

THE ASSESSMENT OF AGRICULTURAL USE OF MOUNTAIN VILLAGE GRASSLANDS – ON THE EXAMPLE OF THEIR SPATIAL ARRANGEMENT

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Summary

The agriculture in mountain areas is still one of the main sources of income for their inhabitants. The faulty land layout of highly fragmented farms and dispersion of lands have no positive impact on their agricultural use. However, abandoning agricultural production due to the functions it fulfils in these areas for the cultural landscape, natural biodiversity, is neither imaginable nor even possible. Clean natural environment, friendly to organic farming and favourable conditions to livestock and pasture farming still make the agriculture an important economic activity in these regions. The economic significance of agriculture in mountain and sub-mountain regions has been decreasing, because tillage of these lands requires more effort and its production costs are higher. That is why the financial support for these regions is necessary. The study attempts to prove the following: because the agriculture in these regions is based on traditional livestock and pasture farming, these lands are agriculturally useful, especially when they are used as grasslands. The study was carried out in a mountain village Polski Spisz (near Nowy Targ) that has one of the highest land fragmentation index, where the average 5 ha farm consists of 45 land plots (parcels), and the mean size of a land plot designed for grassland is only 0.1 ha. In the whole village there are almost no parcels larger than 1 ha that would be appropriate for tractor tillage. It is necessary to carry out rural management works and to transform agricultural lands, change the current structure of land use by significant reduction of arable lands in favour of grasslands.

Keywords

layout of farms • spatial structure of a village • mountain regions

1. Introduction

The proper development of Polish agriculture is impeded by many unfavourable factors. Therefore the government agricultural policy is all the more important. Clear and appropriate principles of rural areas development haven't been established yet. Moreover, developmental strategies of the communes are devoid of any vision of village development and the spatial development plans do not meet the expectations of

rural population [Pijanowski and Pijanowski 2003]. High unemployment, poor spatial structure of farms, large share of marginal lands in the total area of agricultural land, infrastructure underdevelopment are one of the main problems of Polish rural areas [Kłodziński 1999].

The agriculture in mountain regions, which still is one of the main sources of income for mountain population, deserves special attention. Mountain farming has always been difficult. It had to tackle with all sorts of factors that are unfavourable to farming and are typical of mountain regions. High degree of land fragmentation and relatively large farms are characterized by low agricultural productivity related to difficult physiographic conditions. Environmental factors are essentially limiting the possibility of farming in these areas [Twardy 2008]. Apart from harsh climate and poor soils the major difficulty is highly varied topography with height differences and slopes. The farms have defective land layouts and their average size is from 2 to 5 ha. The farms consist from a few to a dozen or so land plots whose size rarely exceeds 30–50 ares. Hence the farms in the southern Poland are on average two times and the lands plots are even four times smaller than those in other regions of our country [Woch 2001]. Due to the hard farming conditions prevailing in these terrains most of the farming, not long ago, was done manually, especially by harvesting and care. Using horses was limited mainly to transport of crops and preparing the soil for sowing. Soil cultivated this way lessens unfavourable impact of parcels' layout for productivity, but contributed to permanent degradation of terrain structure.

The current land fragmentation in mountain villages is related mostly to the size of land plots. The average size of a farm is similar to what is in neighbouring regions, but a mountain farm usually has two to three times more small parcels than other farms. The mountain villages with the greatest land fragmentation can be found e.g. in the regions of Spisz and Orawa. The average farm there consists of a few dozen land plots of a dozen or so ares. There can be often found farms consisting of more than 100 parcels located far away from the farm house. The significance of farming in these regions of Poland is diminishing, because the possibilities of land use are strictly limited and the production costs significantly higher [Kostuch and Twardy 2004, Kurek et al. 1978]. It does not mean however that agricultural production in mountain areas, though it is less efficient and productive, has no future. On the contrary, abandoning it seems unimaginable and even impossible, because it fulfils important functions for these areas [Bätzing 2002]. These areas play an increasingly important role in the environment and landscape protection and in maintaining social structure of villages [Fatyga 1995, 2009, Górecki 1993]. Agriculture in these areas should be environmentally friendly and based on traditional livestock and pasture farming, because permanent grasslands play a favourable role in the mountains. These areas should be maintained and agriculturally used, even if it requires constant financial support.

The aim of the article is demonstrate the agricultural usefulness of lands in mountain areas on the example of their spatial layout, with particular emphasis on the lands used as grasslands, due to the specificity of the mountain agriculture as based on traditional livestock and pasture farming.

2. Material and methods

The analysis of parcels' layout was carried out on the example of a village Łapsze Wyżne, where there is an exceptionally high land fragmentation. The village is situated in the mountain areas, in Polski Spisz, near Nowy Targ. The area of the village covers 1200 ha, of which 12% are forests, slightly more than 70% are arable lands (Table 1). Half of the latter are arable lands, and the rest is designed for grasslands, mainly meadows. In Łapsze Wyżne there are 171 farms with separate farm houses and of mean size of less than 5 ha of agricultural lands. The average farm consists of 45 parcels, the majority of which are arable lands (55.3%), and the rest is used as meadows (38.3%), more rarely as pastures (6.4%). The mean size of parcels designed for grasslands is less than 10 ares.

The general data concerning the farms' layout in the studied village are determined on the basis of information collected in the land register. Due to the laboriousness of the studies on land fragmentation in the whole village, the emphasis has been put on a group of 208 grasslands parcels that constitutes around 5% of their total number. The basic layout parameters of the chosen plots have been determined, such as their size, length, width, distance from a farm's house. To make a general characteristics of land plots layout the so-called layout costs have been used. This means that all tillage costs dependent on the size of a parcel and its spatial layout have been included, as well as the costs of turning manoeuvres, transit across land plots, conservation of headlands and field margins, and crop losses at the fields' borders.

The layout costs were assessed on the assumption of full mechanization of the tillage process and yielding of grasslands of 3 tons per hectare [Harasimowicz and Kubowicz 1994].

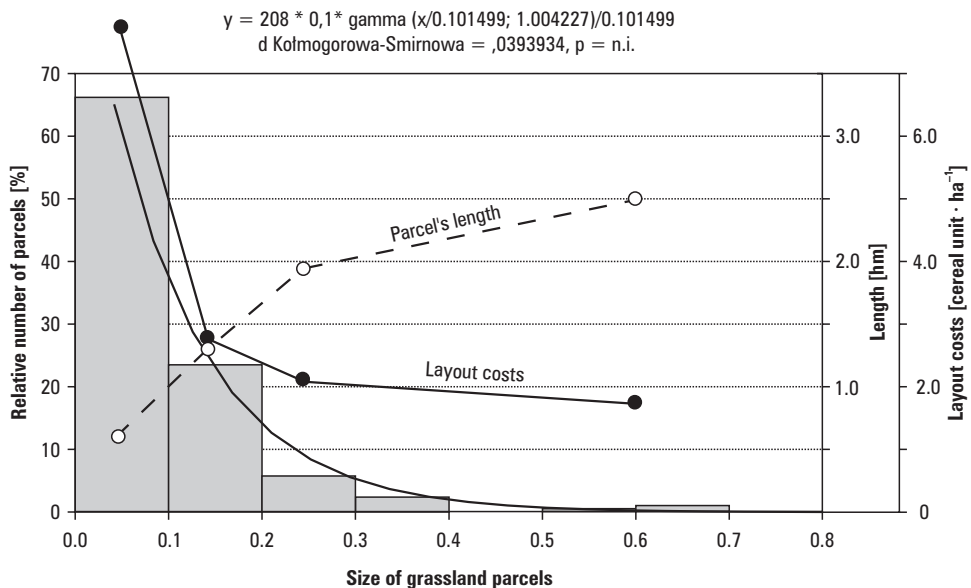
Table 1. Land use in the village of Łapsze Wyżne

Type of agricultural land	Size [ha]	The share of agricultural lands [%]	Share of arable lands [%]
– arable lands	465.51	55.3	39.13
– meadows	322.86	38.3	27.13
– pastures	53.62	6.4	4.51
Total agricultural lands	841.99	100.00	70.77
Forests	331.46	–	27.86
Developed lands	11.89	–	1.00
Roads and other lands	4.40	–	0.37
Total area	1189.75	–	100.00

The variability range of studied land plots' layout features was presented by means of distribution of these features and shown in Figures 1–3. Apart from the relative number of land plots in adopted class ranges, the charts show mean values of chosen layout features. It allowed the feature analysis of land plots belonging to singled out class ranges to be more comprehensive.

3. The results

A family farm in Łapsze Wyżne consists on average of several dozen grassland land plots, of which 74% is used as meadows and 26% as pastures. More than 20 ares is considered to be a good size of land plot to horse tillage and more than 1 ha – to tractor tillage [Pruszczyk and Żurawski 1989]. The large majority of land plots in Łapsze Wyżne (some 90%) is not suitable for horse tillage, as they do not exceed 20 ares (Figure 1). Almost half of these plots (over 40%) has a size below 5 ares, around 20% have 5–10 ares. The tillage on these plots is costly and not very profitable. The parcels of 10–20 ares constitute around 25% of all the parcels in the studied village. Only around 10% of grassland parcels is bigger than 20 ares and they are sufficiently large for horse tillage. In these hard conditions the power of horses is also quite often used to arable land tillage. However there are no land plots bigger than 1 ha that could be efficiently managed by tractors.

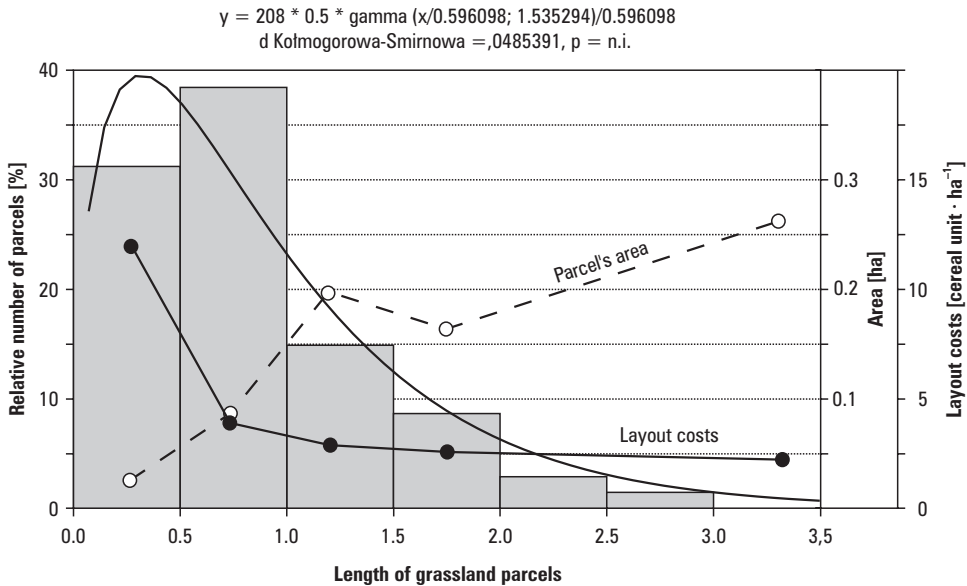


Source: author's study

Fig. 1. The distribution and size of grassland parcels

The average length of land plots in Łapsze Wyżne is 92 m. The optimal plot's length for horse tillage is considered to be above 70–100 m, and for tractors – 150–200 [Cymerman et al. 1982, Pijanowski 1989]. The length of around 30% of land plots does not exceed 50 m (Figure 2) and they are too short even for horse tillage, as many of them is smaller than 5 ares. The tillage costs on these land plots are often higher than 10 cereal unit per ha. Plots used as permanent grasslands cover 38% of agricultural lands, and their length (50–100 m) are usually suitable for horse tillage. However the

average size of these parcels (5–15 ares) in some cases differs from proper size of parcel suitable for using power of horses. Tillage costs in these parcels are quite low with just 3 cereal units per ha. That large number of plots long enough for horse tillage is a result of shaping the land fragmentation in the past when horses in agriculture were universally used.



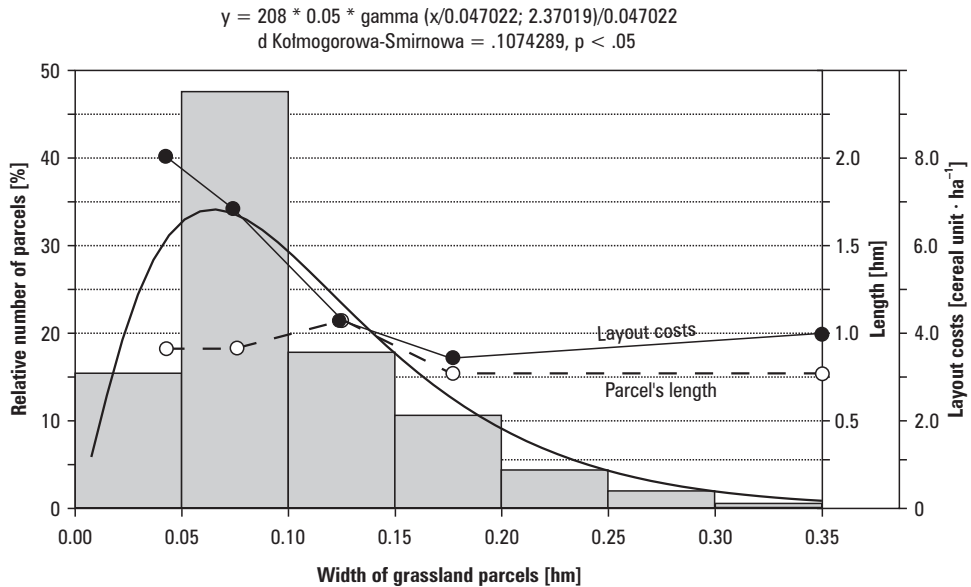
Source: author's study

Fig. 2. The distribution of grassland parcels depending on their length

The width of a parcel has little impact on the efficiency of production processes. But as the parcels become narrower, the yield decreases due to the losses of crops at the field margins along the longer lines. The minimum width limit of parcels for horse tillage is considered 20–30 m, and for tractor tillage 30–70 m.

In the studied village there are unfavourable widths and sizes of parcels designed for grasslands. The mean width of these parcels is just 11 m and is about two times smaller than the width considered to be suitable for horse tillage and unsuitable for tractor tillage. Almost half of grassland parcels in the village (48%) is 5–10 m wide (Figure 3). This, together with the problem of parcels' small sizes and faulty layout, contributes to the fact that tillage cost of these parcels exceeds 7 cereal units per ha. Some 15% of the studied parcels are less than 5 m wide and of 90 m long on average, with the tillage costs above 8 cereal units per ha.

In Łąpsze Wyzne there are meadow and pastures plots wider than 20–30 m (around 8%), suitable for horse tillage, not mentioning tractor tillage. There are no parcels with proper widths that allow the farmer to maintain low tillage costs.



Source: author's study

Fig. 3. The distribution of grassland parcels depending on their width

4. Conclusions

The village of Łapsze Wyżne has always been typically rural. The large proportion of the working age population (60%) is actively engaged in agriculture, and the agricultural production is one of the main sources of income for the village inhabitants.

The agriculture, according to the commune developmental strategy, is to fulfil a complementary function, with a limited pace of development that maintains its mountain character and is based on family farms. The village is to be entrepreneurial with modern all year-round tourism and active organic farming.

Today in Łapsze Wyżne there is a huge land fragmentation, which is highly unfavourable for the agriculture production. The fragmentation is a result of past land divisions and natural conditions, mainly the diversity of the lie of the land. Hard terrain conditions meant that many tillage tasks were done manually. It contributed to land fragmentation. The average farm in a studied village of 5 ha consists of 45 land plots, almost half of which are grassland parcels of mean size around 10 ares.

Unfavourable parcels' layout in Łapsze Wyżne is related mainly to their too small size and width. The size of grassland parcels does not exceed 30 ares, and only a few percent of them ranges between 20 and 30 ares. The problem of parcels' size is related to the that of their width, as 90% of them is narrower than 15–20 m. Therefore there are no grassland parcels suitable for tractor tillage, and only small number of them has layouts good for horse tillage.

Another unfavourable parameter of land plots in Łapsze Wyzne is the their mean length – around 100 m. Therefore their length doesn't differ much from the length regarded as good even for tractor tillage, but around 30% of parcels in the studied area is more than 50 m long, which means they are definitely too short and make the tillage much more difficult.

In spite a high degree of land fragmentation in Łapsze Wyzne and only supplementary function of agriculture ascribed to it in the developmental strategy, the favourable traits for agricultural production, typical of the southern Poland, can be easily found in the area. It is most of all the good state of agricultural environment enabling the development of food production. One can also use the labour-intensive tools of agricultural production that could create a competition with national production and exports. If agriculture is to play only the supplementary role and be based on traditional livestock and pasture farming, rural management works and transformation of agricultural lands need to be carried out, the introduction of food production zoning and changing the structure of tillage. The research on the ways of land use in the mountain areas shows that the current structure of land use should be changed [Twardy 2009]. It results from economic and environmental premises. Two main reasons for it are that the agriculture in mountain areas is less productive than in other areas and that the environment is being degraded. Considerable reduction of arable lands in favour of increasing the share of grasslands in the structure of farmlands and cultivated lands, is necessary. Permanent grasslands in mountains play a very beneficial role, are more suitable for environmental conditions prevailing in higher parts of the mountains, and so they dominate in the share of crops. And one should not forget about the protection of high quality soils which in these regions are rare and are not extensive. In the Polish mountains fallow lands are becoming a problem. The fallowing of lands can in the coming years become an issue in cultivation of lands, because the instruments used up to now, regarding support for farms, have proven not sufficiently effective when it comes to cultivation of abandoned lands [Kuźniar et al. 2014]. Due to current situation in mountain agriculture and the resulting less profitability of production, the share of fallow lands would be increasing. In the coming years in these areas people would give up agricultural activity [Sroka 2008]. In order to keep these areas as low-expenditure land use it is necessary to continually financially support them. Urgent changes in these regions are indispensable, introduced on the level of government politics and mountain agriculture. The development of agriculture should ensure the proper and collision-free development of recreational functions and environmental protection. The environmentally and culturally valuable mountain areas should maintain and develop their economic functions, including agricultural. The knowledge of the specificity and basic functions of mountain areas is indispensable to understand that a different approach is needed when formulating the developmental strategies and planning the support for these areas [Czudec 2004].

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