ANNALS OF THE POLISH ASSOCIATION
OF AGRICULTURAL AND AGRIBUSINESS ECONOMISTS

received: 10.10.2019
acceptance: 21.11.2019
published: 15.12.2019

Annals PAAAE • 2019 • Vol. XXI • No. (4)

JEL codes: Q1, Q15, Q24

DOI: 10.5604/01.3001.0013.5912

WIESŁAW MUSIAŁ[*], KAMILA MUSIAŁ[**]

[*]University of Agriculture in Krakow, Poland,
[**] National Research Institute of Animal Production, Balice, Poland

DEANIMALISATION PROCESSES IN THE POLISH CARPATHIANS – PRODUCTION, ECONOMIC AND ECOLOGICAL ASPECTS

Key words: disagrarisation, deanimalisation, ecological consequences, Polish Carpathians

ABSTRACT. This paper addresses a current issue regarding the increasing problem of a decreasing cattle population in the Polish Carpathians. The problem exacerbated after 1990, as a result of changes in prices of the means of production and agricultural products. It intensified even further after Poland joined the EU. The decrease in cattle population is observed in all districts in the Carpathians. This article includes a diagnosis of four such districts: two with the highest decrease (Łańcut: -67.0% and Sucha: -52.6%) and two with the smallest decrease in cattle population (Bieszczdy: -8.1% and Wadowice: -11.5%). Expert assessments were used to this end. The article includes a definition and analysis of the deanimalisation process and an indication of the consequences of this process in agriculture, in the local environment and in the broadly understood ecological context. It follows from the research that favourable natural conditions, good for breeding ruminants, largely determine high cattle density but, at the same time, these conditions do not impact the decrease in the cattle population to such an extent. The decrease is related to the low concentration of herds, generational changes and the disappearance of local dairy markets. As a result of progressing deanimalisation, abandoned meadows and pastures, as well as part of arable lands, are being permanently lost. Instead, these lands become overgrown with invasive plant species and shrubbery.

INTRODUCTION

The conversion of agricultural structures is a continuous process, which starts on individual farms, and then develops into regional changes. It is also a phenomenon inspired and catalysed by institutions. One of the features and attributes of these transformations is the pace at which they progress, but also the depth of these changes discussed objectively, subjectively and regionally. Political and economic transformations that occurred in Europe, especially after the 1990s, accelerated the changes in many sectors of the economy, including agriculture. The accelerating factors behind such transformations in Poland were diverse, i.a. the stress factor related to the adaptation of agricultural farms to the market economy, the preparation of agriculture, including agricultural structures and agribusiness, for EU accession as well as including the common agricultural policy in these structures. These changes were also accelerated in the face of new problems brought about by globalisation and the increasing openness of the EU economic area to countries from outside the community, including large agricultural producers and exporters.

In recent years, there has been another factor that impacts agriculture in the EU: climate changes, increasingly unfavourable for agricultural production, including a shortage of or inadequate precipitation and recurrent hydrological droughts. Polish agriculture is also strongly affected by these transformations, coupled with various local and regional unfavourable production conditions, which cause recessive phenomena to increase in subregions. They result in a process of disagrarisation, with a diverse structural distribution.

Important transformations in agriculture in the past dozen years or so are related to a decreasing population of livestock, especially ruminants, and therefore result in a decreased net production as well as a decreased productive and economic significance of animal production [Żmija, Czekaj 2017]. These transformations are also observed in the Polish Carpathians, the natural conditions of which are most favourable with regards to producing compound feed and breeding ruminants on grasslands. In all three voivodeships, where a significant portion of agricultural land is situated in the Carpathians, the greatest decrease in cattle population in Poland was observed, which was quite significant in this region, including dairy cows. It was only in 2004-2015 that the cattle population in the Podkarpackie Voivodship decreased to 53.3%, while the population of dairy cows decreased to 39.3%, as compared to the initial count in 2004. The same figures for the Małopolskie Voivodship are 65.7% and 49.5%, respectively and for the Silesian Voivodship – 85.5% and 63.6%, respectively. A reduction in the cattle population was observed in the above mentioned period in more than half of Polish voivodships. While the average positive index describing changes in cattle population was 110.8% and the number of cows decreased to 82.9% of the initial amount, in ten voivodships, there was, in fact, an increase in the cattle population. It mostly referred to the following voivodships: Podlaskie (135.4%) and Wielkopolskie (129.1%). The territorial distribution of the cattle population is important for agricultural production, because this is the dominant species of ruminants in Poland. However, a shortage of ruminants in the mountains, especially the Sudetes, but also the Carpathians, is a fact and the consequences have become the subject matter of academic debate, the significance of which is both cognitive and practical. The aim is to indicate ways of stopping recessive processes and build a good perspective of maintaining and developing cattle production. It is difficult in that the discussed area is dominated by small farms, which are often no longer productive, or their production is located on fragmented, small portions of agricultural land.

The decrease in the cattle population is also reflected in the condition of semi-natural areas of meadows and pastures, the existence of which depends upon the maintenance of an agricultural economy. In order to maintain such areas, it is necessary for ruminants to continue grazing there. This is decisive, not only for the appropriate composition of species in such areas, but also for the border between neighbouring forest complexes. This follows from certain dynamics expressed in the change of spatial borders, e.g. the boundary between agricultural and forest plants, which is one of the most contrasting boundaries in the environment. The structure of the boundary between agricultural and forest plants may point to a degree of natural quality of the landscape, but also to an advancement of secondary succession processes [Ostafin 2008]. A shift of this border is not good from the perspective of maintaining the biodiversity of meadow and pasture complexes, which are transformed into forest complexes in the long run [Musiał et al. 2015].

RESEARCH MATERIAL AND METHODS

The analyses and evaluation of the deanimalisation process were conducted for districts located in highland areas, i.e. in the mountains and the foothills of the Polish Carpathians, on the NUTS 3 level. The first stage of the research involved the preparation of actual databases, including the cattle population in 2005-2018, expressed as a physical count, according to analytical groups as applied by the ARiMR (ARMA – Agency for Restructuring and Modernisation of Agriculture). Afterwards, changes in the cattle population were calculated for the studied period and four districts were selected: two with the greatest difference between the initial and final count and two with the smallest difference (decrease). These are the following districts: Sucha and Łańcut for the greatest decrease, and Wadowice and Bieszczady with the smallest decrease. The next stage of research involved a cause-and-effect analysis and applying the analogy method for the so-called soft interpretation of the existing situation and changes in the cattle population. To this end, a survey was conducted to collect expert assessments. Local experts were agricultural counsellors and consultants from individual districts as well as activists from the local Agricultural Chamber. They pointed to what they believed were the most likely causes and explanations of the current pace of reduction of the cattle population. The starting point of analysis is a synthetic study of the essence of the deanimalisation process, which is an extension of productive disagrarisation and refers to animal production.

In this paper, the authors attempt to achieve two research objectives. The first one is to implement the notion of deanimalisation as a subset of the concept of disagrarisation, and include it in economic and agricultural terminology. The other objective involves the evaluation of the *status quo*, processes, reasons as well as agricultural and ecological consequences of the reduction in the cattle population observed after Poland's EU accession, i.e. in the period from 2005 to 2018.

DEANIMALISATION OF FARMS AND AGRICULTURAL PRODUCTION SPACE – AN ATTEMPT AT FORMULATING A DEFINITION

Deagrarisation is an agricultural and economic concept – a multifaceted definition of a decrease in the significance of agriculture and agricultural production in the national/regional economy or in households of farmer families. It is also analysed as a historical phenomenon – a process where the economic significance of agriculture decreases and is replaced by other sources in the process of creating the national income and the income of individual households [Rosner, Stanny 2018]. As regards macro-economics, disagrarisation involves loosening the bond between the size of food production and consumption in a specific country and results in shifting production to other countries or regions, where natural conditions are better or agriculture is better protected [Musiał 2007]. It can be said that disargarisation is a natural process and a stage in the development of societies. Anna Kołodziejczyk [2017] claims it is the consequence of competition between the city and the countryside, and between agricultural and non-agricultural activity. At the moment, it is a transformation process imposed by economic conditions. It is claimed that it is also a consequence of new functions, i.e. services that farmers and agricultural areas provide

to the local community, or more broadly speaking, to the local population of a specific country. It may, therefore, be considered that disagrarisation is a consequence but, at the same time, a reason for the multi-functional nature of the countryside and agriculture itself [Kłodziński 2010].

When referring to the departure from agriculture, as observed in the countryside, we can say that disagrarisation is a reaction to the inability to retain social and economic development e.g. of an individual village solely from the income provided by agriculture. It is, therefore, an expression of the overarching significance of the multi-functional development of the countryside, which takes precedence over growth based on the agriculture and income it provides. The very process of disagrarisation may be analysed from multiple perspectives and described in various dimensions: production-related, economic, social and cultural as well as landscape- and ecology-related. Each of these categories has its own numerous features, which point to specific phenomena occuring either during or after the departure from agricultural production.

From the point of view of the research objective, it is important to narrow down the analysis of this process to its productive aspect. So far, the analyses and evaluation of disagrarisation has focused on spatial and technological aspects. Productive disagrarisation is, therefore, an area of descriptions of various recessive conditions and phenomena observed in farms. It involves the progressive reduction in farm productivity, and the consequent resignation from agricultural production, fallowing, the extensification of production and often only formal sustenance in order to receive EU funds. It may also involve a gradual reduction in the size of farmed land and agricultural production, as well as progressive disinvestment and divestment processes [Wojewodzic 2017]. It also involves an increase in the proportion of livestock-free farms or farms which keep animals only to meet the needs of their own household [Musiał 2007].

The quick regression of the ruminant population in many subregions, including those particularly good for agricultural production, makes it necessary for us to formulate an accurate definition of this aspect of productive disagrarisation, which should be categorised separately and referred to as deanimalisation. Similarly to disagrarisation, it also describes the macro-economic level, i.e. the decrease in livestock as analysed in aggregate and the share of livestock in net agricultural production. It also involves a decreased share of livestock in the final production of a specific region, or a decrease or even complete physical disappearance of livestock on farms. The description of deanimalisation should primarily refer to all livestock species, namely: ruminants, horses, pigs and poultry, but the significance of these directions or lines with regards to shaping the spatial structure of agriculture and sustainable production differs.

Although cattle is increasingly bred in large herds, this sector is still closely related to the feed-base of farms, composed of grassland and forage produced on arable land. Therefore, if we refer deanimalisation to the available compound feed, then we may observe a certain imbalance, i.e. a shortage of livestock and surplus of feed production, even if permanent grassland (meadows and pastures) is used extensively. Deanimalisation may involve a complete departure from animal production: usually ruminants and pigs are the first ones to be discarded, whereas poultry production is often retained. Animal

production, especially in smaller herds, is now regarded as cumbersome, as it strongly binds the farmer to the land and often disturbs the order and aesthetic aspect of the farm, as expected by the members of the household. As the scale of such production increases, it also becomes inconvenient for those in the vicinity. However, this process results in the progressive or complete elimination of income from this sector, i.e. from the processing industry. Marketable plant products (especially grain) become subject to direct trading and are not used as feed for animals, in order to increase the added value from the production process. Eliminating livestock, especially cattle, also means that existing farm buildings will not be productive; it is hardly ever possible to find an alternative use for livestock buildings. It is often due to the fact that there is no other application for the devices and installations used in animal production, such as stationary milking systems etc. Converting the production structure in a subregion, which often involves abandoning the line of ruminants, means that grassland is no longer productive, which in turn results in landscape shifts caused by rapid plant succession (Figure 1).

This usually results in spontaneous afforestation of the agricultural production space. The deanimalisation of farms, coupled by insufficient agricultural qualifications, often leads to a decreased richness and fertility of soil. With reference to breeding ruminants in small herds, this process also involves a loss of various budget transfers related to the maintenance of animals and payments contingent upon meeting certain requirements concerning cattle density on grassland. However, farmers underline that abandoning animal production also entails certain benefits for them, due to the reduced institutional inconvenience related to cross-compliance, e.g. the segregation of animals by species, ensuring their wellbeing and complying with other sanitary and hygienic requirements.

DEANIMALISATION

→ Complete resignation from livestock breeding

→ Reducing the population of ruminants (and horses) to the extent that gradually makes grassland unproductive

→ Reducing or eliminating the share of animal production in income

→ Making livestock buildings unproductive

→ Reducing production and added value in the subregion

→ Ecological succession of abandoned grassland and related landscape shifts

→ Increased risk with regards to maintaining organic matter balance in the soil

→ Reducing the workload and inconvenience related to agricultural production on the farm

→ "Liberating" the farmer from the inconveniences of the *cross-compliance*

Figure 1. The essence of deanimalisation of farms and agricultural production space
Source: own work

EXTREME EXAMPLES OF DEANIMALISATION IN FOUR CARPATHIAN DISTRICTS

In the whole area of the Polish Carpathians, there has been a shortage of ruminants for many years now. According to Wiesław Musiał et al. [2013], it is estimated that only for the Małopolskie Voivodship it is 221 LSU, i.e. ca. 123% of the initial count. This shortage, however, differs between subregions and even individual localities. There are many Carpathian municipalities where deanimalisation has been pushed to the extreme, and even in large villages with a couple of hundred of houses no cattle is kept at all. Sales of milk is often gradually discontinued, because the inconvenience of keeping a few dairy cows is not sufficiently compensated by the price that can be obtained. On the other hand, there are municipalities and even districts where livestock continues to play an important role and there is sufficient feed, an available workforce on the farms and a subjective feeling of profitability of such production as well as actually existing outlets. What is interesting from a cognitive point of view, is the extreme example of districts with the greatest and smallest cattle density, expressed in aggregate, in the number of animals per 100 ha of area covered by single area payments under CAP (SAP). The largest livestock density (expressed in the number of animals), according to data provided by the ARMA, in 2018, was observed in mountain districts: Tatra – 126.3, Nowy Targ – 95.2 and Limanowa – 63.7. The lowest livestock density was observed in the following districts: Jarosław – 6.6, Brzesko – 7.3 and Przemyśl – 7.4 animals/100 ha of the area covered by single area payments.

A separate problem is the progress and pace of abandoning cattle-breeding, i.e. the deanimalisation of agriculture and agricultural space in the studied districts. The highest pace at which the decrease in cattle population progressed in 2005-2018 was observed in the Łańcut (-67.0%) and Sucha district (-52.6%) (Table 1). The lowest decrease was observed in the Bieszczady (-8.1%) and Wadowice district (-11.5%). Therefore, from a cognitive point of view, it is important to seek answers to questions related to the reasons for such extreme behaviour of farmers in the context of cattle breeding in the future. The reason for this phenomenon is not the natural conditions in which agricultural production takes place (including the crop climate), measured with the Agricultural Production Space Valuation Ratio, or the inconvenience related to terrain. The Wadowice district is similar to the Sucha district in this respect, and yet the changes in the cattle population differ. Also, the share of permanent grassland does not serve as an explanation of these changes. The problem of farm fragmentation, when analysed on such a small sample, will not explain why farmers so readily abandon livestock breeding.

In the Bieszczady district, which has the largest average area of farms (14.39 ha) and a relatively high number and share of large farms, the pace of deanimalisation was the lowest (-8.1% over 13 years). That is why the explanation of the reasons for deanimalisation was sought from local experts (interviews with members of Agricultural Chambers and agricultural services from Rural Advisory Centres). According to the respondents, maintaining a stable cattle population in the Bieszczady district results from sustaining or even developing large-scale beef cattle breeding (a few dozen animals), as well as a few larger dairy farms. Local experts also pointed to the fact that there is no alternative use for large areas of grassland and no alternative jobs for local people. Maintaining pastures in

Table 1. Selected characteristics of the studied districts

Specification	District			
	Sucha	Łańcut	Wadowice	Bieszczady
Area [km^2]	686	452	64.6	113.9
Population per 1 km^2	123	179	24.8	19
Rate of natural increase	1.9	2.3	1.7	- 0.1
Net migration rate per 1,000 population	5.0	3.0	11.0	25.0
Afforestation rate	48.2	20.8	237	70.2
Unemployment rate [%]	4.8	11.3	5.6	15.5
National economic entities per 1,000 inhabitants	98.7	77.2	106.0	100.1
Agricultural area [thous. ha]	31.3	41.1	33.8	22.3
Proportion of permanent grassland [%]	29.3	17.2	24.4	59.0
Agricultural Production Space Valuation Ratio – total, of which:	46.8	81.1	75.6	53.4
– terrain	1.1	3.6	2.5	1.1
– crop climate	5.3	12.2	7.8	5.8
Average area of a farm [ha]	3.75	8.23	4.09	14.39
Total cattle density expressed in the number of animals	35.7	11.3	39.9	21.7
Changes in livestock density in 2005-2018 [%]	-52.6	-67.0	-11.5	-8.1

Source: [Central Statistical Office, Local Data Bank]

local agriculture through grazing is also a condition for receiving area payments, including significant agri-environment and mountain subsidies. Respondents from the Łańcut district noted two issues which might be a reason for considerable regression in cattle count. These issues include the municipalisation of rural pastures, which have lost their original functions, and a drop in the profitability of small-herd cattle breeding (especially with respect to dairy cows).

Respondents from the Sucha district mentioned the following as the main reasons for the regression in cattle breeding: considerable limitations with regard to direct sales (for many years), the liquidation of the local dairy and difficulties in selling milk from small herds (2-5 cows). They also pointed to generational changes related to succession: those who inherit farms do not want to earn their living by breeding cattle. On the other hand, respondents from the Wadowice district explained that good results in sustaining cattle breeding were related to the functioning of the local dairy, which collects milk from farms even with small herds of a few cows, and to transformations in farm structure (the creation of more than a dozen new cattle farms, which increased their production quite rapidly, especially by increasing their dairy cow herds). The Wadowice region has developed a good tradition and culture of cattle breeding, which still affects the slow pace at which herds are decreasing in small farms as well as concentration in bigger and large farms.

ECOLOGICAL CONSEQUENCES OF DEANIMALISATION IN SELECTED CARPATHIAN DISTRICTS

In the Polish Carpathians, we can observe a significant share of meadows and pastures, which have valuable natural features and a considerable production value. These areas include i.a.: fresh mountainous meadows, wet meadows and grasslands with fluctuating water levels as well as tall-herb plant associations. The agricultural landscape in these areas is typically characterised by considerable mosaicity [W. Musiał, K. Musiał 2017]. Among the factors that threaten the maintenance of biodiversity, apart from the simplification of the landscape structure, what can be mentioned is the regression of agricultural production, which results from progressing disagrarisation, including deanimalisation. In large areas of the Małopolskie and Podkarpackie voivodships, the unfavourable transformation of meadows and pastures have been observed for the past couple of years. These transformations correlate with a drop in the ruminant population grazing there. Traditional cattle grazing is becoming less and less popular, because it is no longer profitable to breed cattle in small herds. As a result, no agricultural activity has been performed on some of the grassland in this area, which, in turn, impacts the landscape physiognomy in the tree and synanthropic species appearing in places that used to be occupied by agriculture [Musiał et al. 2015].

In the San valley, in the Bieszczady district, most existing fresh meadows (*Arrhenatheretum elatioris* association) are not used any longer or are only used extensively to provide feed of low economic value. Therefore, plant succession towards forest associations has been observed in these areas [Trąba et al. 2017]. Similar processes occur in the Łańcut district, where the boundary between agricultural land and forest is shifted and invasive plant species spread uncontrollably, including: *Solidago canadensis, S. gigantea*, *Reynoutria japonica*, *Impatiens glandulifera* and *Robinia pseudacacia* [Jarek 2014]. On the other hand, in the Sucha and Wadowice district, the following species are dominant in the surface structure of fallows with trees and shrubbery: *Betula pubescens, B. verrucosa, Salix caprea, S. purpurea,* as well as *Quercus robur, Q. petraea, Populus tremula, Prunus spinosa, Alnus incana, Carpinus betulus* [Ostafin 2008]. Therefore, fallowing may lead to fast shifts between agricultural land and the forest, and this process should be controlled. It can be estimated that ecological consequences of deanimalisation as observed on grassland and abandoned arable land entail afforestation (the area is covered with shrubs) and the spreading of invasive plant species, which replace natural, indigenous and valuable species.

SUMMARY

Deanimalisation is a component of a broader term referred to as disagrarisation and a subset of this concept, which is related to a decrease in the number and density of livestock, as well as net animal production, thus rendering grassland used for feed production unproductive. In the analysis of districts in the whole area of the Polish Carpathians, a different degree of advancement of the deanimalisation process can be observed. Subregionally, the process is reflected by small numbers and a low density of ruminants, especially cattle, and a diverse, but mostly large drop in the number of these animals. Although in mountain regions livestock density is definitely higher than in areas around them, in the neighbouring

districts of Sucha and Wadowice, the differences in the pace at which the cattle population drops are large: -52.6% and -11.5%, respectively. In the Bieszczady district, cattle breeding remains at a fairly stable level, which, according to expert opinion, results from the fact that it is difficult to find non-agricultural employment. Another explanation is the wish to obtain area payments (including agri-environment, climate and mountain payments), which improve the profitability of agricultural production, especially when combined with the income from such production. The greatest drop in the cattle population was observed in the Łańcut district. Local experts explain that these changes result from considerable limitations to the direct sales of dairy products, inconveniences posed by institutions and difficulties related to breeding cattle in small herds (especially cows), as well as unprofitable production, especially when it is easier to obtain an income from sources other than agriculture. As a result of the drop in the cattle population and the abandonment of grazing in commonly owned land, in this district, a shift of the boundary between agricultural land and forest is observed. Consequently, there is a problem with the spreading of invasive plant species. Supporting the grazing of ruminants, which, in practice, prevents deanimalisation of a specific area, is a well-tested method of protecting semi-natural meadows and pastures against natural succession and the anthropogenic process of synanthropization, which ultimately lead to a reduction in biodiversity in specific areas.

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PROCESY DEZANIMALIZACJI KARPAT POLSKICH – ASPEKTY PRODUKCYJNO-EKONOMICZNE I EKOLOGICZNE

Słowa kluczowe: dezagraryzacja, dezanimalizacja, następstwa ekologiczne, Karpaty Polskie

ABSTRAKT

W opracowaniu podjęto aktualny i narastający problem spadku pogłowia bydła w Karpatach Polskich. Proces ten nasilił się po 1990 roku, w wyniku zmian, które zaszły w poziomie cen na środki produkcji i produkty rolne. Narastał także po integracji Polski z Unią Europejską. Spadek pogłowia bydła objął wszystkie powiaty karpackie. Dla czterech z nich, tj. dwóch o największych spadkach (łańcucki: -67,0% i suski -52,6%) oraz dwóch o najmniejszych spadkach pogłowia tych przeżuwaczy (bieszczadzki: -8,1% i wadowicki: -11,5%), przeprowadzono diagnozę takich stanów, stosując metodę ocen eksperckich. Zdefiniowano i poddano analizie proces dezanimalizacji, wskazano także jego następstwa w rolnictwie i w środowisku lokalnym oraz w sferze ekologicznej. Z badań wynika, że dobre warunki przyrodnicze do chowu przeżuwaczy w dużym stopniu determinują wysoką obsadę bydła, lecz jednocześnie nie mają tak dużego wpływu na tempo spadku stanu jego pogłowia. Wiąże się to z niską koncentracją stad, zmianami pokoleniowymi i zamieraniem rynków lokalnych na produkty mleczne. Efektem postępującego procesu dezanimalizacji jest trwała utrata porzuconych łąk i pastwisk oraz części gruntów ornych. Tereny te porastają roślinnością inwazyjną, jak również ulegają zakrzaczeniu.

AUTHORS

KAMILA MUSIAŁ, PHD
ORCID: 0000-0002-6713-341X
National Research Institute
of Animal Production, Balice
Department of Production
Systems and Environment
1 Krakowska St., 32-083 Balice, Poland

WIESŁAW MUSIAŁ, PROF. DR HAB.
ORCID: 0000-0002-8213-4859
University of Agriculture in Krakow
Department of Food Economy and Economics
21 Mickiewicza Av., 31-120 Kraków, Poland