responsible for approximately 45% of agricultural machinery exports of Turkey, along with the capability of self-producing 90% of the equipment employed in tractor manufacturing and 100% of remaining agricultural machinery [6][9][10]. Furthermore, most of the enterprises in Konya fall into the category of small and medium enterprises [6] It is well known that more than 60% of the agricultural machinery production companies produce export goods [?],

as corroborated by the demand analysis report stating 63.5% of these companies being exporters. Consolidating all this data, it demonstrates that Konya is a promising zone with considerable number of SMEs exhibiting high production capability. As expected, the agricultural machinery sector plays an important role in the economy of the region. Although the existing industrial capabilities and the willingness to incorporate R&D services to their operation in the region is promising, only 2.37% of the employers comprised of engineers and the remaining part consists of administrative staff and unskilled labour. For agricultural machinery sector, excluding tractor manufacturers, this ratio is 0.69%.

2. Data, Procedure and Results

2.1. Data and Procedure

A demand analysis was conducted in collaboration with 91 SMEs in the region, by means of a face to face survey assessment. The results of the questionnaire were evaluated by using SPSS program using descriptive and inferential statistical methods. 85 questionnaires showed statistically significant results.

2.2. Results

The results of the survey clearly revealed the existing situation and the chronic problems of the agricultural machinery sector in Konya which, generally is in accordance with some regional-based reports published related the agricultural machinery sector [5]. In the demand analysis survey, companies defined their main activities based on specified pre-defined activities covering all classification standards which are given below;

- Energy and Power Units
- Land Improvement Equipment
- Soil Processing Equipment
- Sowing, Planting and Fertilizing Equipment
- Irrigation Equipment
- Crop Protection and Maintenance Equipment
- Harvesting and Treshing Equipment
- Crop Processing Equipment
- Equipment Used in LiveStock Farming
- Transportation Transmission Equipment
- Precision Agriculture Technology Equipment

In this section, the current profile of the companies is analyzed. When the years of establishment of the companies that filled out the survey were examined, it is observed that the first company was established in 1952, 59% of the companies were established before 2000 and the left was established after 2000. 4 firms did not specify the years of their establishment.

When the total number of employees is examined for companies, it is observed that there are companies with at least 2 employees and maximum 210 employees. 5 companies did not specify the total number of employees, while the average number of employees was 35. In the 5% confidence level, the average number of employees is 26.20-43.79. Total number of engineers a company possesses is analysed. 38.1% of the enterprises (32) do not employ any engineers, 48.8% (41) employ 1 to 3 engineers, 10.7% employ 4 to 6 engineers, and 2.4% employ 10 or more engineers.

According to the sector activities of the companies, 23.6% of the firms has the activity of Soil Processing Equipment. Harvesting and Threshing Equipment was in second place with 19.3% and Sowing, Planting and Fertilizing Equipment was the third place with 18.6%. The area with the least activity is seen as Energy and Power Units with 0.7%.

Based on the question about the export activities of the firms, in total, 85.9% of the enterprises are exporting whether directly or with an intermediary firm. When considering the annual export capacities of enterprises, 39.4% of the enterprises have annual export capacity of 500.000 $ and above. 60.6% of the enterprises have annual export capacity below 500.000 $.12 out of 85 enterprises do not have any export. 7 of the enterprises did not want to give

information about their export capacities.

Considering the regions that the companies, highest percentage of export volume is to Middle East countries by 24% secondly Turkic Republics by 20%, and then countries in Africa by 18,4% at third rank.

It is asked to the firms that how they see the current status and future of the agricultural machinery sector in Konya. 16.5% of the enterprises say that urgent measures should be taken into account and there are serious problems in the sector. 41.2% of the enterprises think that they have problems in the current situation and 42.3% think that the current situation is good.

It is asked to the companies to give a point from 1 (very important) to 5 (not important) for each possible problem types given below;

- *Lack of qualified employee*
- *Lack of necessary machinery / equipment*
- *Weak R & D capability*
- *Weak university and industry collaboration*
- *Problems in accessing new technologies*

In this question which is evaluated according to 1 (very important) - 5 (not important) scale, the problems of the agricultural machinery sector were examined. Lack of qualified personnel is considered the most important problem of this sector with an average of 1.64. Later, the weak R & D capability with an average of 2.29 is seen as the second of the important problems.

The lack of qualified employee is seen as a significant problem due to the scoring of 1 and 2 (approximately 80.7 %). The lack of machinery / equipment is seen as a significant problem due to the scoring of 1 and 2 (approximately 34.2%). The weakness of R & D capability is seen as a significant problem due to the scoring of 1 and 2 (approximately 63.8%). The weakness of university-industry collaboration is seen as an important problem due to the fact that the it is scored as 1 and 2 (approximately 58.8 %). Problems in accessing new technologies is seen as a significant problem due to the scoring of 1 and 2 (approximately 30.4 %). When it is asked to the company, whether they are capable of producing a new generation precision agricultural machinery and / or smart products that are compatible with Agriculture 4.0 or not. 25.9% of companies answered as yes and 69.4% answered as no and left did not answered that question. Following question is "If your answer to the previous one is No; Which of the following reasons are fitting for your condition not to be able produce similar agricultural machinery. Lack of knowledge on how to improve one is the highest rank answer by 27.1%. Unable to develop smart technologies and Machine – equipment shortage is the second rank answers by 22.4%. 16.5% of the enterprises thinks that the current situation and future of the agricultural machinery sector needs urgent measures and there are serious problems in the sector. 41.2% of the enterprises think that they have vital problems in the current situation and 42.3% think that the current situation is good.

By crosstab analysis, the relation between the R&D activities and having an R&D department in a company s analysed. Here the most important information gathered is if a company does not have an R&D department, the company can not have ability to produce smart products compatible with new generation precision agriculture and Agriculture 4.0 by 84,8% . On the other hand, if a company has an R&D department they might be able to produce smart products compatible with new generation precision agriculture and Agriculture 4.0 by 42,89% but possessing an R&D department itself is not enough (Table 1).

Table 1: Crosstab Analysis
Relation between the R&D activities and having an R&D department

			Does your company have an R & D department?		*Total*
			Yes	*No*	
Ability to produce smart products compatible with new generation precision agriculture and Agriculture 4.0	*Yes*	*Count*	15	7	**22**
		Within % *of your company* *have R & D* *department?*	42,9%	15,2%	27,2%
	No	*Count*	**20**	39	**59**

		Within % of your company have R & D department?	57,1%	84,8%	72,8%
Total		Count	**35**	**46**	**81**
		Within % of your company have R & D department?	100,0%	100,0%	100,0%
Chi Square value (1): 7.675, p:0.006 <0.05 *p value of the chi square statistic is less than 5% indicates that the relationship between these variables is statistically significant.*					

48,3% of the companies which does not possesses an R&D department thinks that they can conduct R&D activities by outsourcing or by their own way without a necessity for an R&D department. 76,4% of companies believe that their trade volume and competitiveness should increase at national - international level with properly planned and result oriented R & D activities.

Considering the cross tab analysis *between the awareness of the supports given by state or state supported institutions for R & D activities and what percent of the turnover are devoted to R & D activities by a company,* the number of enterprises that never devote to R&D activities at current state and do not have information about supports is 18 (22.5%). The number of enterprises that currently devote 5% and more of their turnover rate to R&D activities and already benefit from a support is 13. (15.9%).

Considering the cross tab analysis between *what percent of the turnover are devoted to R & D activities by a company and possible amount of budget to be allocated in case of benefiting from a support rate of 75% and above for R & D activities,* the number of enterprises that never devote to R&D activities at current state and should not consider allocating any budget in case of benefiting from a 75% or more support is 15 (19%).

The number of enterprises that currently devote 5% of their turnover rate to R&D activities can consider mostly 100,000 TL budget allocation if they can be able to get financial support of 75% and above for R & D activities is 12. (15.2%).

It is asked that what kind of expectations your company would have from a well-equipped center that should be established in Konya, specialized in agricultural machinery and can support your company in R & D activities. Given expectation options are given below (Table 2);

Table 2: Expectations from a well-equipped center

		Answers		Percent of Cases
		N	Percent	
Expectation	*Expanding your product portfolio*	52	15,5%	65,0%
	Increasing your competitiveness	53	15,8%	66,3%
	Development of advanced technological products	64	19,1%	80,0%
	Support with high-tech machinery and equipment	60	17,9%	75,0%
	Support to improve the production process	59	17,6%	73,8%
	Consulting services	47	14,0%	58,8%
Total		335	100,0%	418,8%

It is asked to the companies if they have belief that a university-supported and high-tech equipped center established in Konya might contribute to make your company more competitive considering support for R & D activities or not.

64.3% of the companies believe that if the system is properly installed and managed, that center should contribute to increase their competitiveness.

Considering the cross-tab analysis between *what kind of special areas the companies can benefit from an R & D center focused on agricultural machinery at that region and highest amount of budget to be allocated in case of having service of related area,* the number of enterprises which never would like to have *software* service and should not allocate any budget for that is 26 (33.3%). The number of enterprises which would like to have *software* service and should allocate budget up to 500.000 TL is 48 (61.4%). The number of enterprises which would like to have software service and should allocate budget more than 500.000 TL is 2 (2.5%).

The number of enterprises which never would like to have *electronic* service and should not allocate any budget for that is 30 (40%). The number of enterprises which would like to have *electronic* service and should allocate budget up to 500.000 TL is 44 (58.7%). The number of enterprises which would like to have *electronic* service and should allocate budget more than 500.000 TL is 1 (1.3%).

The number of enterprises which never would like to have *mechanics* service and should not allocate any budget for that is 20 (26.7%). The number of enterprises which would like to have *mechanics* service and should allocate budget up to 500.000 TL is 50 (66.7%). The number of enterprises which would like to have *electronic* service and should allocate budget more than 500.000 TL is 5 (6.7%).

The number of enterprises which never would like to have *material improvement* service and should not allocate any budget for that is 23 (30.7%). The number of enterprises which would like to have *material improvement* service and should allocate budget up to 500.000 TL is 49 (66.2%). The number of enterprises which would like to have *material improvement* service and should allocate budget more than 500.000 TL is 3 (4%).

When it is asked to the companies whether they could compete in the market with your current production system and infrastructure or not, 24 of them (28.2%) thinks it is difficult to compete, 15 of them (17.6%) thinks by consulting hey can continue to compete and 44 of them (51.8%) thinks that their current production system and infrastructure is sufficient to maintain their competitiveness.

When it is asked to the companies whether they could protect their national and international market shares with their current production capabilities in the near future or not, 30 of them (35.3%) thinks they can only protect national market share, 4 of them (4.7%) thinks they can only protect international market share and 35 of them (41.2%) thinks that they can protect both national and international market share and 13 of them (15.3%) thinks that they can not protect both national and international market share.

3. Summary, Discussion, Conclusions

3.1. Summary

The key findings of the revealed problems are expressed as follows:

1) Lack of skilled labour is deemed as the most important risk factor in the region with 80.7% selection ratio in the survey. This fact is also marked as a significant threat in the SWOT analysis performed for the agricultural machinery sector and graded as "moderate" in Porter's Diamond Model for the competitiveness of the agricultural machinery manufacturers [5]. Moreover, the lack of training programmes to create the qualified labour force is also graded as "low" in the same diamond model. This fact is also emphasized in [7] and prioritized to obtain more competitive enterprises.

2) Insufficient R&D activities is depicted as the second most important problem of the sector, with an approval rate of 63.8% ın survey analysis. This fact is also emphasized in 2014-2023 regional development plan and marked as high priority to enhance competitiveness of the enterprises [7]

a) Low awareness of the SMEs on R&D: As might be expected, the lack of awareness of R&D activities can be considered as the primary issue to be resolved, for SMEs to design and perform R&D activities. To create successful R&D projects in collaboration with SMEs, their awareness and mindsets on R&D activities should be increased. Raising awareness is consequential in advancing R&D.

b) SMEs' insufficient ability to develop and conduct R&D projects: Most of the members of the target group in agricultural machinery sector have lack capabilities and resources to develop and conduct R&D projects on smart technologies. In this respect, establishment of a center likewise STEDEC was depicted as an asset for the region in the Porter's diamond model for the competitiveness sector. In this context, to conduct R&D projects, the funding problem might also be a significant barrier for the SMEs based on their financial resources and financial stability. In this regard, a wide range of funding programmes offered by several government organisations (e.g TÜBİTAK, KOSGEB, MEVKA, MOSiT etc.) are of capital importance. However, the number of SMEs benefiting from these funding programmes is quite low. Moreover in the demand analysis it is shown that only 18.8% of the target group could benefit from such funding programmes, more than 55% of them do not possess any knowledge about the details of the programmes.

3) Lack of effective University-Industry Collaboration is mentioned as the third most important problem of the sector with a selection ratio of 58.8%. Accordingly, this was also reported as a threat in the SWOT analysis performed for the agricultural machinery sector.

Based on the survey results, 67% of the agricultural machinery SMEs in the region needs by means of software-based services. In that regard, the list of possible necessary services can be provided is given as follows:

- Delivering industrial design and modelling services especially related with smart technologies/products.
- Supporting clients on their own R&D studies by means of computational analysis and simulation-based verification of theoretical designs.

Based on the survey results, 60% of and 73.3% of the agricultural machinery SMEs in the region needs by means of electronic and mechanical based services. In this respect, the list of possible necessary services is;

- Rapidly prototyping the theoretically verified pre-designs as electrical and mechanical prototypes.
- Supporting clients on their own R&D studies by means of rapidly produced prototypes in order to provide them to test their theoretically and computationally verified pre-designs in their laboratory and/or in the real environment.
- Validating the functionality of the prototype whether it conforms with the theoretical and simulation-based analyses.
- Ensuring the compliance of the validated prototype with the available standards via pre-compliance tests.
- Supporting clients on their own R&D studies by means of providing them a sophisticated laboratory environment to validate the functionality of their prototyped products and providing them sophisticated testing facilities to check whether their products conform with the available standards.

3.2. Discussion and Conclusion

As a suggestion to solve main R&D implementation issues in agricultural machinery sector in Konya, KTO Karatay University would establish Smart Technologies, Development, Design and Prototyping Center' to leverage TRL of companies. These center might help companies by realizing the following plans;

The level of labour skills should be enhanced by thoroughly diagnosed needs-gaps and successfully planned training organizations. In this respect, the required training programmes should be detected and based on the findings on this study, the appropriate staff members of the center should be educated through the needs. After incorporating the skilled staff in the center, the necessary training programmes should be organized.

In general, focused approach is to provide the required environment for R&D activities to the SMEs, in terms of knowledge and the high-tech equipment; which is quite out of reach for them. To strengthen the approach, it has to be stated that the building of the center that would serve for agricultural machinery sector should be constructed considering the necessary infrastructural details. Thereby, this center should facilitate the R&D activities and increase the R&D ability of SMEs to transform their conventional products to smart and connected ones. Mainly, this aim should be achieved by providing them the required knowledge originated in the academy along with helping them access the required equipment by a well-established center, supplied with relevant high-tech equipment, necessary

technical trainings should be organised about smart technologies to increase awareness and ability of the target group to these technologies in a technical way. Moreover several promoting and awareness raising events should be organised to increase the attention of the target group to smart technologies in a non-technical way

As stated before, this special center should possess high-tech equipment in smart technologies and rapid prototyping which are beyond the accessibility of the agricultural machinery SMEs and it should encourage SMEs and help them develop products equipped with smart technologies. Some training organisations should be devoted to overcoming the nescience to the funding programmes. Besides, depending on the specific programme calls, focused funding programme trainings should be offered to the target group to help them apply to these programmes and in order to increase the accessibility ratio of the target group to such funding programmes.

To build effective collaborations with SMEs, it should be focused on the expectations of the SMEs, in order to help them transform their conventional products into the smart ones effectively

On the other hand, this center should seek to build effective networking and partnerships along with an academic advisory board creation possessing highly skilled academicians in the field in order to broaden the scope of the academy industry collaboration.

A sectoral conference should be organized and this event should bring the academicians and the industrialists together, to share their knowledge and the expectations, which should contribute to develop effective collaborations.

To highlight, the summary of the revealed problems along and based on the findings of the demand analysis, provided that the key drivers of success expressed below should be achieved by proper project management approach then the competitiveness of the target group will be increased by planned R&D activities.

Acknowledgements

References

[1] Guide to Conducting an R&D Survey: For countries starting to measure Research and Experimental Development" Published in 2014 by: UNESCO Institute for Statistics

[2] Kaufmann, A., & Tödtling, F. (2002). How effective is innovation support for SMEs? An analysis of the region of Upper Austria. Technovation, 22(3), 147-159.

[3] *OECD (2002),* Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development, The Measurement of Scientific and Technological Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264199040-en.,

[4] European Comission (2017).European Commission Directorate - General For Research SME Unit, *Research for SMEs and Research SME Associations at a Glance*. p.3, http://www.gppq.fct.pt/_7pq/_docs/brochuras/online/sme_funding_en.pdf [Date of Access: 25 May 2018]

[5]Mevka Vision Report (2013), TR52 Düzey 2 Bölgesi (Konya-Karaman), 2023 Vizyon Raporu http://www.mevka.org.tr/Yukleme/Uploads/DsyqZOmgM719201735015PM.pdf [Date of Access: 25 May 2018] pp. 501-562, pp. 513, 516

[6] Directorate General for Industry, pp. 908-928

[7] MEVKA Konya-Karaman Region Plan, pp 43-70, pp. 83-117

[8] Sanayi Genel Müdürlüğü, 2015 p.908

[9] Konya Chamber of Commerce Economic Report, 2017 p.63

[10] MEVKA Investment Climate, 2017, p.18

[11] Mevka Agricultural Equipment and Machinery Value Chain and Cluster Analysis, 2011, p.26

[12]Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. Harvard Business Review, 92(11), 64-88. https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition [Date of Access: 25 May 2018].