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# INTEGRATION AND LOGISTIC ACTIVITIES BASED ON DAIRY FARMS IN THE MAZOWSZE AND PODLASIE REGIONS

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**Abstract.** The aim of the study was to investigate and assess integration and logistic activities in dairy farms operating in the FADN regions of Mazovia and Podlasie. The study used primary data from studies conducted by the author in 2013 on a target group of 100 households. The investigated population of farms was divided in terms of the number of cows in the following groups of up to 10 cows (9 households), 11–20 cows (27 households), 21–30 cows (31 households), 31–40 cows (14 households) and above 40 cows (19 households). The study used the survey method using questionnaire interviews. The research shows that farmers most frequently collaborated on the joint use of equipment and supplies of agricultural inputs. In contrast, farmers in the study frequently sold products to processing companies or intermediaries.

**Key words:** logistic activities, integration activities, dairy farms

## INTRODUCTION

The Polish agri-food industry is one of the most dynamically developing sectors. The value of food product sales in the value of sold industrial products accounts for almost 15.6% (Jałowiecki et al., 2014). In turn, the value of production sold for the food and tobacco industry in 2013 was 160 722.1 million PLN, of which 5.3% accounted for meat and meat products, 3.3% drinks and 1.7% tobacco products (GUS, 2014). In 2011 the number of employees in agriculture was almost 2 million, which constituted approx. 16% total employment in the national economy

as a whole. Employment in the agri-food industry is observed at a lower, but stable level, which is connected with the relatively advantageous economic situation in this industry. Another factor indicating the importance of the agri-food industry is connected with the share in gross added value, amounting to 2.9% in 2011 and the share of agriculture in the generation of the GDP in that period was 2.7% (Beba and Poczta, 2014). The agri-food industry is of particular importance in the economy of the Warmińsko-mazurskie and the Podlaskie voivodeships, with the share of sales at 40–50% of the industry total. However, this industry is very fragmented. This is affected by the large number of food producers and processors, constituting an obstacle in the organisation of the market.

Integration processes are a factor determining success of dairy producers. They comprise joint activities of farmers in the provision of means for agricultural production, sales of agricultural products or joint use of machinery. Polish farmers became interested in the establishment of agricultural producer groups after 2004 searching for methods to improve efficiency of their market operations and cost reduction (Chlebicka, 2011). Team operations are a challenge for farmers, as this requires greater openness, joint actions and adaptation of production to the requirements of the common market (Knecht and Środoń, 2013). Integration activities also concern broadly understood logistic processes in agriculture and include transport of agricultural products to points of sales and provision of agriculture with means of production.

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An effectively operation of the agricultural market depend on the logistic system. There are numerous factors limiting efficient functioning of the market, including weak organisation and insufficient integration of food producers with processing and trade (Pawlewicz and Gotkiewicz, 2012).

A greater need for the development and rationalisation of logistic processes was observed after Poland's accession to the EU. Polish agriculture was covered by CAP instruments. Moreover, foreign markets were opened to Polish products, characterised by high competitiveness and compliance to the requirements of the Common Market, e.g. they meet the HACCP requirements (Ziętara, 2014). Polish food products had to meet EU quality requirements, production organisation had to be rationalised and processing had to be consolidated, which is frequently connected with improved logistics. Logistic activities are particularly important for the competitiveness of the agri-food industry in Poland, which share in the value of exports increased from 9% before 2004 to 13% in 2013 (Szczepaniak, 2014).

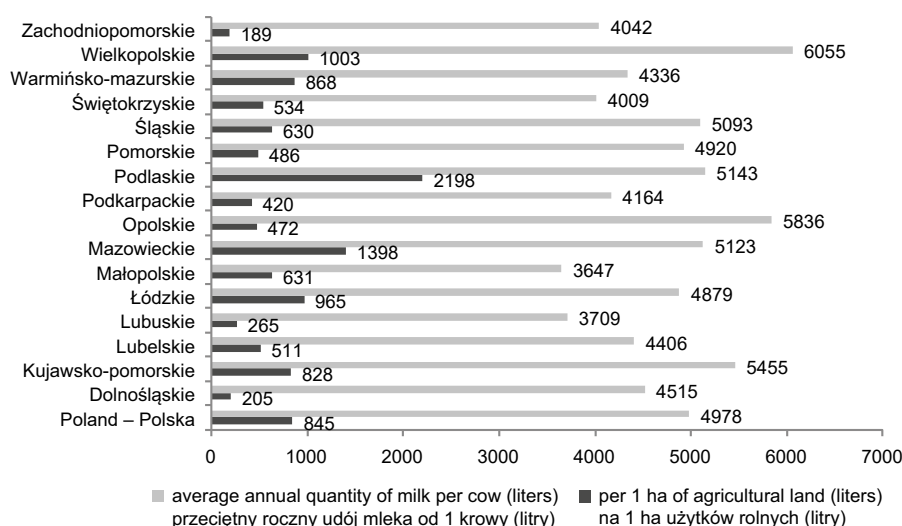
As it was reported by Pietrzak et al. (2010), logistics comprises “management of transport and storage operations, which are to facilitate the flow of products from their origin to the sites of their consumption”. This definition shows that logistics in the dairy industry also

concerns the transport of the raw material from a farm and its transport to the points of sale. Logistics in agriculture varies depending on the type of products. In the case of milk or eggs we typically deal with direct collection of products from farms, while e.g. vegetables, potatoes or industrial crops are typically delivered by farmers to processing plants (Karwat-Woźniak, 2013).

Milk is a perishable product and needs to be transported at an adequately low temperature (max. 4°C) within the shortest possible time and processed within 24 h. The bacterial counts and milk metabolism increase with time (Regulation, 2004).

Production of cow's milk in Poland varies depending on the region. The average annual milk yield from 1 cow in 2013 was greatest in the Wielkopolskie (6055 l), Opolskie (5836 l), Kujawsko-pomorskie (5455 l) as well as the Podlaskie (5143 l) and Mazowieckie voivodeships (5123 l). It also needs to be stressed that the annual milk yield from 1 cow in Poland in 2009 was 4776 l and it was lower than e.g. in the USA (9331 l), Sweden (8396 l), Spain (7547 l) and Great Britain (7101 l) (GUS, 2014).

Analysis of cow's milk production in 2013 per 1 ha UAA showed that it was highest in the Podlaskie (2198 l), the Mazowieckie (1398 l) and the Wielkopolskie voivodeship (1003 l) (Fig. 1). In turn, total cow's milk production was highest in the Mazowieckie



**Fig. 1.** Production of cow's milk by voivodeships in 2013

Source: GUS, 2014.

**Rys. 1.** Produkcja mleka krowiego według województw w roku 2013

Źródło: GUS, 2014.

(2658.5 million l), the Podlaskie (2360.8 million l) and the Wielkopolskie voivodeships (1753.3 million l). These three voivodeships produced almost 40% national milk supply.

## AIM AND METHODS

The aim of this study was to assess integration and logistic processes in dairy farms. The analysed population of farms was divided in terms of the number of cows into the following groups: max. 10 cows (9 farms), 11–20 cows (27 farms), 21–30 cows (31 farms), 31–40 cows (14 farms) and over 40 cows (19 farms). The aim of this division of analysed farms depending on the number of cows was to indicate changes in logistic and integration activities on farm with a change in the production scale. The essence of this division was to verify whether a farm with a larger number of cows would adopt a more market-oriented attitude. Moreover, introduction of such a division made it possible to verify whether farms with a greater number of cows are more independent in their use of machinery. The introduced division showed opinions on the need to establish producer groups depending on an increase in the number of cows on a farm.

The analyses were conducted in 2013 and covered the operations of dairy farms over one year in voivodeships of eastern Poland, i.e. the Podlaskie, the Mazowieckie, the Łódzkie and the Lubelskie voivodeships. The geographical scope of the study covered the FADM Mazowsze and Podlasie regions. This study is also based on data from the Statistical Annuals of Agriculture.

In this study target selection was applied, with the primary criterion being cow rearing on the farm, willingness of farmers to participate in the study and the farm obtaining income from milk sales equivalent to at least 50% total income.

This study was based on the questionnaire method, while in the analysis of results tabular and descriptive statistical methods were applied.

A total of 100 dairy farm owners participated in this study. An important factor for the development of dairy farms was connected with the scale of production, while its increase affects profitability of farms (Śmigła, 2014; Sass, 2007). Milk yields of cows ranged from 3533 l/cow up to 7438 l/cow on farms having over 40 cows (Table 1). It results from this study that an increase in the production scale of dairy farms was accompanied by an increase in milk yields.

**Table 1.** Characteristic of surveyed farms

**Tabela 1.** Charakterystyka gospodarstw objętych badaniami

Indicator Wskaźnik	Number of cows in a farm Liczba krów w gospodarstwie				
	≤10	10.1– –20	20.1– –30	30.1– –40	>40
Average number of cows Średnia liczba krów	5	15.6	26.5	37.6	61.1
Average milk yield Średnia wydajność	3 533	7 017	5 903	7 300	7 438

Source: own elaboration based on studies.

Źródło: opracowanie własne na podstawie badań.

Results of analyses conducted by the author show that specialisation in dairy cattle breeding results in greater milk yields (Bórawski and Brodziński, 2014).

## INTEGRATION ACTIVITIES

One of the manifestations of integration activities in agriculture is connected with cooperation with other farmers in the process of establishment of agricultural producer groups. The aim of such actions is to facilitate sales of agricultural products and to obtain financial support. Important justifications for integration of farmers may also include willingness to win higher prices or stabilisation of operations. Cooperation with other farmers and the establishment of agricultural producer groups is connected with many difficulties, e.g. problems in registration of economic activity or development of a system for the sale of products (Sobczak et al., 2013).

In order to evaluate integration activity farmers were asked to declare whether they cooperate with other milk producers. Analyses showed that the largest percentage of owners of small farms (with max. 10 cows) stated that they do not cooperate with other farmers (Table 2).

In turn, the greatest percentage of farm owners having more than 10 cows declared that they cooperate with others in the joint use of machinery and mutual provision of services as well as supplies for agricultural production. Joint use of machinery and equipment on the farm is a positive sign of cooperation and leads to cost reductions. In turn, cooperation in the supply of means for agricultural production is advantageous for farms, since farmers may together buy larger amounts of means of

**Table 2.** Percentage of farmers cooperating with other milk producers (%)

**Tabela 2.** Odsetek rolników współpracujących z innymi producentami mleka (%)

Cooperation with farmers Współpraca z rolnikami	Number of cows on a farm* Liczba krów w gospodarstwie*				
	≤10	10.1–20	20.1–30	30.1–40	>40
In organisation and production sales W zakresie organizacji i zbytu produkcji	11.1	7.7	19.4	35.7	20.0
In provision of agricultural production means W zakresie zaopatrzenia w środki do produkcji rolnej	22.2	26.9	22.6	42.9	20.0
In shared use of equipment and providing mutual services W zakresie wspólnego wykorzystania sprzętu i wzajemnego świadczenia usług	33.3	34.6	41.9	35.7	30.0
Do not cooperate with other farmers Nie współpracują z innymi rolnikami	44.4	23.1	19.4	28.6	25.0
Difficult to say Trudno powiedzieć	11.1	11.5	16.1	7.1	20.0
Other Inne	–	–	3.2	–	–

\* Respondents could give more than one answer.

Source: own elaboration based on studies..

\* Respondenci mogli wskazać więcej niż jedną odpowiedź.

Źródło: opracowanie własne na podstawie badań.

**Table 3.** Farmers' opinions concerning producer and marketing groups (%)

**Tabela 3.** Opinie rolników o grupach producenckich i marketingowych (%)

Farmers' opinions Opinie rolników	Number of cows in a farm* Liczba krów w gospodarstwie*				
	≤10	10.1–20	20.1–30	30.1–40	>40
I definitely believe that farmers should form such groups Zdecydowanie uważam, że rolnicy powinni tworzyć takie grupy	11.1	19.2	29.0	21.4	40.0
I think it should help farmers not only to sell, but also to modernize their farms Myślę, że to pomogłoby rolnikom nie tylko sprzedawać, ale i modernizować ich gospodarstwa	88.9	61.5	58.1	35.7	35.0
This is good, but only in some lines of business, e.g. fruit and vegetables Jest to dobre, ale w niektórych branżach, np. owoce i warzywa	–	19.2	38.7	42.9	20.0
I do not know how producer groups operate Nie znam zasad funkcjonowania grup producenckich	11.1	11.5	–	7.1	5.0
Other Inne	–	–	3.2	7.1	5.0

\* Respondents could give more than one answer.

Source: own elaboration based on studies.

\* Respondenci mogli wskazać więcej niż jedną odpowiedź.

Źródło: opracowanie własne na podstawie badań.

production at lower prices. In the group of farms having more than 40 cows the percentage of farmers cooperating with others in joint use of machinery was the lowest and amounted to 30%. This may result from a certain independence and self-sufficiency of those farms, having good technical facilities and frequently not requiring services from other farmers.

Studies on producer groups in the dairy industry were conducted by Parzonko (2005). Analyses conducted by that author showed that milk producers most frequently cooperated in the supply of means for agricultural production and less often – in the sale of products. Joint sales of milk and its merchandising are difficult due to the specific character of products. In this respect milk producers undertake joint price negotiations and arrange sales conditions to dairies (Parzonko, 2013). Success of agricultural producer groups depends on internal factors (production, marketing, organisational and social) and external factors (utilisation of external EU funds and cooperation with other groups) Chlebicka, 2011).

An important factor in farm development is connected with the potential for establishment of producer and marketing groups, facilitating market operations. These analyses showed that the greatest percentage of farm owners having over 40 cows were positive that farmers should establish such groups (Table 3). Farmers also believed that the establishment of producer groups would not only aid in sales, but also modernize their farms. Establishment of producer groups is advantageous for farms, since by operating together farms have greater purchasing power and their competitive position is stronger. Such actions should lead to improvement of competitiveness in the analysed farms.

A relatively large number of farms having max. 20 cows are not acquainted with the principles of operation for producer groups.

## LOGISTIC ACTIVITIES

In agriculture and in rural areas a considerable role is played by logistic support connected with the movement of raw materials and products. These movements may be grouped in terms of their type (physical, information), objects (movement of animals, goods), frequency (connected with production periods), form (uni- or multilateral) and objective (movement connected with production or consumption) (Bruska, 2012).

In the dairy industry management of supply chains and enhanced cooperation of dairy companies with suppliers and customers are gaining in importance. This cooperation is typically very well organised, as shown by the concluded agreements and contracts (Pietrzak et al., 2010). In order to investigate the logistics management process farm owners were asked to provide answers concerning problems with milk sales. The greatest percentage of farm owners having max. 10 cows (11.1%) declared that they almost always have problems with sales. Responses “I frequently have problems” were given by the greatest percentage of farmers having max. 10 cows (55.6%), 20.1–30 cows (32.3%) and 10.1–20 cows (30.8%). Generally the lower the number of cows on a farm, the more frequently the owner declared problems with sales of their products (Table 4). It was a surprising result that most farm owners having over 40 cows (60.0%), 20.0–30 cows (58%), 10.1–20 cows (57.7%) and 30.1–40 cows (57.2%) declared that they generally had no problems. This result may indicate good organisation of the milk market. This is connected with the EU requirements and with efficiently operating dairies and milk processing enterprises, which purchase products from farmers. Farm owners by signing

**Table 4.** Percentage of respondents declaring problems with products sale (%)

**Tabela 4.** Odsetek respondentów deklarujących problemy ze sprzedażą produktów (%)

Problems with sale Problemy ze sprzedażą	Number of cows in a farm Liczba krów w gospodarstwie				
	≤10	10.1–20	20.1–30	30.1–40	>40
Almost always Prawie zawsze	11.1	7.7	9.7	7.1	10.0
I often have problems Często mam trudności	55.6	30.8	32.3	28.6	25.0
I generaly have no problems Na ogół nie mam trudności	22.2	57.7	58.0	57.2	60.0
Other Inne	11.1	3.8	0.0	7.1	5.0

Source: own elaboration based on studies.  
Źródło: opracowanie własne na podstawie badań.

contracts with milk processors secure purchase of their product and as a result costs of milk storage on farms are not high.

An important factor in the case of milk turnover is connected with the need to ensure its high quality. Increasingly strict requirements of consumers and retail chains concerning hygienic standards, cleanliness and health value of milk are related with its quality and food safety (Kobus and Kmiecik, 2006). Farm owners mentioned actions aiming at the improvement of quality of offered products. The greatest percentage of declarations on production of quality raw material was given in the group of farms having from 20 to 30 cows (64.5%), 30.1–40 cows (57.1%) and over 40 cows (55%). This result indicates that farmers are aware that they are producing quality milk. Integration with the European Union required an improvement of milk quality and owners had to make investments in milking or cold storage facilities. Milk storage conditions on farm improved and thanks to the continuous collection of the raw material by processors its quality does not deteriorate.

A relatively high percentage of owners having 30.1–40 cows (42.9%) and max. 10 cows (33.3%) indicated that they use agricultural extension services and implement novel solutions on their farms. The use of extension services is connected with various services, e.g.

preparation of farm development plans, applications for direct payments or the utilisation of EU funds.

An important factor facilitating development of farms is connected with an adequate distribution system of their products. This is connected particularly with the possibly the greatest customer satisfaction, limitation of competition or product transport costs (Pawlewicz and Gotkiewicz, 2012).

One of the questionnaire questions asked farmers to specify sale channels for their products. Farmers having over 40 cows (55%) and 20.1–30 cows (54.8%) in the greatest number of cases declared that they sell products for processing (Table 6). It is obvious, since farmers when producing milk sell it to milk processors and other plants. This situation indicates a development of ties between farms and processing, which guarantees sales of their products. The agri-food industry is the most popular buyer of agricultural produce (Karwat-Woźniak, 2013). Development of this form of product purchase for milk producers was first of all a consequence of concentration of milk production and investments of farmers in milking and storage facilities. Similarly, a relatively high percentage of respondents declared that they sell products to intermediaries. This concerns particularly sales of beef cattle and calves. As it was stressed by Karwat-Woźniak (2013), the share of this sale method is

**Table 5.** Actions aiming at quality improvement of products (%)

**Tabela 5.** Działania w zakresie poprawy jakości oferowanych produktów (%)

Specification Wyszczególnienie	Number of cows in a farm* Liczba krów w gospodarstwie*				
	≤10	10.1–20	20.1–30	30.1–40	>40
I produce good quality raw material Produkuję surowce dobrej jakości	33.3	34.6	64.5	57.1	55.0
I watch TV and listen to the radio Oglądam TV i słucham radia	22.2	42.3	38.2	35.7	25.0
I use agricultural extension services Korzystam z doradztwa	33.3	26.9	25.8	42.9	25.0
I try to apply novelties in farming Staram się zastosować nowości w gospodarstwie	44.4	23.1	19.4	50.0	25.0

\* Respondents could give more than one answer.

Source: own elaboration based on studies.

\* Respondenci mogli wskazać więcej niż jedną odpowiedź.

Źródło: opracowanie własne na podstawie badań.

**Table 6.** Sale channels of products in surveyed farms (%)

**Tabela 6.** Kanały sprzedaży produktów badanych gospodarstw (%)

Sale channels Kanały sprzedaży	Number of cows in a farm* Liczba krów w gospodarstwie*				
	≤10	10.1–20	20.1–30	30.1–40	>40
Directly on the farm Bezpośrednio w gospodarstwie	33.3	26.9	22.6	42.9	25.0
For processing Do przetwórstwa	44.4	46.2	54.8	35.7	55.0
Sale to agents Sprzedaż pośrednikom	33.3	38.5	25.8	24.3	15.0
At street markets Na targowiskach	–	7.7	9.7	21.4	5.0
To wholesalers Do hurtowni	22.2	–	3.2	14.3	10.0
To restaurants, etc. Do punktów gastronomicznych	–	3.8	–	–	–
On order with delivery to the customer Na zamówienie z dostawą do klienta	11.1	3.8	–	7.1	–
To supermarkets Do supermarketów	–	–	–	7.1	–

\* Respondents could give more than one answer.

Source: own elaboration based on studies.

\* Respondenci mogli wskazać więcej niż jedną odpowiedź.

Źródło: opracowanie własne na podstawie badań.

systematically decreasing as a result of elimination of intermediate stages of the chain, thus leading to a reduction of transaction costs. In turn, products are sold directly on the farm by the greatest number of farms having 30.1–40 cows (42.9%) and max. 10 cows (33.35). This form of sales is preferred by those farms, which either process milk directly on the farm, or sell it to private consumers or companies purchasing milk.

In turn, sales to intermediaries were declared by the largest number of farms having 10.1–20 cows (38.5%) and max. 10 cows (33.3%), which may indicate a lack of cooperation of these entities with large dairies.

The analyses showed that a small percentage of farmers included in this study sold products at street markets, to restaurants, wholesalers or on order to have the products delivered to individual customers. This means that farmers rarely undertake independent activities concerning sales of their agricultural produce.

## CONCLUDING REMARKS

The considerable fragmentation of the market structure of food producers and processors results in problems in market organisation. For this reason efficient operation of the agri-food market, including milk producers and processors, depends on integration and logistic processes.

Most surveyed farm owners present a positive attitude to producer groups, which facilitates development of their farms. Moreover, for each producer individual milk testing has to be performed to determine contents of fat and protein as well as somatic cell counts. Every farmer is also obliged to store milk at their own chill rooms.

The size of cow herds determined distribution channels in surveyed farms. Farms with the smallest number of cows sell milk and other products to intermediaries.



These entities rarely cooperate with large processing plants. The small volume of the raw material discourages large dairies from cooperation with such producers.

The largest percentage of surveyed farms sell products for processing and broadly understood intermediaries. This shows efficiently operating distribution channels for dairy products. It is connected with contracts between farmers and dairies, ensuring continuous purchase of milk from farmers.

Owners of farms with the smallest number of cows declared that they almost always or frequently have problems with sales of their products. This may result from the fact that they have to search for buyers on their own and large companies are not interested in buying small batches of the raw material.

Owners of farms with the smallest number of cows are aware of the potential opportunities provided by the establishment of agricultural producer groups. Such groups are helpful not only in sales, but also in development of farms. An improvement of the standing of farms with the smallest number of cows will depend on such groups and integration of smaller economic entities.

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## DZIAŁANIA INTEGRACYJNE I LOGISTYCZNE NA PRZYKŁADZIE GOSPODARSTW MLECZNYCH REGIONU MAZOWSZA I PODLASIA

**Streszczenie.** Celem badań było poznanie oraz ocena działań integracyjnych i logistycznych gospodarstw mlecznych funkcjonujących w regionie FADN Mazowsze i Podlasie. W pracy wykorzystano dane pierwotne pochodzące z badań własnych przeprowadzonych w 2013 roku w regionie FADN Mazowsze i Podlasie na grupie 100 gospodarstw wybranych w sposób celowy. Badaną zbiorowość podzielono ze względu na liczbę krów na następujące grupy: do 10 krów (9 gospodarstw), 11–20 krów (27 gospodarstw), 21–30 krów (31 gospodarstw), 31–40 krów (14 gospodarstw) oraz powyżej 40 krów (19 gospodarstw). W badaniach wykorzystano metodę ankiety z zastosowaniem kwestionariusza. Z badań wynika, że rolnicy najczęściej współpracowali w zakresie wspólnego wykorzystania sprzętu i zaopatrzenia w środki do produkcji rolnej. Natomiast objęci badaniem rolnicy najczęściej sprzedawali produkty do przetwórstwa lub pośrednikom.

**Słowa kluczowe:** działania logistyczne, działania integracyjne, gospodarstwa mleczne

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