

OPTIMAL LAND USE EXEMPLIFIED BY A VILLAGE OF POJAŁOWICE

LITWIN URSZULA¹, STANISŁAW BACIOR², IZABELA PIECH³

ABSTRACT - This paper deals with some issues connected with the determination of optimal land use in rural areas. A method of Bajeroski was applied and two basic assumptions were made. The first assumption was that it was possible, on the basis of a set of 56 selected features, to initially determine the optimal function of a given rural area. The second assumption was that the features selected and compiled in this set, represented, sufficiently adequately, the impact of all other features regarded essential for generating the optimal function of a given rural area.

The described concept of optimal land use makes it possible to approach the methodology of determining the optimal state/mode of land use as one of the elements and a part of a study of conditions and trends in managing a rural gmina⁴) (commune).

Key words: optimal land use, present use, and transformation.

INTRODUCTION

Rural areas have always a particular place in the social and economic life of the nation country. This place is determined by their production functions; among those functions, bio-production functions, i.e. agriculture and forestry, are of the key importance. These functions are followed by various industrial branches such as processing of agricultural and forest products, and mineral raw material extraction/mining and processing. Furthermore, rural areas meet the majority of recreational needs and requirements of inhabitants. Rural areas also offer and supply such assets as land, people, and capital. Thus, they have an impact upon the spatial/territorial, demographical, and economic development of towns and cities.

A network of technical infrastructure equipment in rural areas serves both the residents and the economy of the whole nation country. On the other hand, until now, this network better serves towns and cities than villages, methods of managing resources offered by rural areas decide, to a considerable degree, on the ecological balance, and support maintaining this balance in the whole country.

Spatial/territorial management modes and social-economic processes occurring within rural areas mightily influence both the life and labour conditions of residents living therein, as well as the economic development of the whole nation country. In order to find some fitting ways of changing the present forms of area management to the required forms, i.e. to forms of spatial/territorial planning of rural areas, it could be supportive and useful to identify specific functional structures of those areas, to analyse them on their merits, and to interpret factually their spatial/territorial diversities (Stola, 1993).

THE OBJECTIVE OF THE STUDY

The objective of this study is, among other things, to present how a cartographic method of investigations could be successfully applied to preliminarily characterize an optimal land use

¹ Department of Geodetic Arrangement of Rural Terrains, Agricultural University in Cracow, 253 a, Balicka Street 48(012)662-45-08, Poland. E-mail: urszualitwin@wp.pl

² Department of Geodetic Arrangement of Rural Terrains, Agricultural University in Cracow, 253 a, Balicka Street 48(012)662-45-17, Poland. E-mail: rmbacior@cyf-kr.edu.pl

³ Department of Photogrammetry and Remote Sensing, Agricultural University in Cracow, 253 a, Balicka Street 48(012) 662-45-05, Poland. E-mail: rmpiech@cyf-kr.edu.pl

⁴) 'gmina' is a the basic unit of the territorial self-government in Poland

state/mode. The investigation project covered rural areas belonging to a village of Pojałowice, in a gmina and powiat⁵⁾ of Miechów. A Bajerowski method (1996) was applied to identify the optimal function of a given area. This method assumed allowed for developing a model of optimal land use. In addition, a functional classification of the areas was made, and on the basis of the classification performed, particular area zones were selected and separated.

An optimal mode/state of land use is to be defined on the basis of spatial/territorial characteristics. With the optimal mode defined, it is possible to find a way to obtain this optimal mode, and this 'way' is nothing else than an adequately planned and developed set of measures modifying the parameters of spatial/territorial features and adjusting them to a new, optimal mode of using land within a particular rural area (Bajerowski, 1996).

In our study, the present mode of managing the areas was defined through the analysis of the following maps: 1:1 000 scale situational map; 1:2 000 scale cadastral map; 1:5 000 scale agricultural and soil map.

GEOGRAPHICAL POSITION AND ADMINISTRATIVE LOCATION OF THE VILLAGE OF POJAŁOWICE

The village of Pojałowice is situated within the gmina and powiat of Miechów in the NW part of the Province of Małopolska (in Polish: województwo małopolskie). (Fig. 1 and 2)

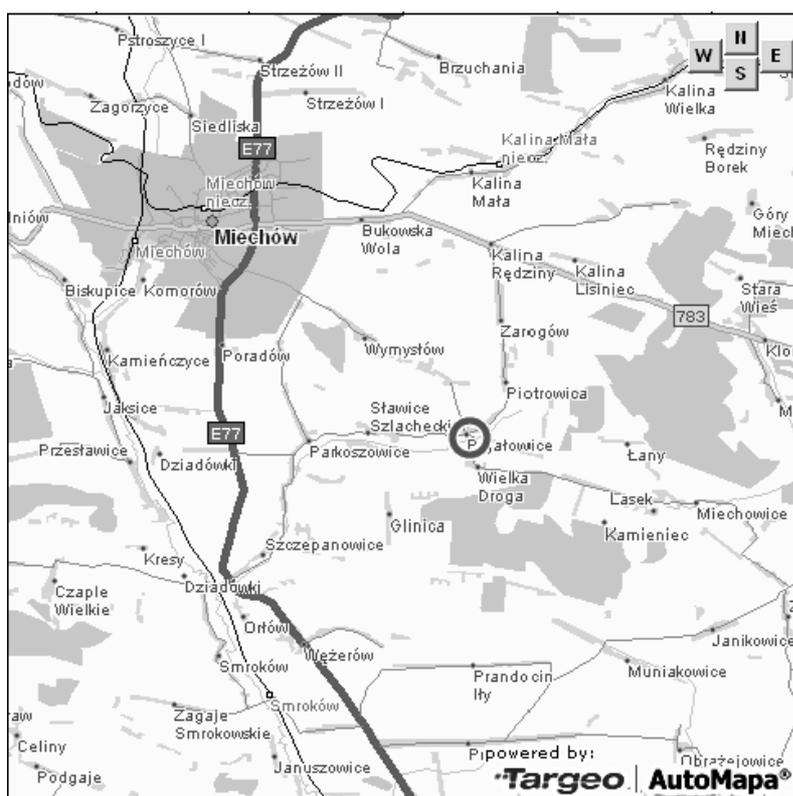


Figure 1. The village of Pojałowice and its location on the map of Poland.

⁵⁾ 'powiat' is a the second (higher than gmina) basic unit of the territorial self-government in Poland

OPTIMAL LAND USE EXEMPLIFIED BY A VILLAGE OF POJAŁOWICE

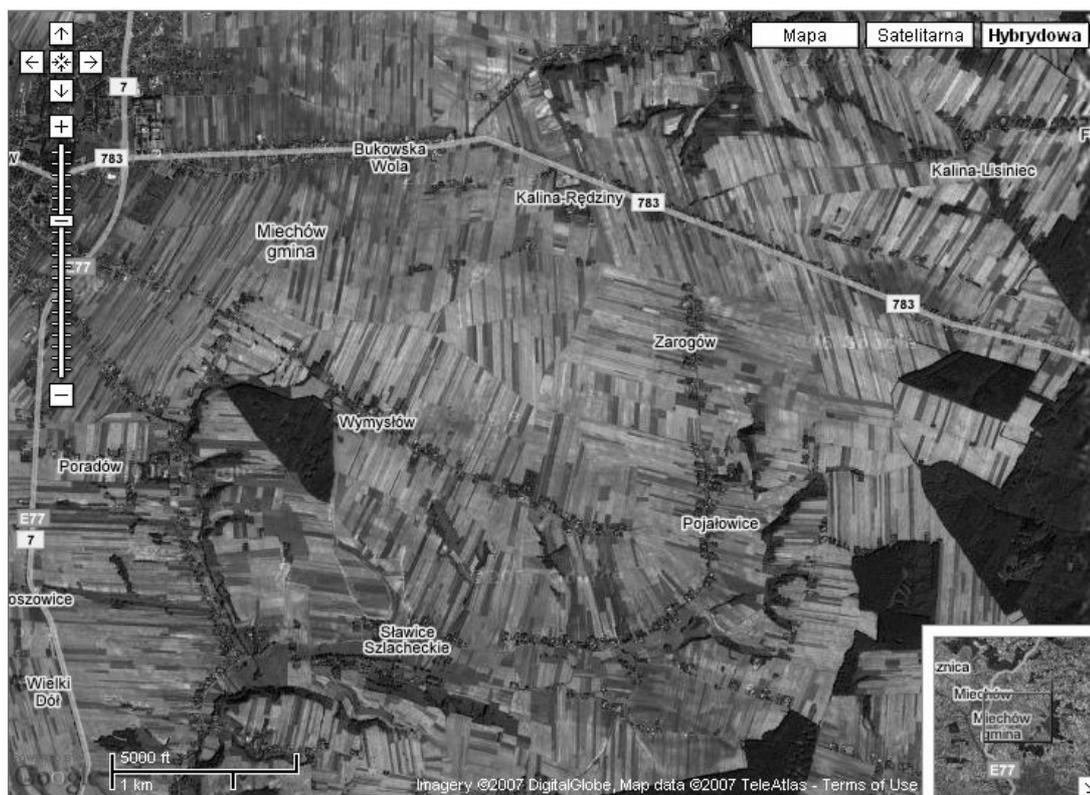


Figure 2. *The village of Pojałowice on the satellite map.*

With regard to the geographical and physical aspects, this area belongs to the region of Wyżyna Małopolska (Lesser Polish Uplands). The majority of the terrains in this powiat are situated within the Miechowska Upland. The town of Miechów is 40 km north of the city of Cracow, the seat of the Provincial authorities, and about 80 km south of the city of Kielce. The main communication axis in this gmina is the E77 national road running from Chyżne at the Polish southern border through Kraków (Cracow), Warszawa (Warsaw), to Gdańsk (Danzig).

The total area of the gmina, including the area of the town of Miechów, is 14,837 ha. The gmina is divided into 34 sołectwo⁶.

The village of Pojałowice lies in the southern part of the gmina; the area of the village is 550 ha. In the east, the village borders on the following sołectwo units: Glinica, Sławice Szlacheckie, and Wymysłów; in the west, on Zarogów and Nasiechowice.

NATURAL CONDITIONS

The agricultural industry in this gmina is based on land being the key mean of production in this gmina. To a large extent, it is dependent on the specific conditions of the gmina's natural environment. This fact is reflected by the production efficiency level in the gmina. Moreover, it affects the effectiveness of the means of production applied, i.e. the effectiveness of labour and capital.

Natural conditions conditioning the plant production in this gmina were investigated and evaluated, and on the basis of the results thereof, it has been concluded that the plant production in this gmina could be adjusted to the natural features of habitats settlements and enhanced to grow (Koreleski, 1993).

⁶) 'sołectwo' is the lowest unit of local administration, usually comprising a single village

Soil is a main element of the natural environment; it is a habitat and a source of nutrients for plants. Beside the soil, there are some other conditions conditioning agricultural production, for example: agro-climate, surface features, and water conditions. All together, those inter-related and interacting elements constitute an agricultural productive space (Rudnicki, 1995).

Gmina of Miechów possesses soils of high and very high natural and economic values; this statement is proved by the indicator of agricultural productive space, which is 90.8 points (according to the data of the Institute of Soil Science and Plant Cultivation in Puławy (in Polish: 'Instytut Uprawy, Nawożenia i Gleboznawstwa (IUNG) w Puławach').

Other elements of the environment in this gmina were scored as follows:

- agricultural quality and usefulness: 73.4 points;
- agro-climate: 11.6 points;
- surface features: 1.8 points;
- water conditions: 4.0 points.

Usability of individual soil types for agricultural production is determined by using Soil Quality Classes to evaluate soils. In the village of Pojałowice, soils classified as the 3rda and 3rdb class soils predominate. There are also many soils classified as 4tha and 4thb class soils. In the central and southern part of this village, there is a land with 1st and 2nd class soils. With all those soils, it is possible to cultivate almost the majority of plant species. On the other hand, it is obvious that the soils types as found in this village, undergo, to some varying extent, erosion and degradation processes that cause the biological activity within the soil environment, the productivity, and the soil cover to decrease.

Degradation processes of loess soils caused by water erosion occur already with slope grades exceeding 6°, and, on the majority of lands in this village fields run along the slopes. Therefore, this specific field arrangement escalates the erosion phenomena, and it can be assumed that about 70 % of croplands are potentially endangered by the erosion process, and approximately 20 % undergo a strong and a very strong erosion process, which is the most disadvantageous and damaging. Therefore, it is highly recommended to introduce proper melioration and agro-technical measures.

NATURE-CONNECTED AND LANDSCAPE VALUES OF THE REGION UNDER INVESTIGATION

The key value of the landscape and territory/space of the gmina of Miechów are its highly diverse topographic features. The landscape in this region is characterized by many deep river valleys and numerous ravines, defiles, flat-bottomed valleys, depression valleys cut into hills, hummocks and ground elevations. Farmlands typical for agricultural areas prevail in the landscape of the village. The vegetation mantle is rather poor, although rare flora species are recorded here.

AGRICULTURE

The gmina of Miechów is classified among the gminas with the highest agricultural productive value.

The Miechowsko-Proszowicki sub-region (a sub-region of the towns Miechów and Proszowice) has been classified among the regions with the most efficient and best-developed soils protection system compared to the rest of Poland. In the study „The Development Strategy of the Province of Kielce”⁷⁾ (until 1999, Miechów belonged, administratively, to the Province of Kielce), the gmina of Miechów was qualified as an agricultural area with the most favourable conditions allowing for the intensification of agriculture restructuring processes and for adjusting agriculture to the market economy requirements. It was also emphasized that this gmina possessed proper natural conditions that spontaneously encouraged the development of eco-production herein.

⁷⁾ in Polish: ‘Strategia rozwoju województwa kieleckiego’

OPTIMAL LAND USE EXEMPLIFIED BY A VILLAGE OF POJAŁOWICE

Additionally, this region is included in the “Małopolski Plan of Village and Agricultural Development”⁸⁾. According to this "Plan of Village and Agricultural Development" the essential impediments to developing and adjusting agriculture to the EU requirements are: a high percentage of people employed in agriculture, a high fragmentation of individual farms, and a poor development of economic infrastructure, especially in the domain of agro-services, agro-food processing industry, and marketing.

Table1. *Land use in the farmsteads.*

Specification	Total		Incl. individual farms	
	in [ha]	as per cent	in [ha]	as per cent
LAND AREA	12459	100.00	12399	100.00
Croplands	11588	93.0	11528	93.0
Arable Lands including	11118	89.2	11069	89.3
Fallow Lands	559	4.5	514	4.1
Under-developed Lands	116	0.9	116	0.9
Orchards	93	0.7	93	0.8
Meadows	250	2.0	247	2.0
Pastures	127	1.0	119	1.0
Forests and Forest Lands	201	1.6	201	1.6
Other Land types	670	5.4	670	5.4

Source: The authors' own study

The Table above shows that more than 93 % of lands are used as arable lands. The remaining percentage of lands is used as orchards, meadows, and pastures, which, in total, constitute only a small portion of the total area of lands in this village. A characteristic feature of any statistical, individual farmstead in the gmina of Miechów (and, also, in the whole powiat) is that the share of forests and forest lands in the total land area is very low. Fallow and under-developed lands constitute a low portion of the total land area, too, and this is the evidence that the plant cultivation intensity here is really high.

THE FUNCTIONAL AND SPATIAL ARRANGEMENT OF THE VILLAGE OF POJAŁOWICE

The present land use system in the village of Pojałowice is the combination of many various conditions, both natural and anthropogenic.

There are selected ten (10) systems of land using in rural areas, hereinafter those land use systems are called functions (Bajerowski, 1996).

The selected functions are:

- 1) agricultural function: arable lands '**R**'
- 2) agricultural function; pastures '**Ps**'
- 3) agricultural function: meadows '**L**'
- 4) forest & production function: '**LsP**'
- 5) forest & ecological function: '**LsE**'
- 6) recreational function: individual recreation '**Wi**'
- 7) recreational function: mass recreation '**Wz**'
- 8) recreational function: recreation without the right to develop (to build-up and to erect buildings, facilities etc.) '**Wn**'
- 9) housing estate function: '**B**'
- 10) infrastructure-industrial function: '**P**'

⁸⁾ in Polish: 'Małopolskim programem rozwoju wsi i rolnictwa'

The present state of land use in the village of Pojałowice was investigated on the basis of digital situational and cadastral maps developed for the purpose of this study, and on the basis of an orthophotomap. The investigated area was divided into 175 calculation squares, each one showing a real surface area of 4 ha. In the present study, the authors focused on the central part of the village, and investigated 54 squares (numbered from 62 to 105 and from 111 to 120). A classification criterion as assumed by the authors was that cropland area had to exceed 75 % of the total land area. In all investigated squares, a mode of land use was revealed and defined fig.3.

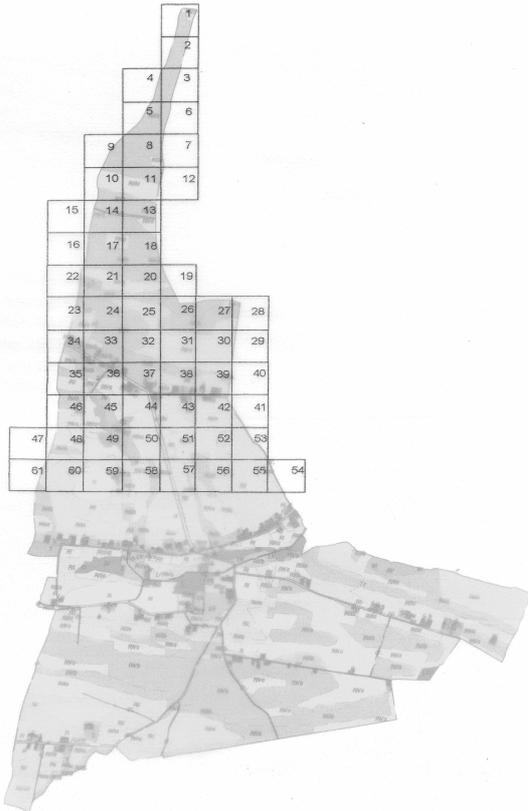


Figure 3. *The present state of land use.*

While investigating the present state/mode of land use, it was found that arable lands prevailed in the area under investigation; they made 94.5 % of the area studied. Meadows covered exclusively 5.5 %. Arable lands predominated in the northern and southern part of the village. Meadows and pastures are in the central part of this village and form patches. Buildings and other facilities are grouped along the main roads, mainly in the central and southern part of the village.

The analysis performed provided evidence that there were no other lands / terrains in the village with non-agricultural activities carried out, nor with basis and facilities for recreational purposes/plans.

OPTIMAL STATE/MODE OF LAND USE

In order to define the optimal land use state/mode, a method by Bajerowski was applied and two assumptions were made. The first was that on the basis of a set comprising 56 features, it was possible to characterize the optimal

function of a particular rural area. The second assumption was that the selected features satisfactorily and adequately reflected the impact of all other features being essential from the point of view of generating the optimal function of a given rural area. (...)

The optimal function of a given rural area can be determined by multiplying a transposed matrix of features producing optimal land use by an inventory matrix of features of a given rural area where this inventory matrix registers the occurrence of subsequent diagnostic features as contained in the above named set of 56 features in individual, smaller basic fields.

The inventory matrix takes the shape of a zero-one matrix (Bajerowski, 1996), where 'one' means the occurrence of a particular feature, and 'zero' means that this feature does not occur.

In the matrix of features producing the optimal land use, there are contained elements informing with what strength a given feature generates the need for introducing one of functions specified above (agricultural, forest, recreational, housing estate, or industrial functions) in the area of a basic field under analysis. Figures with a minus sign assigned represent a 'percentage strength' involved in the occurrence of a given feature so that this feature excludes the possibility of introducing this particular function in the field investigated. This „strength” is comprehended as the intensity of needs for introducing a given land use function.

TRANSFORMATIONS OF THE STATE OF LAND USE

Villages undergo a continuous transformation process aiming at modernizing them. The consequence of the village modernization will be a close association between the urbanization and agriculture. In the spatial/territorial sense, the following remains in effect: phenomena of spatial/territorial concentration of lands and settlements, land use gradient, and organization of the settlement network. Their responses are delayed if compared with social-economic changes, which must have adequate strength/intensity and duration to enable the spatial/territorial elements to react and to switch from initial forms to significantly noticeable, developed forms, and to become the true spatial property (Tkocz, 1998).

The contents of two matrices were compared (the matrix of the present state/mode of land use and the matrix of the optimal state/mode of land use). The comparison results obtained allowed for the statement that the transformation of the present function in seven (7) basic fields is indispensable required.

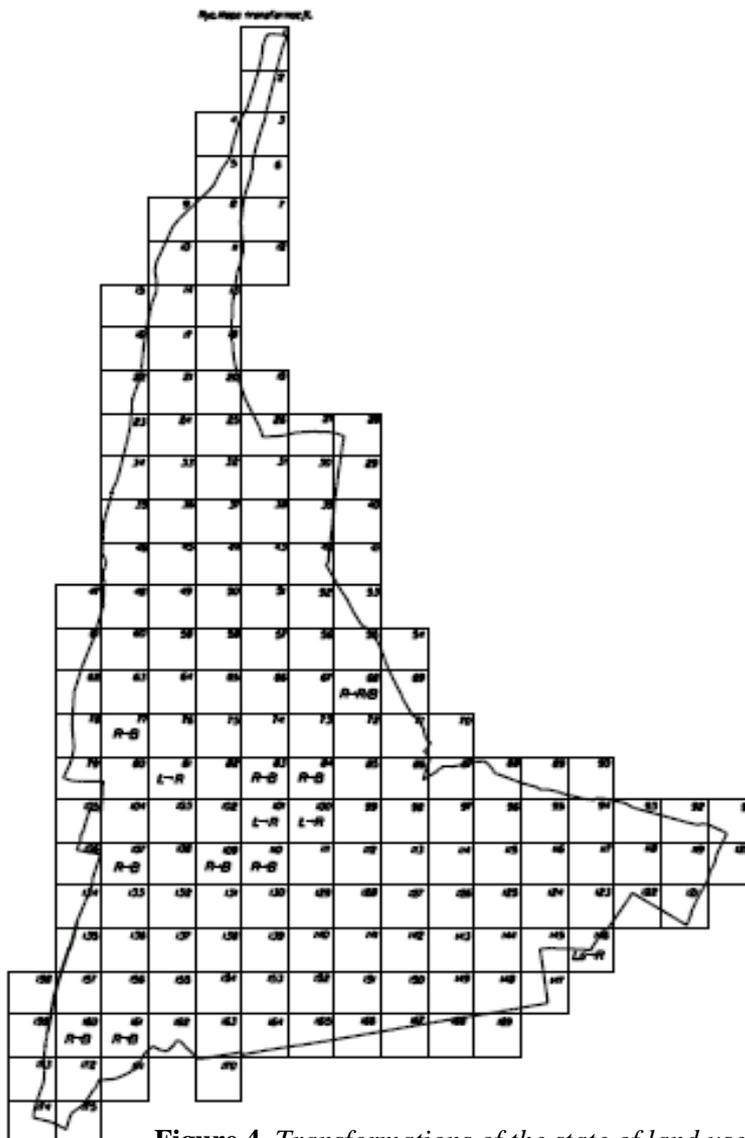


Figure 4. Transformations of the state of land use

Transformations:

- 68 R-R/B
- 77 R-B
- 81 L-R
- 83 R-B
- 84 R-B
- 100 L-R
- 101 L-R

The following transformation functions were performed:

- R • B (agricultural function (arable lands) was transformed into a dwelling (housing estate) function)
- L • R (meadow into arable lands)
- L • B (agricultural function (meadow) into a dwelling (housing estate) function).

Just a few transformations performed provide evidence that the rural area in the village of Pojałowice is used in compliance with the optimal function. This situation is to be contributed to the fact that Pojałowice is a typical agricultural village where arable lands certainly prevail. The above breakdown clearly shows that the agricultural function aiming at using lands as croplands predominates in both the present and the optimal state/mode of land use. In the new breakdown, a housing estate function appear,

and the agricultural function aiming at using lands as meadows ‘disappears’ fig.4.

SYNTHESIS OF THE INVESTIGATIONS ACCOMPLISHED

While summing up the investigations performed, it should be stated that the village of Pojałowice has a typical agricultural character. This statement is confirmed by the present structure of land use therein. Agricultural function with arable lands is the major function. Changes resulting from the determination of an optimal mode/state of land use are minor and inconsequential. They comprise only transformations connected with increasing the area for housing estates located in the vicinity of main communication routes crossing this village. The development of settlement should obey the rules of protecting environment, landscape, and their resources.

Moreover, the investigations accomplished and their results can be applied to delineate the development directions of the village. The agricultural development in this village is naturally possible provided the existing natural and anthropogenic conditions are rationally incorporated and utilized. While carrying out developmental plans and projects, due attention must be given to protect and preserve topographic features, and to protect the existing trees. At the same time, endeavours should be made to improve the existing technical infrastructure, and to enlarge the basis of hi-tech equipment, in particular to improve water supply and wastewater disposal systems for the already existing and the prospective objects.

CONCLUSIONS

The accomplished investigations on the present state of land use, and the results thereof, allow for the conclusions, which refer to the possibilities of and impediments to the rural area development. Development of any area is a dynamic process. Changes are caused by a number of factors and agents, and they persistently take place; those changes continuously impact the development or possible regress of each and any area. However, analyses based on the data, apparently the most recent and updated, do not always bring rational results. (Litwin,1997).

The strong points of the entire gmina of Miechów including the village of Pojałowice are as follows:

- high potential for agriculture;
- good state of the natural environment;
- proper location and communication/transportation access;
- there are lands/areas here that can be built-up (developed);
- history and tradition of ‘The Region of Miechów’¹⁾;
- high tourist attractiveness of the entire gmina.

The agricultural trend, deemed optimal, in the development of this village, will affect the spatial arrangement and the landscape of the whole village. Owing to obvious ecological and landscape aspects, the developmental tendencies should absolutely aim at developing a tourist and recreational base and tourist and recreational services.

REFERENCES

- BAJEROWSKI T., (1996), *Metodyka wyboru optymalnego użytkowania ziemi na obszarach wiejskich*. Wydawnictwo Akademii Rolniczo-Technicznej, Olsztyn.
- LITWIN U., (1997), *Synergiczne uporządkowanie struktur krajobrazowych na przykładzie Kotliny Mszańskiej*. Zeszyty Naukowe AR Kraków, Rozprawy i Habilitacje 225, Kraków, s.9.
- KORELESKI K., (1993), *Przyrodnicze podstawy użytkowania rolniczej przestrzeni produkcyjnej*. Zeszyty Naukowe AR Kraków.
- RUDNICKI H., (1995), *Gospodarka ziemia rolnicza w Polsce*. Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin.
- STOLA W., (1993), *Struktura przestrzenna i klasyfikacja funkcjonalna obszarów wiejskich Polski*. Wydawnictwo Polskiej Akademii Nauki, Warszawa.
- TKOCZ J., (1998), *Organizacja przestrzenna wsi w Polsce*. Wydawnictwo Uniwersytetu Śląskiego, Katowice.

¹⁾ In Polish: ‘Ziemia Miechowska’