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## The Market Structure and Relationships of Companies in the Agricultural Input Market

### Summary

This paper discusses the changes in the structure of agricultural input products market and its possible impact to the relationships of the entities creating the market triad (agricultural producers, trade companies, and pesticides producers). The data presented in the paper cover the period from 2010 to 2016 and were collected from secondary sources: official public statistics and research institute named Kleffmann & Partner.

The market analysed in the article is in the phase of structural changes which concern each group of enterprises forming the triad of the market. However, the rate of changes is more dynamic among farmers and trade companies. Those changes will have an impact on relations arrangements existing both between entities forming a given group and entities from different groups. As an intermediate link, trade companies seem to face the most challenging environment due to the structural changes at the farms and producers level.

**Key words:** companies' relationships, input products market, market shares, distribution, internal trade, agribusiness.

**JEL codes:** D02, L14, L16

### Introduction

The focus of this conceptual paper lies on agricultural markets. Authors discuss the changes in the market structure, namely the number and market shares of entities creating a market triad (agricultural producers, trade companies and input producers). Based on identified market changes Authors propose possible direction of further changes in relationships between market entities within each group and between the groups.

### Market Structure

The phrase "market structure" is commonly used in economic sciences (Araujo, Chateaneuf, Faro 2018; Etro 2017; Leibowicz 2018; Parenti 2018; Rammer, Schubert 2018). However, there is no unambiguous interpretation for this phrase, because it is understood in different ways by various economic streams and contexts in which it is used. In the classical theory of

economy, the market structure applies to the perfect competition, monopolistic competition, oligopoly and monopoly (Dickson 2007; Haw, Hu, Lee, Wu 2016; Song-Ken Hsu, Ming-Fang Tsai, Chih-Hai Yang 2008). Consequently, in this approach the market structure will be described by the number of enterprises in the market and their market (bidding) strength, the diversification of products, the conditions of entering the market and the degree of relations between enterprises, both in vertical and horizontal arrangements. The main topic of analysis in this aspect will be the degree of concentration of markets, measured by the enterprises' shares in the market. The work in this regard was pioneered by Bain (1951), who would analyze the relations between the degree of concentration of the markets and the profitability of enterprises, with the underlying hypothesis that markets with stronger concentration would favor the emergence of oligopolistic behavior of the market entities. These works gave rise to the development of the Structure-Conduct-Performance hypothesis that assumes the existence of a positive relation between the concentration of the market and the results of the enterprises. However, it should be noted now that higher competition contributes to affecting the prices as the result of price fixing, thus affecting the profits (Feuerstein 2005). The works based on the Relative-Market-Power hypothesis may be considered an alternative for this section of works. According to this hypothesis the significance of the market share of enterprises prevails over the degree of market concentration, meaning that enterprises enjoying more market strength (a higher relative share in the market) would be able to apply higher prices strategies (Rhoades 1985). Another theoretical concept that could explain the enterprise's profitability was the hypothesis of efficient market structure, according to which the higher profits of enterprises result from specific advantages of the enterprises, such as cost efficiency, rather than solely from the concentration of the market (Peltzman 1977).

Market structures are understood differently in institutional economy, where the concept of institutional structure exists and consists of the so-called cored and derived institutions, of complementary nature to the core (North 2005). The influence of formal and non-formal institutions on the behavior of units and organization is the topic of analysis. The co-called new institutional economy focuses on collective interests, particularly on legal and organizational solutions at the level of the enterprise, the state or other entities (Woźniak-Jęchorek 2013).

Due to significant market changes in the agricultural sector which manifested mainly by decreasing of market entities number and their market shares development, the classical approach to the market structure has been used in the paper.

## Business Networks and Agribusiness

For the first time the phrase "agribusiness" appeared in a publication titled *A Concept of Agribusiness* by Davies and Goldberg (1957). The authors defined it as a complex covering all operations within the area of farming production, providing the farms with inputs, and the turnover, storage and processing of farming products. Many Polish authors exhibit a similar approach to defining agribusiness. Now, it should be noted that our domestic literature also uses the term "food economy", which should be treated as identical. As Firlej (2008) claims,

food economy was more appropriate for the command and quota economy, but was replaced with agribusiness in the market economy reality.

The concept of agribusiness is defined to the biggest extent by Woś (1996), according to whom it is a separate subsystem of domestic economy that combines all activities with entities participating in manufacturing food products. Agribusiness consists of 3 phases, with the first one (the pre-production phase) is concerned with providing the farming industry with inputs, the second one (production phase) applicable to agriculture and industry and the third one (post-production phase) that creates the broadly understood turnover of farming and food products (Firlej 2008). The growing popularity of the concept of agribusiness is related to the gradual changes that agriculture is undergoing. The changes consist in it being incorporated into a constantly growing complex of industrial enterprises sourcing products and services for the agriculture, dealing with trade and processing. Agriculture becomes more and more integrated with the activity of non-farming sectors and agribusiness is the result (Tomczak 2004).

This results in the gradual loss of independence of the farmers as they morph into businesses operating in the network of market dependences and relations with other market players. In the future, the directions of development of agribusiness will be determined by the surrounding trends, namely quick technological development and adaptation of modern technologies in food production and processing, increasing social requirements on food safety (Wiśniewska-Paluszak 2017). The world's growing population will translate into growing demand for food products<sup>1</sup>. In the face of shrinking resources, mainly the reducing area of agricultural land (spreading urban areas), the climatic changes (water shortage) and the reducing labor resources in rural areas, it will be necessary to maintain the growth of agricultural production<sup>2</sup>. This growth will be possible with very intensive cooperation that will take place between agribusiness entities. Consequently, we can expect that relations between these entities will keep enhancing for the next few dozen years.

The challenges of the surrounding environment render the current, theoretical fundamentals of the analysis of entities making up the agribusiness insufficient. They mostly stem from transactional approach that focuses on a single entity and take into consideration its place, role and interactions with other entities of this subsystem of economy only to a lesser degree. Given the new conditions of functioning, the need to take agribusiness into consideration within the network approach is more and more often highlighted (Abdirahman, Cherni, Sauvée 2014; Martinez, Lazzarotti, Manzini, García 2014; Wiśniewska-Paluszak 2017). For example, the possibilities of creating innovations through cooperation within the agribusiness networks are now being analyzed. The analysis of agribusiness in the network approach is also present in the works being created within the IMP group<sup>3</sup>, usually related to the ties

<sup>1</sup> Population forecasts show that by 2050 it may reach around 9.5 billion, which means a rise of 2 billion in relation to the data from 2015 (FAO Statistical Yearbook 2013)

<sup>2</sup> According to the World Bank data, the added value of global agricultural production doubled from 1990 to 2015, calculated as per fixed prices in 2010 (World Bank national accounts data 2017).

<sup>3</sup> The IMP Group was originally formed in the mid 1970s, as a research project on "Industrial Marketing and Purchasing", by a group of researchers representing five European countries and universities; the Universities of Uppsala, Bath, UMIST, ESC Lyon and the Ludwig Maximilians University Munich

between agribusiness entities. For example, Batt (2000) discusses the problem of modeling relations between potato suppliers for the processing industry by analyzing the trust and satisfaction from the cooperation (Batt, Rexha 2000)). Creating a relation understood as an industry's resource is discussed by Prenkert (2016) on the example of Chilean Salmon Production Network, mainly focusing on the methods with which this resource is created. Huemer's (2012) work is dedicated to the creation of identity of enterprises in business networks of companies related to the salmon growing industry. The network approach elements can also be found in Lucas & Chhajer's article (2004), where the authors analyze the location in agribusiness by examining international connections between market entities. Narrod et al. (2009) wrote a paper on ensuring food security through public & private partnership.

The relation marketing concept and the network marketing concept are derived from the interaction approach. Despite many similarities, the approaches differ from one another with the main subject of analysis. In the relation (partnership) marketing, the development of which was largely influenced by Berry (1995), the focus is mainly on creating long-term partner relations between market entities. In particular, the deliberations are related to the complexity of contacts between entities within the relation, the multilateralism of relations with the environment and the management of portfolios of the buyers (Ratajczak-Mrozek 2008, p. 16). The exchange taking place between the entities is based on close and long-term cooperation. The deliberations in the relationship approach are usually done from the perspective of a single company and cover the so-called dyads, or systems created by two enterprises. Each business entity is present, at the same time, in numerous dual systems (dyads), in which various relations emerge. The network approach was developed through expanding the perspective and focusing attention on numerous enterprises. The analyses in the network approach are performed for a larger group of entities and the network is viewed as a whole (Mattsson 1997). Therefore, the network approach stems from the partnership marketing and the interaction approach, but its perspective is wider (Ratajczak-Mrozek 2008, p. 16). When describing the business network, the leading members of the IMP group cite the dictionary definition and point to the system of relations and dependences among the entities. A characteristic feature is that there are no "gravity centers" in the network, which would enjoy a leading position (Håkansson, Snehota 1995, p. 270). The business networks were also described in strategic marketing as systems that create values, where the entities cooperate to bring value to their customers, but at the same time compete for resources (Abrahamsen, 2011). Consequently, a business networks is a set of entities (actors) connected with a set of ties (relations) (Czakoń 2012, p. 15).

## Scope and methodological approach of the paper

The scope of subjects will be slightly reduced in further considerations. The author's attention will be focused on the initial links that make up agribusiness. According to Tomczak (2004), in agribusiness, the farms gradually lose their independence and become increasingly integrated with the other users of the market. The article focuses on entities that

co-participate in providing raw materials for food production. They create a sort of a market triad of various groups of closely connected entities. This group includes:

- agricultural producers (farms/agricultural businesses; groups of producers), whose products are raw materials for the food processing industry;
- trade companies who provide agricultural producers with inputs products;
- enterprises manufacturing inputs.

Each of the above groups is made up by numerous entities of one kind that interact with entities from the same group and from other groups, too. The interactions with entities from outside the analyzed market triad are not covered in this paper. Due to the availability of data, the article focuses on the plant protection products market in Poland and the entities who operate on this market.

The paper will discuss the changes in the market structure, namely the number and market shares of entities creating a market triad. Based on structural changes the possible directions of relations development will be proposed.

As a structural changes indicators, the following measures has been chosen: the number of entities on the market, cumulative market shares of top 3, top 5 and top 10 companies, and the Herfindahl-Hirschman Index (HHI) which is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. HHI can range from close to zero to 10,000.

### **The structure of the plant protection products market in Poland - selected information**

The market of plant protection products in Poland has grown steadily in the analyzed period, however, the rate of this growth decreased (Table 1) over the years. If the decline in market dynamics continues in the upcoming years, it will lead to the maturity and stabilization of the market which is typical for Western European countries.

In each of the types of entities which are present in the market triad discussed in the article, structural changes have taken place. The number of agricultural holdings (Table 2) decreased, which was particularly noticeable in the period 2010-2013. Especially the number of smaller farms with agricultural land up to 50 ha dropped, while the number of larger entities with an area exceeding 50 ha, has grown by 37% as compared to 2010. It means that there is a process of shifting the agricultural area towards larger entities (and, in the same time, their purchasing power) and this process is likely to accelerate in the future.

The market for trade companies who provide farmers with input products remains still fragmented (Table 3). However, it should be stressed that decrease HHI<sup>4</sup> ratio is mainly a result of increasing the number of commercial entities operating in the market. However, if we look at the share of the largest companies, one can see a slow but systematic growth - in 2016, the

<sup>4</sup> The Herfindahl-Hirschman Index (HHI) is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. HHI can range from close to zero to 10,000.

15 largest companies concentrated 59% of market turnover. This means that the largest players are expanding their scope of impact, and the space for smaller companies shrinks. An increase in their number and a simultaneously, decrease in the dynamics of the total market of plant protection products, will lead to a reduction in the average level of turnover per company. In the long run, they will be forced to pursue a market exit or horizontal concentration strategy.

**Table 1**  
**Dynamics of plant protection products market in Poland\***

Specification	2010	2011	2012	2013	2014	2015	2016
Previous year = 100	.	1,01	1,10	1,24	1,02	1,03	1,01
Year 2010 = 100	.	1,01	1,11	1,37	1,40	1,43	1,45

\* the market value is estimated based on the consumption of plant protection products in the following crops: cereals, oil seed rape, maize, potatoes, sugar beet, tree fruits, field vegetables.

Source: data provided by Kleffmann and Partner Company.

**Table 2**  
**Number of farms and their changes in Poland by area size categories**

Size category	Number of farms			Changes of the farms number	
	2010	2013	2016	Δ 2013-2010	Δ 2016-2013
do 10 ha	1 212 902	1 048 067	1 047 086	-164 835	-981
20-50 ha	321 172	314 744	306 199	-6 428	-8 545
50-100 ha	16 764	20 743	22 536	3 979	1 793
> 100 ha	8 495	11 078	12 116	2 583	1 038
Total	1 559 333	1 394 632	1 387 937	-164 701	-6 695

Source: *Charakterystyka gospodarstw rolnych za lata 2010-2016* (2017) GUS, Warszawa.

**Table 3**  
**Selected data about the trade companies operating on the plant protection products market in Poland**

Specification	2010	2011	2012	2013	2014	2015	2016
Number on entities	230	288	272	299	314	294	309
Market share of Top 3	22%	22%	21%	20%	22%	24%	24%
Market share of Top 5	30%	29%	28%	28%	30%	32%	33%
Market share of Top 10	44%	44%	42%	43%	43%	46%	49%
Market share of Top 15	54%	54%	52%	54%	53%	56%	59%
HHI index	682,92	595,31	568,22	397,91	386,09	426,61	390,79

\* The entities are identified based on farmers declaration regarding of plant protection products providers

Source: own calculations based on data provided by Kleffmann and Partner Research Institute.

The market created by plant protection producers is definitely more concentrated – nearly 90% of the turnover is concentrated to the largest 10 players. The figures in table 4 show that the structure of this market remained relatively stable during the analyzed period. The only sign of upcoming changes of the producers' market position is an increase in the importance of smaller entities which can adapt more flexibly to the market changes.

**Table 4**  
**Selected data about the plant protection products producers operating in Poland**

Specification	2010	2011	2012	2013	2014	2015	2016
Number on entities	64	67	80	82	71	74	81
Market share of Top 3	47%	50%	48%	50%	53%	53%	51%
Market share of Top 5	65%	67%	64%	66%	69%	68%	68%
Market share of Top 10	85%	87%	84%	84%	88%	87%	87%
Market share of Top 15	94%	94%	93%	93%	95%	95%	93%
HHI index	1 020,51	1 090,25	1 006,30	1 052,42	1 168,40	1 141,62	1 119,47

Source: as in Table 3.

The market analyzed in the paper is in a phase of dynamic structural transformation, which manifests itself mainly in a consecutive concentration of companies' market shares. The current level of market concentration among the analyzed types of entities is low, but this means that there is considerable potential for further concentration processes. Relatively stable market shares of the largest companies, combined with a simultaneous increase in the market value, may mean that a production and trading company will find it difficult to maintain the pace of development based on existing infrastructure. The next stage of development is likely to be capital concentration, which will occur mainly among producers and traders.

### **The possible consequences of structural changes for the companies' relationship**

The consequences of structural transformations for relationship systems among the participants of the discussed market examined within a given group and among groups. In this section of the paper we will discuss possible consequences of structural changes to the relationships of the entities forming the market triads which is describe in the article.

Among agricultural producers, due to the specific nature of farms, cooperation with each other is relatively infrequently. Additionally, there is usually no competition for the market in a scale comparable to non-farming industries. The slow, irreversible structural changes may mean lead to a rise of competition for inputs among farms. This may be mainly related to farming land resources which determine the economic survivability of the farms. The

competition for the access to capital and work will intensify as the land is transferred and the farms grow.

Producers of plant protection products face high competition from each other. The presented data indicate that this market is still growing, however, the dynamics of this growth is falling and stabilisation can be expected in the coming years. Taking this into consideration, concentration-based development strategies, which are already launched in 2016 and 2017<sup>5</sup> will be continued. It should be noted here that the companies operating in Poland are representative offices of international concerns (Gazdecki 2014). These processes of merges, initiated at the global level, will have a strong impact on local markets in the upcoming years. Certainly, during this period a new arrangement of power and market position of producers will be formed. The final shape of the market will result from the concentration initiated at the global level and significant local conditions. As a result of these processes, competition between plant protection product manufacturers is expected to intensify due to the growing bargaining power of the merged entities.

In view of the structural changes described in the previous section of the article, it can be assumed that the market of trade companies will be polarized. It can therefore be divided into two groups of actors: leading companies, followers. Relationships of the entities within each group will be complex and will include both competition and cooperation. There may be a number of tensions between entities belonging to different groups caused by strong competition.

The presented data show that of the discussed market triad, it was the trade companies the experienced the quickest changes during the analyzed period. The growth of the plant protection products resulted both from the increased used in terms of quantity and from the increased prices of the products. This had to affect the tightening of relations between the trade companies and the agricultural producers due to their intensified interactions. The growing number of trade entities indicates that the agricultural producers were able to diversify, to a higher degree, the sourcing of inputs, thus strengthening their bargaining power. In the case of the largest trade companies, the bargaining power was equalized by the concentration of capital.

The changes in relationships among agricultural producers and producers of plant protection (PPP) products were mainly determined by the growing turnover, while the number of entities in both groups changed slightly. We should also note that due to the high disproportions in the number of entities in each group, the PPP producers maintain direct relations only with the largest agricultural producers. This situation favored the tightening of the existing relations. The key question seems to be about the direction of the coming changes in the view of the concentration of capital among the PPP producers, a process the started in 2017.

<sup>5</sup> In these years, the merger processes have been initiated and are still in progress at different stages of advancement: Dow and DuPont merge, acquisition of Syngenta by ChemChina, acquisition of Monsanto by Bayer (Fairclough 2018).



Trade companies and producers of plant protection products compose an exceptionally complex system. Agricultural producers are the final customers for both types of the discussed entities. Trade companies provide trade intermediation services for the plant protection products producers. Therefore, the trade companies will intensify their cooperation with a given producer as long as their margin from such a cooperation will grow. In turn, producers should find it increasingly beneficial to cooperate with a trade entity that will allow them to access more farming land operated by agricultural producers. Although slow, the concentration of trade entities may pose a challenge for the producers, as it will increase the bargaining power.

### **Concluding remarks**

The market analyzed in the article is in the phase of structural changes, which concern each group of enterprises forming the triad of the market. However, the rate of changes is more dynamic among farmers and trade companies than the group of plant protection products producers.

Structural changes discussed in the paper i.e. a change in the number of entities on the market, market shares development and the degree of market concentration, may affect relations between market entities. This impact may concern both the relationship between companies from the one group (e. g. trade companies) and entities belonging to the different groups (e. g. structures composed of trade companies and a production companies). A change in the number of market players may have an impact on the creation of links between entities that have not previously cooperated with each other. In such a case, emerge of relation relations and its development can be considered. New relations will also affect the relations that each company already has with other market players. Changes in market shares and the degree of market concentration affect the bargaining power of agribusiness enterprises. In the case of agricultural producers, it results from their purchasing potential of agricultural input products, which is derived from the scale of production. In the case of producers and trade companies, it is created by sales performance and the scope of customer service.

Due to the ongoing structural changes, it can be expected that the upcoming years will be a period of development of new relations structure between the entities composing the market of agriculture input products. This issue will certainly require further analysis, and the results of these analyses can be valuable to the agricultural sector as well as can contribute to the business relations theory.

### **Limitations and recommendations for further research**

This paper is a conceptual one. Possible directions of changes in relations between agricultural input market entities are a proposal which requires further deepening through empirical research conducted in each type of entities discussed in the paper. Further studies

will also require wider approach to the market structures, which is described in this paper by limited set of indicators i.e. market shares, market concentration and number of entities. The structures analysis may be extended, for instance by regional differentiation, analysis of the number of links between market players and a qualitative factors.

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## Структура рынка а relacje przedsiębiorstw на рынке środków produkcji для rolnictwa

### Streszczenie

W artykule omówiono zmiany strukturalne на rynku środków produkcji для rolnictwa oraz ich wpływ на relacje między przedsiębiorstwami tworzącymi triadę rynkową składającą się z gospodarstw rolnych, firm handlowych oraz przedsiębiorstw produkujących środki ochrony roślin. Dane przedstawione в artykule dotyczą lat 2010-2016 i pochodzą ze źródeł wtórnych: raportów GUS oraz materiałów udostępnionych przez Instytut Badawczy Kleffmann & Partner.

Analizowany в artykule rynek znajdował się в fazie zmian strukturalnych, które dotyczyły każdej grupy przedsiębiorstw tworzących analizowaną в opracowaniu triadę rynkową. Bardziej dynamiczny przebieg miały one wśród gospodarstw rolnych i przedsiębiorstw handlowych, wolniej przebiegały wśród producentów. Zmiany te będą oddziaływać на układy relacyjne występujące zarówno pomiędzy podmiotami tworzącymi daną grupę, jak i podmiotami z różnych grup. Najwięcej wyzwania mogą tworzyć для przedsiębiorstw handlowych.

**Słowa kluczowe:** relacje przedsiębiorstw, rynek środków produkcji, udziały rynkowe, dystrybucja, handel wewnętrzny, agrobiznes.

**Kody JEL:** D02, L14, L16

## Структура рынка и отношения между предприятиями на рынке средств производства для сельского хозяйства

### Резюме

В статье обсудили структурные изменения на рынке средств производства для сельского хозяйства, а также их влияние на отношения между предприятиями, создающими рыночную триаду, состоящую из сельских хозяйств, торговых фирм и предприятий, производящих средства защиты растений. Данные, представленные в статье, касаются 2010-2016 гг. и происходят из вторичных источников: отчетов ЦСУ и материалов, предоставленных исследовательским институтом *Kleffmann & Partner*.

Анализируемый в статье рынок находился в фазе структурных изменений, которые касались каждой группы предприятий, создающих рассматриваемую в статье рыночную триаду. Более динамично они протекали среди производителей. Эти изменения будут влиять на отношения, выступающие как между субъектами, создающими данную группу, так и субъектами из разных групп. Больше всего вызовов они могут создавать для торговых предприятий.

**Ключевые слова:** отношения между предприятиями, рынок средств производства, доля в рынке, распределение, внутренняя торговля, агробизнес.

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