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THE IMPACT OF AGRARIAN FRAGMENTATION ON THE DYNAMICS OF REGIONAL CHANGES IN DAIRY CATTLE BREEDING IN THE YEARS 1990–2010

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Abstract. Since the commencement of political system transformations in Poland the number of farms keeping cows and the stock of milk cows has been decreasing very fast. A basic factor behind the regional diversity of the process is the scale of agrarian fragmentation and the size of farms. This hypothesis was verified by analyzing changes affecting cows bred in a sector of farms operated by natural persons (private farms) in the entire country and in two regions where private farms predominated. The first region is the south-eastern region characterized by a very unfavorable acreage structure of farms while the other one is the central and eastern region where the structure of farms is relatively favorable. Research results clearly indicate that, due to increasing market competition, cow breeding is concentrated and has been moving to higher and higher acreage groups. As a result, strong stock regress has been observed in the region with fragmented agriculture and such trend has been on the increase. However, in the area characterized by the favorable farm structure such regress which marked the commencement of the political system transformations was relatively quickly slowed down; already in the period preceding Poland's accession to the UE the stock quantity and quality growth emerged which can also be seen during the post-accession era.

Key words: dairy cattle breeding, agrarian fragmentation, regional diversification of milk production

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INTRODUCTION

Dairy cattle breeding, due to the necessity of obtaining large quantities of bulky fodder, is strongly connected to plant production. Naturally, also this type of production can rely on feeds obtained from outside the farm, including as part of co-operation, however, it is difficult and was not popularized in Poland to a greater extent. As a result, the scale of cattle breeding has been and is strongly dependent on appropriate fodder area on farms. In the case of extensive cattle breeding its scale is basically conditional on the area of compound feeds, especially those obtained from pastures. However, due to changes in the organization of breeding and cattle feeding technologies, especially, in regard of dairy cows, currently the scale of cattle breeding depends on the acreage of the entire farm, hence, also on the area of arable land. Such basic plants are cultivated on arable land required for preparing good bulky feeds, such as corn, crops and legumes. However, as the development of the process of concentration and specialization of farms progressed due to competitiveness on the agricultural market, cattle breeding has been shifting over to farms from higher and higher acreage groups [Parzonko 2013]. Due to being uncompetitive, farms keeping small herds of cows face the following choices: either expanding the herd and staying on the market or abandoning breeding, or reducing its scale to satisfy their family needs and selling directly to consumers. Most frequently option number two is chosen. It is only possible to expand the herd if the farm has fodder base growth reserves as part of its area of arable land or expand the farm by leasing or purchasing arable land. The third variant, which has been chosen by the farmers more and more frequently, involves liquidating the herd and shifting over to the production of animals which are more loosely connected to own fodder base or abandoning livestock production altogether. The first and the second possibility are not always viable due to different reasons. In regions of defragmented agriculture the share of farms with larger acreage that breed cows is insignificant and it proves very difficult to expand the farm's acreage [Musiał, Wojewodzic 2011]. Therefore, it can be hypothesized that a sub-regional acreage structure is a major factor[1] behind the regional diversification of changes in cow breeding during the period of political system transformations and Poland's accession to the European Union, including, in particular, the acreage of farms, especially those breeding cattle, specifically, milk cows.

The hypothesis presented earlier will be verified based on the analysis of changes in cattle raised in the entire country and in two regions predominated by private farms which, however, are completely different in terms of their acreage structure. Changes in cow breeding were analyzed based on data collected in the course of Common Agricultural Censuses (CAS) in 1966, 2002 and 2010 and representative research of the stock of farm animals conducted by the Central Statistical Office (GUS). The process was analyzed solely on farms operated by natural persons. The related changes on farms of legal persons were very strongly distorted by the political system transformations, mostly due to the liquidation of state-owned farms (PGR) and the deterioration of agricultural production co-operatives. The share of the farms in the sector of legal persons which

[1]Naturally, additional factors limiting greater herd size increase may include: the necessity of engaging considerable funds to develop the existing or the construction of a new barn, the certainty of milk purchasing by a milk processing plant etc.

specialize in cow breeding Poland-wide is very small and almost non-existent in selected regions. The analysis was performed taking into account the following periods: the period of intensive political system transformations, that is, 1990–1997, the pre-accession period 1998–2003, the post-accession period 2004–2012.

In 1990–1997 region no 1 (characterized by fragmented agriculture) covered former southern and eastern voivodeships: Krośnieńskie, Nowosądeckie, Rzeszowskie and Tarnowskie, while the region with a relatively good acreage structure of farms operated by natural persons – the south-eastern region – consisted of the former Białostockie, Ciechanowskie, Łomżyńskie and Ostrołęckie Voivodeships. However, as of 1998, after the new administrative division, region no 1 included voivodeships covering former administrative and territorial structures, i.e. the new Małopolskie and Podkarpackie Voivodeships and the Podlaskie and Mazowieckie Voivodeships, respectively.

COW BREEDING IN THE PERIOD OF A BREAKTHROUGH AND AFTER THE DEVELOPMENT OF A MARKET ECONOMY

In Poland during the period of the centrally planned economy, purchasing prices for agricultural produce, including milk and meat, were relatively high and agricultural and food processing plants were obligated to purchase any quantities of animal produce offered by farms, even the smallest quantities [Cieślik 2010]. As a result, in that period the definite majority of farms was engaged in breeding cattle and the stock of cattle, including cows, was relatively high[2] [Dzun 2012a]. Despite a crisis in the 1980s, back at the early stage of the political system transformations the definite majority of private farms was still engaged in raising dairy cattle. In 1990 cattle was raised by 70.5%, and cows were raised by 68.5% of private farms (above 0.5 ha of utilized agricultural area – UAA). The percentage of farms engaged in raising cows on private farms of an acreage of 1 ha and over was much higher accounting for as much as 77.4% back in 1991.

The share of the farms keeping cows in the voivodeships of the south-eastern region was still the highest in 1991 in Poland and even slightly higher than in the central and eastern region which was characterized by a definitely more favorable acreage structure of farms. In that region the share of the farms keeping cows ranged from 82.6% in the Krośnieńskie Voivodeship to 90.7% in the Nowosądeckie Voivodeship vis-á-vis the national average of 77.4%. The region was also a leader in regard of cow density per 100 ha of UAA and milk production per 1 ha of UAA. Those voivodeships have been (and still are) predestined to animal production, including keeping grass-eating animals, which stems from the area's hilly structure and, thus, a high share of permanent grassland. Due to higher rainfall and other climate and topography-related difficulties, the production of many varieties of plants there, including crops and rape, is significantly hindered or unprofitable. The Nowosądeckie Voivodeship was a definite leader in the area of the density of cows and milk production with 54.1 cows per 100 ha of AAL and 1,500 l per ha, respectively, vis-á-vis the average national totaling 30.7 cows per 100 ha and 821 l

[2]In mid-1970s nearly 73% of farms of an area of over 0.5 ha of UAA was engaged in cattle breeding and the stock totaled 13.2 million heads, including 6.1 million cows – the highest number of cattle in Poland.

per ha, respectively. The density of cows in the remaining voivodeships in that region was higher compared to other voivodeships in Poland, including voivodeships of the eastern and central part of the region. In the central and eastern region the Ostrołęckie Voivodeship was the leader with 38.4 cows per 100 ha and 1,039 l of milk per ha, respectively.

However, in the south-eastern region, due to strong agrarian fragmentation, the structure of farms keeping cows, by herd size, was very unfavorable (Fig. 1). Farms keeping 1–2 cows constituted an overwhelming majority (ranging from nearly 90% in the Krośnieńskie Voivodeship to 78% in the Nowosądeckie Voivodeship), and the share of the farms with larger herds (6 and more cows) was insignificant (between 0.8% in the Nowosądeckie Voivodeship to 0.2% in the Rzeszowskie Voivodeship). A definitely more favorable situation was recorded in the central and eastern region where the share of the farms keeping 1–2 cows ranged from 28% in the Łomżyńskie Voivodeship to 40% in the Ostrołęckie Voivodeship, and, what's more important, the share of the farms with larger herds was radically higher ranging from 24% in the Łomżyńskie Voivodeship to more than 18% in the Ostrołęckie Voivodeship.

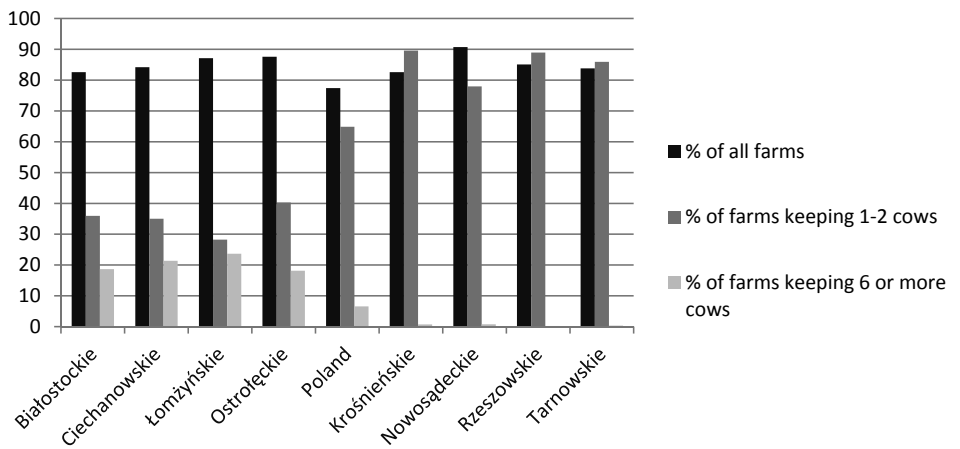

Fig. 1. Farms keeping cows in of total farms and the structure of the farms by herd size in 1991 (%) by selected voivodeships

Source: Results of the 1991 Agricultural Census, The use of land, the area of crops and farm animals, GUS, Warsaw 1991.

Changes in the political system, which followed in the second half of 1989 and rapidly accelerated in 1990 (a shock therapy)[3], adversely affected the situation in agriculture, especially in the areas characterized by agrarian fragmentation. A wide gap of price scissors[4] resulting in the rapidly deteriorated profitability of agricultural output, the destruc-

[3]Rapidly rejected existing rules of managing social and economic development and adopting an assumption that such role will be assumed by "the market's invisible hand".

[4]If in 1989 the "price scissors" ratio (y-o-y) was 128, then in 1990 it reached 41.7, and in 1991 – 74.5. After such rapid changes the price scissors' rate, with 1988 being the base year, reached approx. 45 in 1992–1993 and after a few following years, which were more favorable to agriculture, it reached 50 in mid-1990s.

tion of the existing purchasing system, radically deteriorated conditions of crediting and financial support for farms with an additional retrospective effect (the application of such terms and conditions to credits and loans taken prior to the changes), with nearly complete abandonment of the nation-state's interventionism towards agriculture, led to very difficult conditions for farms to operate in [Świtłyk, Ziętara 2011]. To the greatest degree, the situation of the farms producing agricultural raw materials for the production of food products, which until 1990 had, to the greatest extent, enjoyed the system of subsidies and additional payments (to which group the animal products belonged, mostly milk and its basic products[5]), deteriorated the most. Under such circumstances[6] agricultural output recorded clear regress, especially animal production. Animal stock in large head pieces declined in 1991 (vis-á-vis 1990) by 6%, and in 1992 by 11% (vis-á-vis in 1985 by more than 10% and more than 15%, respectively). Such decrease resulted from the regress of dairy cattle and sheep breeding because the stock of swine increased back then. Due to a much smaller slump of the profitability of raising pigs compared to breeding cattle and sheep, farms shifted over to raising swine.

The circumstances described earlier contributed to even greater regress in raising dairy cattle; such trend has been observed since the 1980s (in 1985–1990 the cow stock decreased by 11%). If in 1990 approximately 1,780,000 private farms were engaged in cow breeding (of more than 0.5 ha of AAL), then in 1996 the corresponding figure was 1,372,000 (including 59k of up to 1 ha of AAL), i.e. approximately 23% less. In the sector of private farms the number of commodity farms keeping small herds of cows (3–5) changed particularly quickly. In 1990–1996 the stock of cows in the sector of natural persons decreased by 27%. The process of the rapid decrease of the number of farms engaged in breeding dairy cattle was clearly visible along with the process of restructuring those farms (which decided to maintain breeding cows), involving the adjustment of the size of the herd of cows and a milk production technology to a new market situation, especially, local demand for milk and quality requirements. Increasing competition on the milk market and growing demands of dairy plants were the driving force behind those processes. However, the dynamics of the processes was considerably diversified in individual periods and strongly diversified in terms of regions [Seremak-Bulge et al. 2006, Dzun 2012a and 2012b, Ziętara 2012].

The dynamics of the decrease of the stock of cows and milk production was particularly high in the south-eastern region (Fig. 2). In that region only in the Nowosądeckie Voivodeship the dynamics of the decrease of the number of stock of cows was much smaller and more or less resembled that recorded in the Białostockie and Ciechanowskie Voivodeships. That allowed the Nowosądeckie Voivodeship to maintain its leading position in Poland in terms of cow density (despite the decline from 54.1 to 45.3 cows per 100 ha of AAL). It should also be noticed that in the Nowosądeckie and Krośnieńskie Voivodeships the decrease of commodity milk production was higher than the decrease of

[5]It can be said that if in 1988 the purchase price of 1 kg of pig livestock was the equivalent of 5.5 l of milk and 1.1 kg of beef livestock, then in 1990 such figures were 12.6 and 1.9, respectively.

[6]The above also resulted from the activities in agriculture towards elimination or at least deterioration of the so-called socialized sector (manifested by closing down state-owned farms which was not thought over, prepared poorly, very rapid and mishandled) for the purpose of expanding and strengthening the sector of private farms [Dzun 2011].

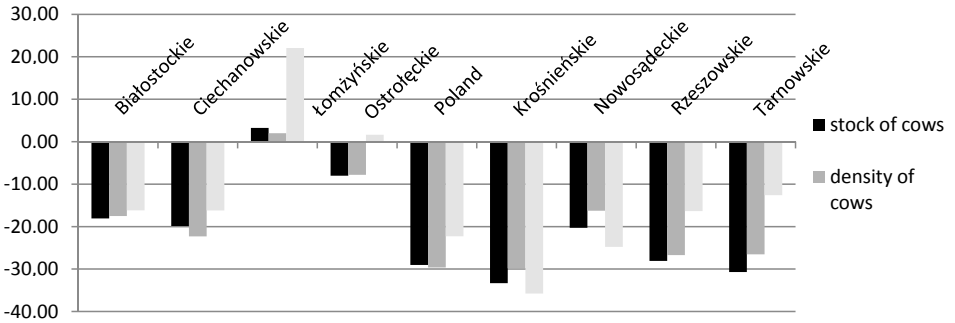

Fig. 2. Basic indices of changes in cow breeding in 1990–1997 by selected voivodeships (%)
Source: Own calculation and breakdown based on: Agriculture and Farm Management 1986–1990, GUS, Warsaw 1992; 1998 Agriculture Statistical Yearbook, GUS, Warsaw 1999.

the cow stock as, due to closing many dairy plants and the impossibility of selling milk, the farms limited such output to satisfy their household needs and possible direct sales to neighbors and markets. Production extensification occurred, including food extensification, which led to the decline in milking yield. However in the central and eastern region definitely the most advantageous situation was recorded in the Łomżyńskie Voivodeship which, being the only one in Poland, observed the increase of the stock as well as considerable increase of milk production. Also in the Ostrołęckie Voivodeship the cow stock level slightly decreased with the concurrent milk yield increase.

In the entire south-eastern region the stock of cows in the period under analysis (i.e. in 1990–1997) dropped by 27%, and milk production – by 23%, whereas in the entire central and eastern region the decrease of the stock of cows was 2.5 times smaller and milk production – 6.5 times smaller. Very strong agrarian fragmentation was the reason for such disadvantageous relations in the case of the south-eastern region which, in the period under analysis, not only was not decreased but even intensified. The above prevented the improvement of the concentration of animals, density and size of the herds. Whereas in the central and eastern region the share of the farms in a group with more than 10 ha of AAL rose clearly, which permitted to increase the number and share of the farms keeping smaller herds of cows (Fig. 3).

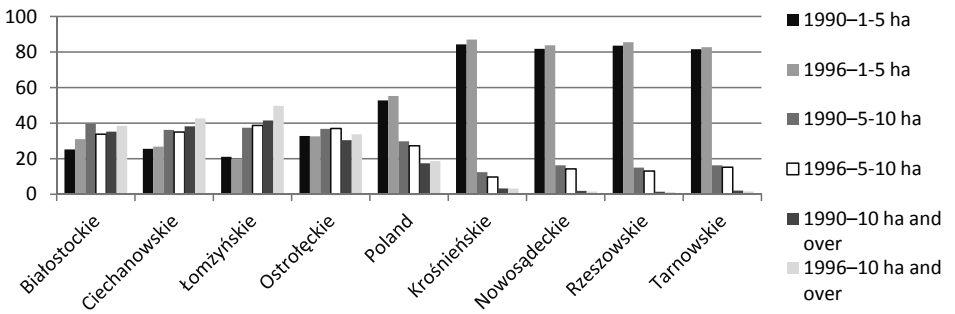

Fig. 3. Changes in the structure of farms by acreage groups in selected voivodeships under analysis against the average for Poland in 1990–1996 (%)
Source: Own calculation and breakdown based on: Agriculture and Farm Management 1986–1990, GUS, Warsaw 1992; 1998 Agriculture Statistical Yearbook, GUS, Warsaw 1999.

The effects of the presented changes of the acreage structure of farms can be illustrated based on the changes in the structure of herds kept in the leading voivodeships of the regions under comparison. In the Łomżyńskie Voivodeship the share of the farms with 1–2 cows in a total number of the farms keeping cows decreased in 1991–1995 from 28 to 24%, and in the case of the farms keeping at least 6 cows – such share rose from 24 to 30%, whereas in the case of the Nowosądeckie Voivodeship, the share of the farms with 1–2 cows rose from 78 to 83%, and the share of the farms with 6 or more cows the share's level was maintained, i.e. approximately 0.8%. Hence it can be said that in the Łomżyńskie Voivodeship the considerable increase of the number of commodity farms capable of competing on the milk production market occurred. However, in the Nowosądeckie Voivodeship, due to the considerable drop of the total number of farms, the number of farms with small herds of cows dropped considerably which phenomenon was accompanied by the considerable drop of the number of farms with larger herds allowing competition on the milk market[7].

CHANGES IN COW BREEDING AND MILK PRODUCTION IN PRE-ACCESSION AND POST-ACCESSION PERIODS

Since 1997 until Poland's accession to the European Union a tendency of gradual deterioration of farmers' economic condition was observed. Also the profitability of agricultural production did not improve considerably after Poland joined the European Union[8]. However after the accession to the European Union, farmers' incomes, including incomes of milk producers, were considerably higher thanks to subsidies and additional payments. Regarding dairy farms' economic standing, 1996–2000 can be described as a period of insignificant deterioration and 2000–2003 as a period of considerable deterioration of milk production profitability. On the other hand, the period since 2004 was the period of significant improvement of such profitability[9]. Under such difficult macroeconomic conditions the trends related to changes in cow breeding were mostly affected by changes in the structure of produce prices (especially animal produce) and demand for milk as well as possibilities of restructuring farms keeping cows. In the period under analysis, the prices of milk and beef vis-á-vis the prices of swine and poultry improved gradually. The dynamics of such improvement was particularly strong after Poland's accession to the

[7]In mid-1990s the minimal cow herd size ensuring profitability was approx. 6–7 cows.

[8]The price scissors rate in the pre-accession years (2001–2003), with 1988 being the base year, was nearly 34, and with 1995 being the base year – approx. 69. After Poland's accession to the UE the situation in that area hardly changed. After short-term improvement of the price relations the price scissors' rate in 2007, with the 1995 being the base year, reached 73, but in the subsequent years it dropped to reach almost 70 in 2010.

[9]In the initial period milk prices rose by approx. 50%, beef livestock purchasing prices by 10% with the increase of the prices of agricultural production means by approx. 50%, in the second period the prices of milk and beef livestock purchasing decreased by 8 and 14%, respectively, and the prices of production means rose by 48%, whereas in the post-accession period the prices of beef livestock purchasing rose by 82%, milk prices by 48% (with the breakdown by 11% in 2009 y-o-y), while the prices of production means rose by 39%.

EU. The improved relation of milk prices[10] was decisive which rose until 2007, including that year. This factor unquestionably contributed to cow breeding [Seremak-Bulge et al. 2006, Dzun 2012a].

The fact that in the entire pre-accession period (apart from 1999–2000), in particular, in the first post-accession years, a noticeable increase of purchases and milk market occurred, was also crucial to changes in cow breeding. Such increase was basically attributed to the dynamic increase of the exports of milk and milk products, while import continued to be low. Since 2005 an insignificant increase of internal milk consumption was also observed, basically due to the increased consumer consumption [Seremak-Bulge 2006, Dzun 2012a and 2012b, Ziętara 2012].

RELATIONS OF CHANGES IN COW BREEDING AND ACREAGE STRUCTURE OF FARMS

Due to the conditions described in previous chapter, a very strong tendency of the decline in the number of farms engaged in cow breeding occurred which was observed in the period of intensive changes of the political system transformations and continued until years directly preceding Poland's accession to the UE. The perspective of Poland to join the European Union shortly and then the application of the Common Agricultural Policy's tools in Poland clearly weakened the speed of the decrease of the number of farms breeding cows. However at the end of that period, due to the considerable deterioration of the dynamics of the improvement of milk production's profitability and its deterioration in 2009, the tendency to resign from cow breeding strongly intensified. In total in 1996–2002 the number of farms of natural persons keeping cows was reduced. The annual average dynamics of the decrease of the number of such farms in 2002–2010 (5.9%) was even slightly higher than in 1996–2002 (5.5%).

In the entire period under analysis the loss of farms keeping cows was mostly recorded in regard of the groups of small and medium-sized acreage farms (the most intensive process was observed in 5-ha-acreage groups), and the increase – in regard of the groups of large acreage farms (in recent years only in the group of very large acreage farms).

As a result, despite significant changes affecting all farms (the decreasing number of small and medium-sized acreage farms and the increasing number of large acreage farms) in the entire period, definitely the greatest decrease of the share of the farms keeping cows was observed in the group of the smallest farms (Fig. 4).

The changes presented earlier resulted in a clear shift in cow breeding from smaller acreage farms to the larger acreage ones. This trend is particularly noticeable in regard of the change of the number of cows by acreage groups. The tendency clearly intensified as a result of the acceleration of the process of the specialization and concentration of cow breeding. At the same it should be noted that the dynamics of the increase of the number of cows on large acreage farms was, after 2004, to a significant extent slowed down

[10]If back in 1996 the purchasing price of 1 kg of swine livestock was the equivalent of 5.9 l of milk and the purchasing price of 1 kg of poultry livestock was the equivalent of 6.4 l of milk, then in 2003 the corresponding figures were 4.4 and 4.4 l of milk, respectively, in 2007: 3.2 and 3.3 l of milk, respectively, and in 2010: 3.6 and 3.2, respectively.

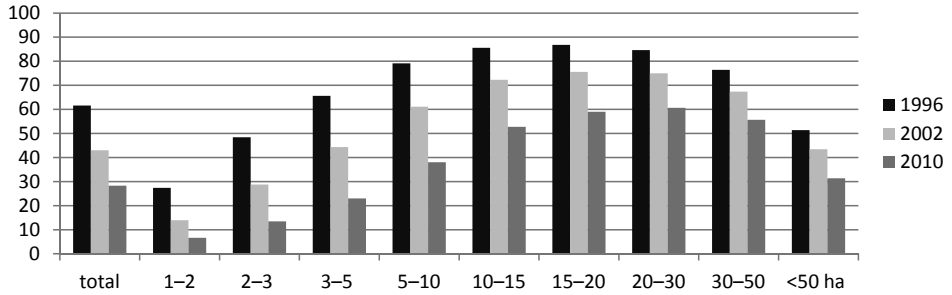

Fig. 4. Changes of the share of the farms keeping cows in individual acreage groups in 1996––2010 (%)

Source: Own calculation and breakdown based on: Farm animals, PSR 1996, GUS, Warsaw 1997; Farm animals, PSR 2002, GUS, Warsaw 2003; Farm animals and selected elements of animal production methods, PSR 2010, GUS, Warsaw 2011.

due to introduced milk quotas, i.e. mostly limits of milk supplies to processing plants. Both in the pre-accession and post-accession periods the average national dynamics of the decrease of the number of cows affected the farms belonging to a few lower acreage groups, i.e. up to 15 ha and was noticeably correlated with the acreage, i.e. the higher the dynamics the smaller the farm acreage. At the same time it should be noted that in the group of the farms of up to 3 ha in the post-accession period the dynamics rose while in other acreage groups it dropped.

Farms of very small acreage did not stand any chance of improvement as the possibility of obtaining bulky fodder prevented higher increase of the number of cows kept and in the case of a small herd increase the obtained output did not guarantee collection by

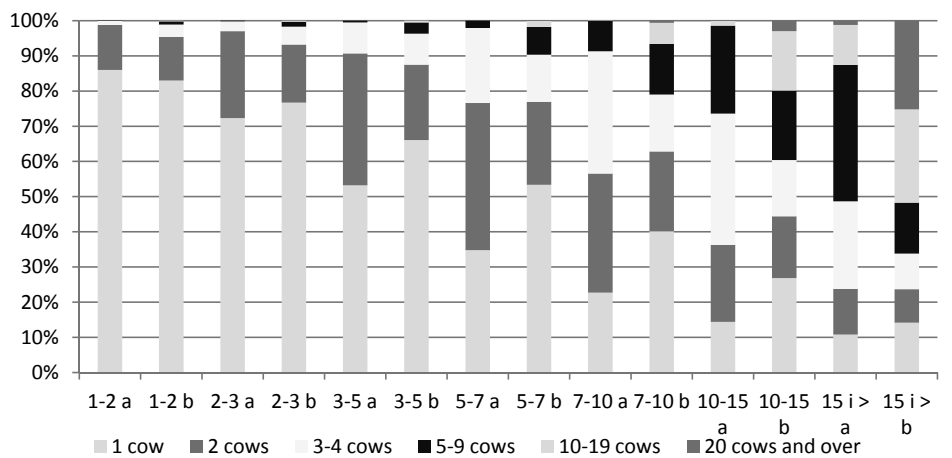

Fig. 5. Changes in the structure of farms keeping cows by the size of herds kept in individual acreage groups in 1996–2010 (in % of total farms keeping cows in a given group) – (a) 1996 (b) in 2010

Source: Own calculation and breakdown based on: Farm animals, PSR 1996, GUS, Warsaw 1997; Farm animals, PSR 2002, GUS, Warsaw 2003; Farm animals and selected elements of animal production methods, PSR 2010, GUS, Warsaw 2011.

dairy plants. Despite such difficulties, especially in recent years, a tendency to increase the number of cows being bred is visible which is manifested by the increasing share in the case of farms' acreage groups keeping herds consisting of 5–9 cows or 10 and more cows (Fig. 5). Those farms mostly obtain bulky fodder through the lease of land from neighboring farms and sell their milk to dairy plants or directly to consumers in such way earning a decent income from such output based on the prices charged.

CHANGES IN COW BREEDING IN VOIVODESHIPS CHARACTERIZED BY STRONG AGRARIAN FRAGMENTATION VIS-Á-VIS VOIVODESHIPS WITH A MORE FAVORABLE ACREAGE STRUCTURE

The trends in cow breeding presented in previous chapter are particularly severe in regard of regions of fragmented agriculture where the overwhelming majority of farms has remained in the acreage group of up to 5 ha despite the fact that it has been 20 years since the political system transformations (Fig. 6). In 1996–2010 the share of the farms of the area of 1–5 ha in the Małopolskie Voivodeship slightly decreased from 85 to 84% (farms of up to 3 ha account for 62%), and in the Podkarpackie Voivodeship it totaled 82% (60%, respectively). The share of larger acreage farms on which cows can be bred allowing competition on the milk production market, has been growing in that region quite dynamically; however, taking into account the initial level it still remains to be very low (in 2010 in the Małopolskie Voivodeship – 3.5% and in the Podkarpackie – 4.5%). In absolute terms taking into account the period under analysis (14 years) such increase is small totaling in the Małopolskie Voivodeship – 36% (from 3.8k to 5.2k), and in the Podkarpackie – 46% (from 4.3k to 6.3k). In the Małopolskie and Podlaskie Voivodeships in the period under analysis the share of very small acreage farms rose minimally, but at the same time the share of farms of an area of 20 ha or over rose quickly and the total

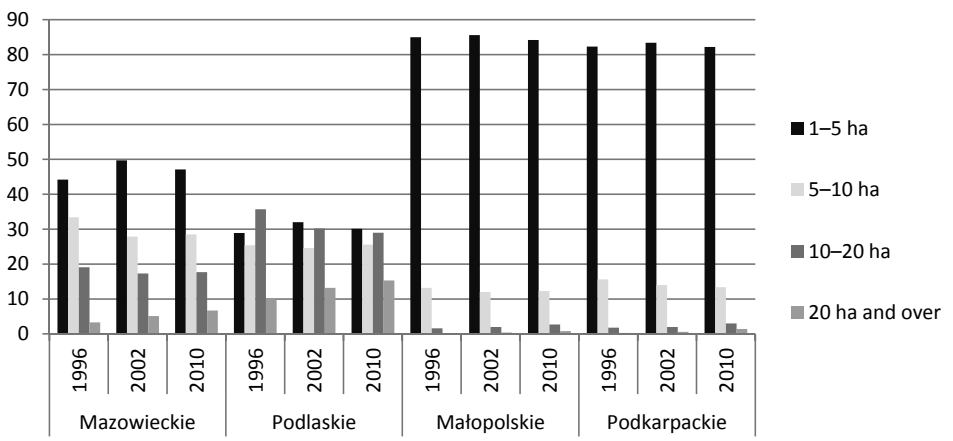

Fig. 6. Changes of the structure of agricultural farms of natural persons in comparable voivodeships by acreage groups in 1996–2010 (ha)

Source: Systematics and characteristics of farms, PSR 2002, GUS, Warsaw 2003; The characteristics of farms, PSR 2010, GUS, Warsaw 2012.

number of those farms is significant (in 2010 – 15.8k in the Mazowieckie and 13.1k in the Podlaskie Voivodeships).

As a result in the voivodeships characterized by strong agrarian fragmentation, the dynamics of the decrease of the farms keeping cows both in the pre- and post-accession period was much higher than on average in the sector of natural persons and definitely higher than in the voivodeships characterized by the favorable structure. In 2002–2010 the number of the farms keeping cows operated by natural persons Poland-wide decreased by 48%, while in the Małopolskie Voivodeship – by 52%, and in the Podkarpackie Voivodeship by as much as 61%. In the Podlaskie Voivodeship it decreased by 32%, and in the Mazowieckie Voivodeship – by 43%.

The changes of the number of farms breeding cows in comparable voivodeships are spread differently by the size of herds kept. First of all in the voivodeships characterized by the favorable agrarian structure a noticeable increase of the share of farms keeping larger herds of cows can be seen, while such share in the voivodeships with the fragmented agrarian structure, despite growth, remains at a very low level.

As a result in the Małopolska Voivodeship, in particular, the average size of a cow herd has slightly increased, whereas in the Mazowieckie and Podlaskie Voivodeships it has increased clearly. Currently in the Podlaskie Voivodeship the average size of the herd is nearly 6 times bigger than in the Małopolskie and Podkarpackie Voivodeships (Fig. 7).

Due to the changes described earliere, regress in cow breeding in the Małopolskie and Podkarpackie Voivodeships is clearly on the rise. Even though the dynamics of the decrease of the stock of cows in the two voivodeships slightly decreased (from 40% in the pre-accession period down to 38% in the post-accession period), however, the dynamics of the decrease of milk production rose considerably (from 22 to 51%, respectively). Also the dynamics of the decrease of the density of cows per 100 ha of UAA rose which evidences the decline in the interest in cow breeding and poor progress in the specialization and concentration on farms breeding cows, whereas a considerable decline in milk production shows that in regard of a significant portion of the farms keeping cows (the above

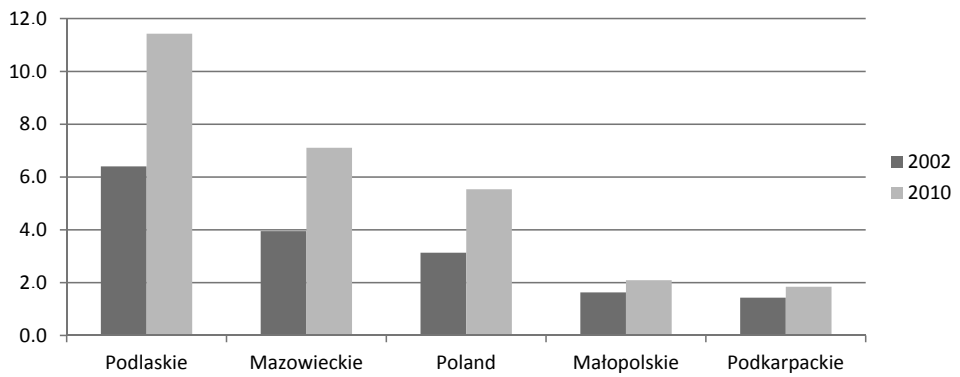

Fig. 7. Changes of the average size of a cow herd in 2002–2010 in comparable voivodeships (cows)

Source: The systematics and characteristics of farms, PSR 2002, GUS, Warsaw 2003; The characteristics of farms, PSR 2010, GUS, Warsaw 2012.

mostly refers to the farms keeping the smallest herds of cows) the interest in the growth of cow milking capacity decreased which may indicate that the tendency to withdraw from their breeding has been reinforced.

Whilst in the Mazowieckie Voivodeship, in particular, in the Podlaskie Voivodeship, the tendency to develop cow breeding can be observed very clearly. It is mostly manifested by the increased dynamics of milk production – from nearly 8% in the pre-accession period to more than 39% in the post-accession period (Fig. 8). In the Podlaskie Voivodeship such growth results both from the increased number of stock and cows' milking yield, while in the Mazowieckie Voivodeship – the cows' milking yield predominantly (in 1998–2010 the milking capacity rose from 3.4 to more than 5.2 l).

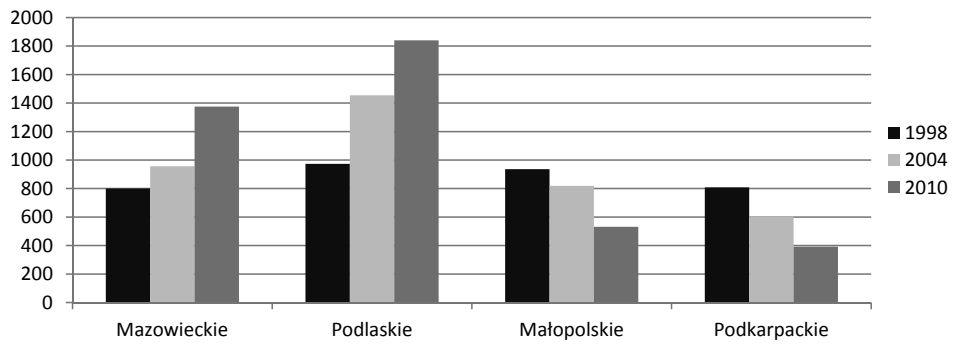

Fig. 8. Changes in milk production on farms of natural persons in the voivodeships under analysis per 1 ha UAA (l)

Source: Own calculation and breakdown based on: the 2001 Statistical Agricultural Yearbook, GUS, Warsaw 2002; the 2005 Statistical Agricultural Yearbook, GUS, Warsaw, 2006; the 2011 Statistical Agricultural Yearbook, GUS, Warsaw 2011.

In the central and eastern voivodeships the majority of farms keeping cows are commodity entities. Despite the fact that in the voivodeships of the region, being the subject matter of the analysis, the increase of the dynamics of milk production in 2004–2010 was higher than the dynamics of milk purchases, the share of milk purchases in the production of the same in the region has already been very high (in 2004 – 82%, and in 2010 – approx. 74%). Regarding the south-eastern region the trend is the opposite. Due to a very intensive decline of milk production and a definitely smaller decrease of milk purchases, the share of the milk purchased in its production rose slightly, yet it remains very low (2004 – 27%, and in 2010 – 38%). The majority of the farms in the region are the farms engaged in production to satisfy the needs of their households or to sell directly to consumers. They are predominantly typically peasant farms whose users, usually the elderly ones, are used to the fact that the farm should keep farm animals and good farms – cattle. The majority of the farms will cease to keep cows when the ownership passes to the next generation [Parzonko 2010, Musiał 2011].

While searching for scientific justification of the regional differences in the size of the stock and the intensity of the cattle production in both provinces Małopolska and Podlasie emphasis has been put on the problem of support for structural changes in livestock production in the 1990s. In the Małopolska Province these changes were extremely vio-

lent, and consequently they resulted in the decline of local dairies and the elimination of dairy herds. In the Podlasie Province, on the other hand, in 1988–1995 the Polish-Dutch experimental farm programme has been implemented by the local authorities to support the development of production in small farms [Majewski 2006]. This programme was so successful that local farms have multiplied its positive effects.

CONCLUSIONS

In Poland since the commencement of the political system transformations (since 1990), the number of the farms keeping cows (and cattle stock) has been decreasing very rapidly. The scale of the farms' acreage fragmentation is a basic factor behind the regional diversity of the process. The hypothesis was positively verified by analyzing changes of cow breeding in the sector of natural persons (private farms) in the whole Poland and in two regions where private farms predominated. The first region was the south-eastern region characterized by a very unfavorable agrarian structure, while the other one was the central and eastern region with a relatively favorable acreage structure of farms. Research results clearly show that due to the increasing competition on the market, cow breeding has been shifting over to higher and higher acreage groups. As a result, in the region of the fragmented agriculture strong and increasing regress in cow breeding has been observed while in the region with the favorable structure of farms such regress affecting cow breeding occurring upon the commencement of the political system transformations was relatively quickly slowed down and in the pre-accession period its qualitative and quantitative development emerged. It is also observed in the post-accession period. The research clearly shows that the further development of cow breeding in Poland is conditional upon the acceleration of the process of the improvement of farms' acreage structure. In the situation of the absence of the progress in the agrarian structure, progressing integration, lifting milk quotas and fading competitive edges of our agriculture and agricultural processing, Poland can still decrease cattle stock and lose its good position in the area of the production and exports of dairy products to European markets.

Huge differences in the stock of cattle in Podlasie, Małopolska and Podkarpacie Provinces have their grounds in both the support for farm work and the perfection of technological production via the Polish-Dutch project of the development of small farms. Unfortunately, in the southern Poland there are no special programmes aimed at the support for cattle breeding.

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WPŁYW ROZDROBNIENIA AGRARNEGO NA DYNAMIKĘ REGIONALNYCH ZMIAN W CHOWIE BYDŁA MLECZNEGO W LATACH 1990–2010

Streszczenie. W Polsce, poczynając od momentu rozpoczęcia przemian systemowych, w bardzo szybkim tempie zmniejsza się liczba gospodarstw utrzymujących krowy i pogłowie krów mlecznych. Podstawowym czynnikiem zróżnicowania regionalnego tego procesu jest skala rozdrobnienia agrarnego i rozmiary gospodarstw rolnych. Weryfikację tej hipotezy przeprowadzono poprzez analizę zmian w chowie krów w sektorze gospodarstw osób fizycznych (gospodarstw indywidualnych) w całym kraju i w dwóch regionach zdominowanych przez gospodarstwa indywidualne. Pierwszy to region południowo-wschodni cechujący się bardzo niekorzystną, a drugi środkowo-wschodni cechujący się stosunkowo korzystną strukturą obszarową gospodarstw rolnych. Wyniki badań wyraźnie wskazują, że w warunkach nasilającej się konkurencji rynkowej następuje koncentracja chowu krów, który przesuwa się do coraz wyższych grup obszarowych. W rezultacie w regionie rozdrobnionego rolnictwa widoczny jest silny, przy tym narastający, regres w pogłowiu. W regionie z korzystną strukturą gospodarstw regres w chowie krów, który wystąpił na początku

przemian systemowych, został natomiast stosunkowo szybko zahamowany i już w okresie przedakcesyjnym zarysował się rozwój ilościowy i jakościowy pogłowia, który widoczny jest także w okresie poakcesyjnym.

Słowa kluczowe: chów bydła mlecznego, rozdrobnienie agrarne, regionalne zróżnicowanie produkcji mleka

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