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INDUSTRIAL IMPACT ON ANIMAL PRODUCTION IN
BELCHATOW INDUSTRIAL REGION

This paper is a synthesis of a comprehensive study devoted to determination of the trends of changes in growth dynamics and directions of animal breeding (cattle, hogs, sheep, horses) in private farms occurring as a result of activity of the fuel and energy industrial combine in Belchatow region. Increase of animal production is dependent, first of all, on the fodder potential affected by the structure of land use, the structure of crops, labour resources, pricing conditions and degree of mechanization. Changes in animal breeding in Belchatow Industrial Region in the years 1970-1982 were reflecting transformations taking place in determinants of animal production in this period. The factors determining development of animal breeding underwent changes, on the one hand, caused by industrialization of this area and, on the other hand, by altered national economic situation. Changes in animal production in this region are a resultant of the impact exerted by both groups of factors, and a synthesis of transformations both in natural, and socio-economic determinants of agriculture and of plant production itself. Among the main changes generated by activity of the investment project in Belchatow and exerting their influence on development of animal breeding in private farms are transformations in the natural environment affecting the fodder potential and water resources utilized by farms, changes in labour resources in agriculture, and transfer of money from industry to agriculture.

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Changes in growth dynamics of particular kinds of animals did not proceed in a uniform way in this region. The stock of cattle and hogs was characterized with an upward trend, that of sheep and horses with a downward trend. In relative terms, the share of cattle amounted to 14.1 per cent and it was almost the same as the national average or a little higher than in the other parts of this administrative province. Development of cattle breeding was promoted by favourable economic conditions in Poland being a result of profitable relation of prices for milk and prices at which cattle on the hoof was purchased by the state. The impact of these favourable conditions could be clearly seen in the external zone of Belchatow Industrial Region, and especially in administrative rural communes of Wola Krzysztoporska, Sulmierzyce, Belchatow, Grabica and Zelow, in which the share of cattle in animal production grew from 15.5 per cent in Zelow administrative commune to 35.5 per cent in Sulmierzyce commune. In the remaining area of Belchatow Industrial Region, the level of cattle breeding went down. Its biggest drop was recorded in the immediate vicinity of the industrial combine. In administrative communes of Kamiensk, Kleszczow and Kluki it decreased in relation to the average for the entire Belchatow Industrial Region by around 14 per cent, in administrative communes of Gorzkowice, Gomunice, Rozprza, and Szczerców - by 3 to 9 per cent.

The size of the cattle stock is directly related to fodder and hay crops, i.e. the size of cultivated area and gathered crops. The performed analysis of grasslands revealed that the share of meadows and pasturages in the total area of cropland had not undergone any major changes. In the territorial cross-section, the differences ranged from -2.9 per cent in Grabica administrative commune to +2.7 per cent in Kamiensk administrative commune and they were not correlated with changes in the cattle stock. In the central zone, which is in the area where the biggest drop in the share of cattle in animal breeding was recorded, the share of grasslands displayed a growth trend (for example, in administrative communes of Kamiensk and Kluki) or an insignificant decline. Thus, it can be assumed that changes

in the cattle stock in the zone adjoining the industrial combine are very loosely correlated with changes in acreage of grasslands. This downward trend in the cattle stock could be affected, to some degree, by changes in meadow and pasturage crops. The studies on impact of changing humidity relations on grassland crops did not reveal any changes with the exception of meadow-sandy soils.

Changes in the share of cattle stock are accompanied by changes in the share of acreage under fodder crops in the total acreage under crops. In comparison with the preinvestment period, there grew the share of acreage under fodder crops by 1.2 per cent. Its most pronounced increase was recorded in administrative communes of Belchatow, Druzbice, Kleszczow, Ligota Wielka, Rozprza, Rzasnia, Wola Krzysztoperska and Zelow and, thus, on the area characterized with a relatively high increase in the cattle stock. On the other hand, the acreage under fodder crops was decreased in administrative communes of Gomonice, Gorzkowice, Kamiensk, Kluki and Szczercow. In this region, the share of cattle stock in total animal production dropped below the level from the preinvestment period. It seems, however, that changes in the share of arable land under fodder crops are not a cause but rather an effect of trends of changes in the cattle stock.

Accordingly, taking into account a slight decrease in hay crops in the central zone, trends of growth in grasslands and lack of changes in fodder crops, the causes of decrease in the cattle stock should be sought outside the fodder resources.

Changes in the share of cattle stock in animal production are correlated with outflow of labour from agriculture. The biggest numbers of out-migrants to non-agricultural sectors were recorded in administrative communes of Kluki, Kamiensk, Gorzkowice, Gomonice, Rozprza and Szczercow. This region witnessed either a decline or a relatively insignificant increase in the cattle stock. The cattle breeding in comparison with breeding of other animals calls for the biggest outlays of labour. Hence, outflow of labour from agriculture exerts the strongest direct impact on the size of cattle stock and leads to changes in directions of cattle breeding.

The outlays made on breeding of feeder cattle are similar to outlays of labour in cattle fattening. In conditions of a balanced profitability of cattle on the hoof and milk, the direction of cattle breeding for meat finds favourable chances for development in regions characterized with a considerable outflow of labour from agriculture. A similar situation could be observed in other regions under industrialization in the past.

In Belchatow Industrial Region, the trend of changes in directions of cattle breeding was considerably disturbed in the late seventies and the early eighties by lack of equilibrium between profitability of milk production and that of cattle on the hoof production as a result of incorrect relations of free market prices of fodder and state purchasing prices of cattle on the hoof, as well as free market prices of meat and state purchasing prices of milk.

The share of cows in the total cattle stock declined from 68.4 per cent in 1970 to 63.5 per cent in 1982. The percentage share of cows decreased by 5 per cent. A similar trend could be observed in other parts of Poland as well. In the spatial cross-section, this drop in the share of cows is quite differentiated. A relatively big decline in the share of cows in herds took place in administrative communes of Belchatow, Gomonice, Grabica, Gorzkowice, and Druzbice. The number of cows went up in administrative rural communes of Kleszczow, Kluki, and Rząśnia, it remained unchanged in Rozprza administrative commune and slightly declined in Sulmierzyce, Szczercow and Kamiensk communes. Changes in the share of cows in the total cattle stock were inversely proportional to outflow of labour.

An intensive expansion of cattle fattening in the vicinity of the town of Belchatow, much higher than in the peripheral zone of Belchatow Industrial Region (communes of Druzbice, Grabica and Wola Krzysztoporska) seems to result from specific characteristics of the meat market and immediate vicinity of a meat consumption centre such as the town of Belchatow, and the ensuing increased demand for meat coming from cattle slaughtering in private farms (the so-called free market). It can be expected that the growth of cattle stock in its fattening di-

rection in the vicinity of Belchatow corresponds to directions of cattle breeding in the vicinity of other Urban centres, where the free market meat prices compete effectively with the state purchasing prices of milk.

The share of cows in a herd determines profitability of milk production. Consequently, outflow of labour could not have exerted a major influence on changes in directions of cattle breeding in the central zone of Belchatow Industrial Region taking into account lack of equilibrium between profitability of milk and cattle on the hoof production. A smaller share of cows in the herd in 1982 as compared with the preinvestment period did not result from decrease of labour force employed in agriculture, as it could be presumed from an apparent correlation between changes in the volume of labour in agriculture and the cattle stock, but from less favourable economic determinants with regard to milk production in 1982. This is confirmed by differences in price relations. In 1970, the relation of state purchasing prices of cattle on the hoof to those of milk amounted to 4.90, and in 1982 - to 5.21.

Summing up the above analysis focussed on growth dynamics and directions in cattle breeding, it should be said that the size of the cattle stock decreased in the central part of Belchatow Industrial Region and increased in its peripheral zone. This decrease in the cattle stock was mainly due to reduced labour resources. It was, however, disproportionately superficial in relation to changes in the share of professionally active population per 100 hectare of arable land. A more substantial drop was counteracted by favourable conditions for milk production.

The share of hogs per 100 hectare of arable lands in Belchatow Industrial Region increased by 7.9 per cent. This was, however, a very insignificant growth in comparison with that recorded in the entire administrative province (an increase of 29.3 per cent) or in the entire country (41.2 per cent). In the territorial cross-section, the share of hogs in total animal production increased in administrative communes of Grabica, Ligota Wielka, Wola Krzysztoporska, Gorzkowice, Sulmierzyce, and

Druzbiec, and thus in the peripheral zone of Belchatow Industrial Region possessing the most fertile soils. A relatively high increase in the number of hogs was recorded in Grabica (58.1 per cent), Ligota Wielka (31.4 per cent) and Wola Krzysztoporska (24.6 per cent). On the remaining areas, their number either increased slightly or declined.

The biggest decline in the share of hogs in animal production was recorded in the central zone of Belchatow Industrial Region adjoining the industrial combine and coinciding with the area of the biggest labour outflow from agriculture. And, thus, in Kluki commune the number of hogs declined by 25.4 per cent, in Kamiensk commune - by 17 per cent, and in communes of Gomuńnica, Kleszczow and Szczercow - by about 10 per cent.

The economic conditions prevailing in Poland such as free market prices of fodder, mainly of potatoes and rye, in relation to state purchasing prices of hogs were unfavourable for development of hogs breeding.

Proper price relations, being synonymous with favourable economic conditions, for hogs breeding existed in Poland between 1971 and 1973. At that time, relations of state purchasing prices of hogs to fodder prices exceeded by 10-15 per cent the margin level, that is such relation of prices, at which increment in purchasing equalled zero. In the mid-seventies, price relations approached the margin level to fall below in the following years. This situation was largely due to deteriorating relations between prices of hogs and free market prices of potatoes. In the early eighties, as a result of low potato crops, the relation fell by about 40 per cent below the margin level.

In recent years, there was also deteriorated the relation of state purchasing prices of hogs to free market prices of rye. In the second half of the seventies, it was maintained above the margin level, it was considerably reduced in 1980, and two years later it dropped to 4.42, i.e. 37 per cent below the margin level. As a result, hogs breeding became very unprofitable in relation to free market prices of rye and potatoes, which resulted in reduced fodder production. This was reflected in changes in the structure of crops. The acreage under 4 main

grain crops and potatoes decreased, which was accompanied by increased share of fodder, industrial and other crops. The acreage under 4 main grain crops in Belchatow Industrial Region declined from 57.5 per cent in 1973 to 53.2 per cent in 1981, and acreage under potato crops declined from 25.8 per cent to 23.9 per cent respectively.

In the spatial cross-section, the most significant changes in the share of 4 main grain crops towards its decrease were recorded in Grabica, Rzasnia, Wola Krzysztoporska, Druzbice, Zelow and Sulmierzyce. They were not correlated, however, with changes in the number of hogs with the exception of Rzasnia and Zelow administrative communes. Changes in the share of 4 main grain crops were insignificant in the zone adjoining the industrial combine, that is on the area witnessing the biggest decline in the share of hogs in animal production. In Kamiensk, Kluki and Dobryszyce, the share of grain crops did not change, in Gorzkowice - it grew by 2.2 per cent, in Gomunice, Rozprza, and Szczercow - it dropped by 1.5 to 3.0 per cent with the average drop for the entire Belchatow region amounting to 3.8 per cent. The share of potato crops in all crops declined in the entire Belchatow region with the exception of administrative communes of Kleszczow, Kluki, Gorzkowice and Sulmierzyce. The acreage under potatoes was reduced more than the average for the region in the peripheral zone.

Changes in the share of 4 main grains and potatoes in all crops in the zone adjoining the industrial combine do not correspond with a substantial decrease in the number of hogs, with relations between them being even inversely proportional. A conclusion, which could be drawn here, is that preference is given to crops production in the central zone with existing surpluses of fodder resources utilized for production of milk.

Apart from changes in acreage under the main crops, the fodder potential is affected by changes in the level of gathered crops. Comparison of grain and potato crops in the central zone with the remaining part of Belchatow Industrial Region between the preinvestment period and the depression period shows absence of any major changes in crops gathered in the peripheral zone

and a drop in rye and oat crops of about 4 per cent, and of potatoes - of 1.2 per cent in the central zone.

Taking into account stability in the share of arable land under grain crops, growth trend in acreage under potatoes and slight changes in gathered crops, it may be assumed that the fodder potential in the immediate vicinity of the industrial centre did not undergo any major changes. This leads to a conclusion that a drop in the number of hogs in the central zone was due to outflow of labour, followed by a shift from animal to crops production.

The sheep stock per 100 hectare of cropland in this region declined to reach 95 per cent of the preinvestment level. On the scale of the administrative province, it went down to 87.9 per cent, while on the national scale, it rose to 110.9 per cent. In the territorial cross-section, the index of changes is quite differentiated. The share of sheep in animal production surpassed the preinvestment level in administrative communes of Belchatow, Druzbice, Gorzkowice, Grabica and Kamiensk. On the remaining area, it decreased. The number of sheep declined by a high 40 per cent on the average in Ligota Wielka, Kleszczow, Kluki, and by 20 to 30 per cent in Rzasnia, Szczercow, Sulmierzyce, Gmunicie, and Rozprza. The size of sheep breeding is directly related to acreage of low-grade grasslands. Changes in the share of sheep in total animal breeding generally correspond to changes in the share of meadows and pasturages (5th and 6th class) in the total area of farmlands. They are, however, disproportionately bigger than differences in the share of grasslands, especially in the area adjoining the industrial combine. They are not dependent either on changes in the fodder potential resulting from changes in the structure of crops used for fodder.

In the situation when production of milk has become profitable, cattle breeding seems to have become too competitive for sheep. Hence, in order to increase fodder resources for cattle, the sheep stock has been restricted. A substantial decline in the share of sheep in total animal production in the central zone of the region resulted from a relatively small drop in the cattle stock in relation to outflow of labour.

Similarly, the number of horses in this region is on the decline. The rate of this decline resembled that recorded in the entire Poland, but it was much faster than the average rate for the entire administrative province. The number of horses in this region went down by 12.2 per cent in comparison with their number in the entire administrative province. The difference is due to the rate of changes in mechanization of agricultural production, and mainly to provision of tractors for private farms. Over the period 1970-1979, the number of hectares of arable land per 1 tractor in Belchatow region decreased 12-fold and amounted to 65.6 hectare. In the corresponding period, these changes were twice slower in the administrative province, and one tractor was working on 145.9 hectare in 1979.

In the spatial cross-section, the number of horses declined in all administrative communes. The most pronounced downward trend was observed in Dobryrzyce, Grabica, Ligota Wielka, Wola Krzysztoporska, Zelow, Gorzkowice, Druzbyce and Rozprza, and thus on areas characterized for their biggest part with good-quality soils and high levels of productivity. All these administrative communes recorded a marked growth in the number of tractors. Reduction in the number of horses was promoted by changes in the size structure of private farms. Between 1970 and 1981, there took place an increase in the average acreage of farmland per 1 farm. And although these changes are rather small so far, they can be considered a positive trend in agriculture. A marked improvement in the size structure of farms took place in administrative communes of Grabica, Ligota Wielka and Zelow (between 14 and 24 per cent).

In the central zone, growth in the size of private farms was below the average level for the entire Belchatow region. The most insignificant growth in the size of farms was observed in Sulmierzyce, Gorzkowice, Kleszczow, Kluki, Kamiensk, and Wola Krzysztoporska, while in two communes of Belchatow and Rzasnia the structure of farms according to their size was deteriorated. The progressive process of atomization of farms in Rzasnia and their practically unchanged size in Sulmierzyce, accompanied by their relatively good provision with tractors, should be consid-

ered as one of main causes checking a decline in the number of horses in this area. A relatively small drop in the share of horses was observed in Belchatow, Kamiensk, Kleszczow, Kluki and Szczercow. The number of hectares of farmland per 1 tractor in this area ranges from 90.7 in Szczercow to 256.2 in Kamiensk administrative communes.

It seems that relatively low incomes from agricultural production in the central part of Belchatow Industrial Region, being a result of poor soils, a shift to extensive directions of agricultural production, improper structure of farms with very high predominance of small farms in Kamiensk, hamper purchases of agricultural machines. The lack of the expected high degree of mechanization through transfer of money from industry to agriculture is also due to the fact that a considerable share of surplus labour from overpopulated villages found employment in non-agricultural occupations, with incomes obtained in new places of work constituting the basic source of livelihood for this population. Nonetheless, changes in equipment of the central zone with tractors (exception of Kamiensk administrative commune) were faster here than in the entire administrative province.

In the territorial cross-section, the share of all animals (without horses) in relation to the average level for the entire Belchatow region went up by 8.7 per cent in Belchatow administrative commune, by 0.5 per cent in Druzbice, 13.4 per cent in Grabica, 1.5 per cent in Ligota Wielka, 13.8 per cent in Sulmierzyce, and 9.6 per cent in Wola Krzysztoporska. On the remaining area, there was recorded a drop in the animal stock per 100 hectare of farmland. The biggest drop was recorded in administrative communes of Kluki, Kleszczow, and Kamiensk ranging between 11 and 16 per cent, while in Gorzkowice, Gomonice, Rozprza, Rzasnia and Szczercow it reached about 5 per cent.

A drop in the number of all kinds of animals (without horses) was visible in administrative communes of Kluki, Kleszczow, Gomonice, Rozprza and Rzasnia, the stock of cattle and hogs shrank in Kamiensk and that of cattle in Gorzkowice. Taking into consideration the fact that there did not occur any major changes

in the fodder potential, this drop in total animal production may testify to a shift to the plant production in this area, and especially in administrative communes of Kluki, Kleszczów and Kamiensk, which is mainly connected with outflow of labour from this region not compensated by any improvement in degree of mechanization.

These dynamic changes in the number of animals resulted in major transformations in directions of animal breeding consisting in an increased share of cattle accompanied by a drop in the share of hogs and sheep. They were due to the strong impact exerted by price determinants of animal production in Poland.

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ODDZIAŁYWANIE PRZEMYSŁU NA PRODUKCJĘ ZWIERZĘCĄ
W BIELCHATOWSKIM OKRĘGU PRZEMYSŁOWYM

W artykule przedstawiono zmiany w pogłowie poszczególnych rodzajów zwierząt gospodarskich w latach 1970-82 na tle zachodzących przeobrażeń w determinantach produkcji zwierzęcej (potencjał paszowy, struktura użytkowania ziemi, struktura zasiewów, plonowanie, zasoby siły roboczej, uwarunkowania cenowe i stopień mechanizacji) pod wpływem industrializacji obszaru oraz zmian w ogólnokrajowych uwarunkowaniach ekonomicznych.

Analizę przeprowadzono w układzie gminnym w podziale na strefę wewnętrzną i zewnętrzną BOP. W obszarze wewnętrznym BOP (gm. Kamiensk, Kleszczów i Kluki) w porównaniu ze strefą zewnętrzną lub średnio BOP, podobnie jak w innych rejonach uprzemysławianych, odpływ siły roboczej z rolnictwa nie rekompensowany odpowiednim wzrostem stopnia mechanizacji, spowodował obniżenie pogłowia zwierząt gospodarskich na 100 ha użytków rolnych.

Wpływ polityki rolnej, polegający między innymi na preferowaniu produkcji mleka, zaznaczył się w przeobrażeniu kierunków chowu zwierząt gospodarskich, polegający na wzroście udziału bydła mlecznego przy jednoczesnym ograniczeniu trzody i owiec.