LAND UTILIZATION IN EASTERN EUROPE

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Ten papers in No. IV of the Series contain abundant information on the various forms and ways of land utilization in some eight East European countries. The methods and problems encountered in evaluating and typifying lands are introduced so as to permit an insight into the strenuous work with which the participants of the Budapest Conference, 1964, wish to serve the practical needs of their national economies. It becomes clear from this book why land utilization survey — that particular branch of agrogeography — has recently cropped up from the soils of physical and economic geography, claiming ever-broadening attention for the practical and learned concerns linked up with it. These thought-provoking studies will be certainly appreciated in all countries where the intricate questions of overpopulation and an inadequate agriculture have become a major public interest.

AKADÉMIAI KIADÓ

LAND UTILIZATION IN EASTERN EUROPE

STUDIES IN GEOGRAPHY IN HUNGARY, 4

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LAND UTILIZATION IN EASTERN EUROPE

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INTRODUCTION

Land utilization survey, initiated by L. D. Stamp, was first adapted in Poland of all the countries of East Europe. Here, under the vigorous and genuine direction of J. Kostrowicki, highly effective methods of land utilization survey have been developed. At the XVIIIth IGU Congress held in Rio de Janeiro 1956, Professor Kostrowicki could report already on considerable results. By the same Congress he was appointed as ordinary member to the Commission of World Land Use Survey.

In the period between 1956 and 1960 the research in land utilization survey also gained ground in several other countries of East Europe (Soviet Union, Yugoslavia, Hungary), and further results were reported upon at the XIXth IGU Congress in Stockholm, where a Yugoslavian (S. Ilešič) and a Hungarian geographer (Gy. Enyedi) were appointed as corresponding members of the Commission. By then, time was ripe for the co-ordination of the work of land utilization surveys in East Europe. The geographers of this area assembled in Warsaw in 1960 as guests of the Geographical Research Institute of the Polish Academy of Sciences. This meeting proved to be a very important step towards a more intensive co-operation,* and we may freely acknowledge that the decisions made by the participants of the conference did not remain dead letters. Collective field works conducted by teams of Polish, Bulgarian, Yugoslavian, Czechoslovakian and Hungarian researchers and subsequent publications testify to this. Notwithstanding its significance as a milestone, the Warsaw Conference had evidenced hardly more than the initial stages of practical investigations for most of the countries concerned. The lectures—with the only exception of the Polish contributor's—deal with matters of methods and planned projects rather than with actual results achieved in field work.

The second meeting was organized by the Geographical Research Institute of the Hungarian Academy of Sciences in Budapest in 1964. Ten participants (authors of the papers in the present volume), representing eight different countries, and several Hungarian agrogeographers and agrarian economists attending the meeting, reported on considerable progress on this occasion, and arrived at a profound understanding in many a question concerning means and methods of research. Accordingly, it has become possible now to embark upon investigations on an international scale, and there is every reason for us to hope that the agrogeographical studies conducted in various

* The lectures held at the meeting were published under the title of "Land Utilization Methods and Problems of Research". Geographical Studies No. 31. Warsaw, 1962.

countries will serve not only scientific, but also practical concerns (viz. the joint plans of CMEA including those relating to the regional development of the boundary zones). The significant results as propounded at this conference in matters of method offered ground for the establishment of the IGU Regional Sub-Committee of Land Utilization Survey in the East European Countries.

The participants were given an opportunity to visit some co-operatives and state farms in order to study on the spot the various characteristic forms of land utilization in Hungary (cereal production, pig-breeding, viticulture, meadow- and pasture management on former marshlands, production of rye and potatoes on poor-quality sandy soils, intensive cattle-breeding, vegetable growing under irrigation; vine- and fruit cultures on fixed blown-sand areas, etc.).

The main points of the lectures and discussions, as well as of the information gathered in the field, have been summarized in a comprehensive working programme, the most important items of which are as follows:

1. In order to further the co-operation of the geographers of East Europe, the Regional Sub-Committee of the IGU Commission of World Land Use Survey has been established with J. Kostrowicki as President of the Sub-Committee. Each participating country has the right to delegate several members and a vice-president to the Sub-Committee.

2. Arrangement has been made for the mutual exchange of publications and joint edition of works made in common.

3. Joint field-work has been considered to be the most profitable way of co-operation. The next collective field-work will be carried out in Dalmatia in 1965,* with the participation of Polish, Yugoslavian, Czechoslovakian and Hungarian geographers.

4. The Sub-Committee's next meeting to be held in Ljubljana (Yugoslavia) in 1967, will be organized by the Geographical Department of the Ljubljana University.

This volume in itself is a document of co-operation between the East European geographers. All the participating countries of the Sub-Committee have contributed in a way or other to the material compiled. Thus the text was printed and published in Hungary, while the colour maps were drafted in Poland and printed in Czechoslovakia.

György Enyedi

* This proposition was carried out in May 1965.

METHODS APPLIED IN ELABORATING THE MATERIAL OF LAND UTILIZATION SURVEY

J. KOSTROWICKI

(Poland)

Elaboration of land utilization survey material has in view both cognitive and practical purposes. The questions of methods concerning this work are all the more important since a survey usually amasses a great deal of valuable material which for points of readability is not plotted onto the maps, let alone one single map, and then, also, because we could not so far solve the problem of printing colour-maps in a satisfactory way. As a result, a sizable part of the material is hardly available to people concerned.

For reasons like these, the question of methods by which the mass of collected material can be elaborated has been facing us ever since a detailed research of land utilization was started in Poland. We planned at first to work up all survey material, but it soon turned out that an all-round elaboration was not feasible, especially in the first stage when the methods of survey changed frequently. Later on, when the scope of research expanded, we often lacked the means and possibilities of elaboration. As a result only part of the material has been worked up and published. In order to improve the state of affairs, selected survey areas have been made themes of doctor theses dealing with the land utilization and agriculture of certain *sub-regions* which usually cover 4 to 6 counties each (4 to 6 thousand sq. kilometres).* Apart from statistical data and bibliographical references, the theses, as a rule, present general surveys of the entire region but sometimes also detailed ones for selected units (villages, state farms), thus representing the various types of land utilization. I am not going to discuss here the entire course of progress that has been experienced since the earliest material was collected in Mrasgowo county under the guidance of K. Dziewonski, then those obtained from Bielsk Podlaski**, Gdansk, Krosno, Limanowa, Koszalin, Suwalki and other counties were elaborated. Gradually, by trial and error, we have developed our methods which are known from some of the type-written papers on Bulgarian villages, and from other studies prepared for print as a joint work under the title: Land Utilization in East Central Europe, Case Studies.*** It goes without saying that further investigations and experiments will help

* For instance Nida Basin, Cuiavian Plain, Warsaw Suburban Zone, The mouth area of Vistula river, etc.

** The study commenced in 1958 by J. Pasznicki was never completed.

*** Land Utilization in Petarch. Dermantsi and Lazar Stanevo by J. Kostrowicki, I. Velchev, Z. Borisov, W. Stola, S. Hauzer and W. Kusinski based on Bulgarian–Polish field research-work in Bulgaria in 1960.

to develop our methods. Moreover, some parts—to be discussed below—are particularly in need of methodic elaboration.*

The abridged English and French versions of the instructions have been extended to include particular experiences acquired during investigations in other countries. These, in fact, incorporate but few pages of general remarks on the subject.

Apart from defining the scientific and practical purposes, these remarks primarily indicate that an elaboration of this kind should consider both external conditions and internal features of land utilization and that the analyses of the particular elements should also seek to present a synthetic survey of the area under examination.

(a) As regards the *determining conditions*, i.e. both the physical and the social-economic and technical factors which may be either appearing now or have a longer past to look back upon in the area, it seems that although these are not direct subjects of land utilization survey, they should be thoroughly analysed by specialists of the natural sciences (physical geographers, geologists, pedologists, botanists, etc.), as well as of the social sciences (economic geographers, historians, economists, sociologists, etc.).

Now, how those premises have been put into effect in our elaborations prepared so far?

As regards physical conditions, all our elaborations, whether concerning Poland or other countries, include a characterization of the particular elements of the natural environment and physical properties of soil which to a lesser or greater extent justify the actual forms and ways of the utilization of the area. On the other hand, however, no such synthetic presentations have appeared so far as would seek to evaluate the whole of the physical conditions from the point of view to what extent the ensemble is suitable for the actual forms of land utilization, not to speak of concrete propositions concerning the further development in the line of a more effective utilization of the given physical properties. No attempts have been made so far to prepare qualifying maps of the geographical conditions. (Such maps have been provided by some of the British surveys, or by the Soviet or American geographers.) Especially maps based on precise measurement data are badly needed by the agricultural planners in our countries. Therefore it seems imperative to work out methods of such an evaluation, if land utilization survey is to be scientifically useful and practically valuable. This kind of evaluation should concern not so much the particular elements of natural environment approached from the point of view of economy as a whole, not even the existing forms of land utilization, but it should rather consider to what degree the physical conditions in the area are advantageous or disadvantageous for the requirements of the particular forms, ways, orientations and types of this utilization, or on the reverse: what forms or ways of land utilization would be most profitable on the investigated area. (In result we could get maps qualifying precisely and in a measurable way the suitability of the natural conditions of the natural environment for the diverse sections, branches and orientations of economy.) Such

* See 4 successive instructions in Polish: Dokumentacja Geograficzna 1956, 1, 35 p.; 1959, 2, 81 p.; 1959/60, 2, 124 p.; 1962, 4, 128 p.

maps, supplemented by others reflecting the actual forms of land utilization could provide both scientific and practical information for agricultural planners whose task is to suggest decisions with a view of changing the current forms and ways of land utilization for better and more reasonable ones.

As far as historical, social-economic and technical conditions are concerned, the elaborations contain, as a rule, some notes which are not always systematically arranged or well substantiated. Obviously, such elaborations should strive, without getting too much involved into historical matters, to explain briefly what past, or present, social-economic and technical conditions (political systems, economic policy, communication- and marketing possibilities, cultural and technical level of the population and so on) have contributed to the development of the existing forms, ways and orientations of land utilization in a given region. What are the possibilities and limitations as regards changes and transformations in this field?

(b) The *characteristic features* are the proper subject of survey, and it is these that first of all are reflected in the material collected by means of observation, gathered from interviews, from various sources of information and statistical data.

It seems that the elaboration of these characteristics is depending on the purpose and scientific interest of the investigator concerned either with some selected forms (agricultural use of land and its various branches: woodland, waters, settlements, etc.) or with the mutually interconnected and correlated forms of land utilization which occur in the area under examination.

The most advanced methods in the studies made so far have been those which relate to the agricultural utilization of land.

In a number of recently completed works they are mainly concerned with determining the various types of agricultural use of land, or rather with the typology of agriculture.

The following features or characteristics of agriculture are examined in those elaborations:

(1) Questions of ownership—a field of problems that used to be referred to as the sole subject of land utilization surveys, and in French studies has been termed *structure agraire*, namely: distinction of the various forms of ownership (common, private, co-operative, state); sources of manpower (family labour, hired labour, tenancy); size of farms, shape of land tracts, fragmentations and scattering of land, and so on. The historical changes in the ways, orientations and efficiency of agricultural land utilization should be detailed to such an extent only as is really necessary for an adequate explanation of the actual state of affairs.

(2) Organizational and technical matters, i.e. methods, orientations and intensity of land use, which taken all together constitute the *system* of land utilization, are considered either by branches or jointly for the entirety of the area. In both cases the area is regarded a basis of calculations and comparisons.

Ways of land utilization embrace all the operations and measures undertaken with a view to ensuring crop harvest and preserving or improving soil fertility. In respect of arable land, the measures and operations include crop

rotation, methods of soil cultivation and crop management, manuring, mechanization, irrigation, drainage, field enclosure, terracing, anti-erosion measures, plant protection, methods of harvesting, etc. The operations are manifold and greatly differentiated, depending on the crops and consequently cannot be measured quantitatively. They are expressed by means of various indices which hardly allow any comparison between each other. That is the reason why such guiding characteristic should be searched for as would reflect the combination of the main operative factors. Crop rotation is frequently regarded as such, and this explains why so much attention has been paid to it both in the survey itself and in the chamber work. It is by no means certain, however, whether crop rotation system constitutes, especially in the case of a well-developed, intensive agriculture, an adequately representative element by which the overall picture of the ways of land utilization can be characterized. That is why the crop rotation data need further supplementary information on the standards of mechanization, manuring, man-power supply, etc.

The direction of land utilization means specialization for certain kinds of crops of the given farm or area. Since there are very many kinds of cultivable crops, and some of them are similar to or complementary of others, it would be rather difficult to obtain a clear picture if each of them were considered separately. Therefore crops are classed into groups of similar agrotechnique and natural requirements (such as habitat, labour expenditure, precipitation, manuring, crop rotation, etc.).

Concerning the perennial crops, the new elaborations reflect the ways in which their sowing areas are utilized (forms of cultivation, system of manuring, irrigation, drainage, terracing, harvesting, animal- and plant-protection, etc.) and contain information as to the developmental stage of uniform, mixed and coordinate forms of land use. The attempt at determining the expectable pattern of specialization on the basis of quantitative participation of the various kinds of crops, as was first thought feasible for the "Land Utilization, Case Studies", cannot be regarded as quite successful, owing to the incorrect common comparable measure adopted. The method, therefore, should be worked out in such countries were perennial crops play a more distinctive role than in Poland. The determination of the ways of the utilization of permanent grasslands considers by and large the same points (cultivation, manuring, irrigation, drainage, reseeding, harvesting by manual or mechanical mowing, grazing and its various forms, etc.). More problematic is, however, the *quantitative differentiation* of the products harvested from meadows and pastures. The habitat of such crops has been accepted as basis —for lack of other means—though only approximate values can be obtained by this.

Although the livestock is not always directly depending upon the local yields of land, the indirect influence it has upon the ways, orientations and outputs of arables and permanent grassland utilization makes it necessary that also material concerning the livestock husbandry of the region should be collected. An overall appraisal of the livestock is usually accomplished by employing the conventional units (for instance, big animal units). As for the orientations of stockbreeding, it is a much more difficult proposition. In this respect the percentual share of the livestock species cannot provide a reliable basis, since

the production values are greatly depending on the type of animal husbandry (for instance: bacon or lard in pig breeding, or beef or dairy in cattle breeding, etc.). Therefore, special coefficients have to be introduced in order to reflect in comparable terms the efficiency of stockbreeding according to species and orientations.

The *intensity* of agricultural land utilization interpreted numerically as the quotient of labour- and capital investment per unit area is considered as a generally accepted measure for all forms of agricultural land use (including utilization by stockbreeding). Notwithstanding its wide currency, the application of this method raises many problems, especially when a larger number of areal units are investigated. The elaborations made so far followed either the method of determination of the proportion by which the intensive branches participate in the structure of agricultural production (intensive crops, stockbreeding, etc.), or the method of selecting some representative factors of intensity which are easy to measure, for instance: employment, number of draught animals, manuring, number of machines, tractors per unit area, etc., or, finally, the method of coefficients of intensity of various crops and elements of stockbreeding (a German method adapted for Polish conditions by W. Schramm, B. Kopeć and others).

Each of the above methods has its advantages and disadvantages, but none of them is fully satisfactory for the spatial investigations of agricultural land utilization. Therefore we have resumed studies with a view to working out more suitable but not too labour-absorbing methods.

(3) Production characteristics, that is, the results or outputs of production are usually presented jointly for all forms of agricultural land utilization. It is necessary to settle whether gross or net production (gross without products used up for reproduction purposes) should be taken as a basis of determination, and also the units in which agricultural production is measured have to be settled. With the net production method it is possible to avoid the double involvement of certain elements of production, but gross production ensures a much broader applicability and makes calculation much easier. Similarly, the adoption of some monetary unit as a common measure of production widens the applicability of calculations (to cover the whole field of incomes, for instance) but the variability and instability of the prices undermine comparability, in time and space, of the production values. And comparability is of paramount importance for geographical research.

Considering all this, we have elaborated most of our survey material making departure from the gross production values expressed in natural (cereal) units. Our elaborations have been usually focussed on the following production characteristics of agriculture:

Productivity (gross or net production per unit area);

Efficiency (gross production in relation to labour and capital investments);

Marketability (market production per unit area or share of market production in gross or net production);

Orientation, mainly elaborated by examining the proportions, first of all, between crop and animal yields, and then also between those of various branches of agriculture, and finally the dominating elements of production in the particular groups. The procedure is very similar when it comes to

determining the orientation or specialization of market production. As regards crop yields, the products are divided, as of late, into food, fodder and industrial crops with quite a number of sub-groups, and as regards animal production, according to products and species of animals which provide them. Capital letters are employed to indicate either crop production (V) or animal production (A) while small letters indicate the dominating groups which share over 20% of the gross production, as well as crop and animal species prevailing in each of the groups. So the main orientations are distinguished according to the following method:

Percentage of crops in total production	Specification	Symbol
80	mainly crop	V_4
60–80	crop	V_3 A_1
40–60	mixed	V_2 A_2
20–40	animal	V_1 A_3
–20	mainly animal	A_4

And then, orientations of agricultural production are expressed in full symbols. Here are some examples:

mainly crop, food, vegetable	$V_4 a_x l g_x$
crop, food, wheat-beet with pig breeding	$V_3(a_1 tv + i_1 bs) + A_1(sv)$
mixed crop-livestock, wheat-sugarbeet with pig breeding	$V_3(a_1 tv + i_1 bs) + A_1(sv)$
mixed crop-livestock, food-fodder, rye--clover and dairy-meat, cattle-pig breeding	$V_2(a_1 sc + p_1 tr) + A_2(bl_1 + sv_1)$
mixed livestock-crop, fodder pasture-meat-wool, cattle-sheep breeding	$V_2(p_2 - pt) + A_2\,(bm + on)$
livestock, dairy-meat, cattle-pig with crop production, fodder potatoes-oats	$V_1(st + as) + A_3\,(sv_2 + bl_1)$

First the proportion between plant growing (V) and stockbreeding (A) has to be established. Omitting items below 20%, we use as index numbers *1* for 20% to 40%, *2* for 40% to 60%, *3* for 60% to 80%, and *4* for denoting participation above 80%. For example, the symbol characterizing the agriculture of a region where a plant production of 70% is coupled with a stockbreeding of 30% is V_3A_1. When breaking down these values, we further distinguish the proportions of plant groups and kinds of animal products, resp., by using small-letter symbols and index numbers again (no index is

shown for values below 20%, though here these may be represented). The leading crop or crops in the plant groups are followed by such ones the participation of which is equal to at least 80% of the main crop.

For example, the agricultural structure of an area expressed by the symbol

$$V_3(a_1wh_1ry + f_1mz + i_1bs) + A_1(dc\ x\ pk)\ m_1l$$

can be worded like this:

In a prominantly plant growing area ($V_3 = 60\%$ to 80%) the share of food crops (a_1) is 20% to 40%, in which wheat (wh) holds the lead followed by rye (ry) with a proportion equal to 80% of that of the wheat; forage crops similarly participate with 20% to 40% in the agricultural production (with maize as a leading plant); of the industrial plants of equal participation, sugarbeet (bs) predominates. A subordinate stockbreeding (A_1) is represented by dairy cattle (cd) and porkers (pk), but none of them exceeds 20% (therefore no index number is given), main products are milk (l) and meat (m).

The agriculture of any selected region can be easily characterized by means of key-words abbreviated in the style of the list which has proved to be highly satisfactory in the course of Polish survey:

List of Abbreviations in the Formulas

A	animal production	*m*	meat
a	food (alimentary) crops	*mb*	malting barley
ap	apples	*mh*	meadow hay
at	apricots	*mx*	mixtures
b	beef	*mz*	maize
bf	fodder beets	*ol*	olives
bl	barley	*or*	oranges
bs	sugar beets	*ot*	oats
bu	buffaloes	*p*	pigs
c	cattle	*pc*	peaches
cb	beef cattle	*pg*	pomegranates
cd	dairy cattle	*pk*	pork
ch	cherries	*pl*	poultry
cs	sour cherries	*ps*	pastures
cv	clover	*pt*	potatoes
d	dairy	*r*	root crops vegetable
E	extensive (exhaustive) crops	*rp*	rape
		rr	rearing
e	eggs	*ry*	rye
f	fodder crops	*S*	structure forming crops
fg	figs	*s*	succulent forage
fr	fodder roots	*sh*	sheep
ft	fruits	*sm*	mutton sheep
g	grain crops	*sr*	serradella
gt	goats	*st*	straw
h	rough forage	*sw*	strawberries
hn	honey	*V*	plant production
I	intensive crops	*v*	grapes
i	industrial crops	*vg*	vegetables
l	milk	*w*	wool
lc	lucerne	*wh*	wheat
lp	lupine	*wm*	wool sheep

All such characteristics can well serve a basis for the determination of type as a combined expression of ways, orientations and effects of land use as may have evolved under conditions of a given physical environment in a given period of social-economic development. Nevertheless, no method has yet been established for a close integration of these type-determining characteristics. Therefore our typology is based on a set of arbitrarily selected points of determination rather than on precise methods of integration.

As a matter of fact, most of the elaborations prepared so far covered but small areas, and even so the problem of determination has been reduced to labelling the types with the marks of the most representative environmental, production etc. features. Admittedly, this way of delimitation is very problematic; the methods of a multigrade hierarchical typology has only lately been placed on exact, measurable foundations. The above-mentioned joint elaboration of selected villages of the East European countries was the first attempt—as a summing up of the whole work—to carry out a complex work of typology.

As has been indicated above, the method of elaborating other forms of land use leaves much more to be wished. It seems that the methods which have been adopted so far for agricultural elaborations might be followed to some extent. Thus, for instance, as regards the utilization of forest areas, one can trace the various forms of ownership (communal, individual, social, etc.), then the size, shape and fragmentation of forest land.

As for the organizational and technical features, we can group the forest lands as follows:

1. unmanaged and unexploited
2. exploited but unmanaged
3. exploited and managed by
   (a) total felling
   (b) selective cutting
   (c) limited exploitation
4. managed but not exploited

It is also possible to measure the intensity of operations and the means employed in forest utilization, as well as its orientations. In elaborating the survey material, the latter has been determined so far—mostly according to the composition—by means of scale reflecting prevalence or co-prevalence of the particular species of trees. In the case of natural forest areas, the composition of woods so determined corresponds in principle to habitat types or associations. A comparison of such classifications—in transformed or artificial woods—reveals divergences which along with the determining conditions, may furnish the basis for the evaluation of the economy of forest husbandry. Apart from the type of tree-cover, the elaborations analyse also such important features as: age and density of tree-cover, utilization of intercalary and by-products, as well as the size of management, efficiency, etc. Ownership, organization-technical and production characteristics could have been regarded as proper bases of typology of forest utilization. So far, however, neither the principles nor the methods of such typology have been worked out.

The situation is very much similar as far as water utilization is concerned. Here again ownership characteristics primarily enter into consideration. The ways of utilization, however, have only a secondary importance as compared to the orientations of utilization which—in this instance—are quite numerous (water supply, navigation, tourist purposes, agricultural utilization, fishing, etc.). It is only in fishing that our elaborations occasionally determine the orientations and production features of water utilization. Bio-fishing types of waters have been classified either according to habitats or the structure of fish catching.

Settlements may be classified in two different classes of typology—a physiognomic and a functional one. The former analyses the layout plans, zoning of the settlement and the technical features of building (height, building materials, etc.), while the latter concerns the economic relations of the settlements. Survey material could not be well exploited for this purpose so far, owing to the survey scale (1 : 25,000) which is too comprehensive to apply to settlements. A small number of elaborations made at a detailed scale (1 : 5000) seem to corroborate this view.

And finally we have to own that the problems connected with the method of *synthetic* elaboration of all land utilization forms as a whole have not been settled as yet. This is not a case of mere comparison of percentage shares of the various forms of land utilization, nor even a case of such an attempt as the Polish geographer W. Ormicki made before the war on that basis. It is a case of a full, synthetic typology of land utilization, the rudiments of which, not based as a rule on land utilization survey, can be found in the literature. Such a typology is still ahead of us.

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THE ROLE OF SOVIET GEOGRAPHERS IN LAND RECORDING AND APPRAISAL

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(USSR)

Prior to World War II, the efforts of Soviet physico-geographers were directed almost exclusively to the study of geographical landscapes and physical processes, while those of the economic geographers to the study of the location of productive forces. At the end of the 40ies, when an extensive work was started in order to transform nature for the benefit of agriculture, an intermediate line dealing with the effect of social activities upon nature became of interest. Geographers were not only busy at evaluating landscapes to the ends of subsequent improvement of these, but also participated in drafting melioration plans and measures, like struggle against water- and wind erosion, stabilization of shifting sands, field-protection by afforestation, etc. Besides a purely theoretical concern, geography has also gained in practical importance.

At that time the specialists of agriculture—agronomists, forest meliorators, hydromeliorators—each working in his own line, followed separate ways of fighting harmful physical effects. Thanks to the complex character of the geographical sciences, a general understanding of the interrelations between physical and economic factors soon made the geographers realize how unsatisfactory and restricted these measures were. They supported and expanded the concept of the erosion specialists (A. S. Kozmenko, S. I. Silvestrov), according to which the cause of harmful process was a wrong land utilization and reasonable earal specialization and organization of land exploitation would be a promising solution (Institute of Regional Organization, 1936).

It became also clear that to achieve such specialization it is necessary to improve the methods of land recording, to introduce a qualitative evaluation of soils, and to set up a register of lands. Finally, a register was suggested for all arable lands, including such ones as are not affected by physical adversities but could be better utilized under better organization. The realization of this progressive idea evoked a lengthy discussion, and thorough experiments were needed to discard an erroneous opinion which was held at that time by many economists, according to whom no land register was necessary in a planned economy where the land is not subject to sale and purchase.

In 1955 a team of geographers took an active part in the work conducted by the Committee of the Institute of Soil Science, Academy of Sciences of the USSR. This Committee was brought about in order to discuss a new plan of State Registration Book with a view to land use. It convened a wide conference in 1956 on the qualitative evaluation of land, in co-operation with the Moscow Division of the Geographical Society of the USSR. Volume 43 of the series "Voprosy geografii" (Problems of geography) published by the Moscow Division was devoted to these proceedings.

The conference has shown that a qualitative evaluation of land is particularly necessary in the socialist countries where such evaluation can furnish a scientific basis of differentiated systems in agriculture, which would guarantee maximum output with the greatest possible preservation or even increase of soil fertility. It can supply valuable points of departure for a land arrangement within state- and collective farms, and for the discovery of the potential reserves of cultivable lands. It may be useful further when it comes to selection of the best equipment and fertilizers, planning of meliorative measures, and struggle against disadvantageous physical conditions. All in all, a qualitative evaluation of lands is indispensable for national economists making plans for collective and state farms, and may result in a fair estimate of the obligations they main tain in respect of the State, as well as in a correct price policy.

Despite differences in details, a uniform approach to the subject has been generally accepted by the participants of the conference. Fundamentally, the various geographical stand-points may be synthetized in the following concepts (Armand, 1958):

(1) The system of registration should be based on a thorough appraisal of the physical conditions together with those properties of the agricultural areas as may have developed under the influence of agricultural processes. Such a complex registration cannot be replaced by a simple delimitation in units of the actually existing forms of land utilization (types of arable lands, crop rotation, fields, brigade plots), since such forms of land utilization might be obsolete and unprofitable as well. If we want to improve the forms of land utilization by means of land evaluation, we must not content ourselves with a mere collection of data concerning the actual state of affairs, though they should be taken into consideration in respect to their influence on the lands. For example, the boundaries of land plots to be indicated on cadastre maps should be settled by field investigations, and not copied from the plans of land use. However, both the cadastre maps and the plans of land use should be compiled and compared in order to determine the extent to which the present organization of land use is rational.

(2) The unit of evaluation is the "elementary plot" ("natural landscape") —a territory uniform in properties that are essential in the selection of the form of land use. Very often elementary plots coincide with the spread of soil varieties. However, when the area of one and the same soil variety is covered by different kinds of vegetation (forest, meadow, arable crops), or when —owing to different degrees of exposure—the soil ripens for ploughing at different times or shows other divergencies not reflected in the soil map, the area should be divided into smaller elementary plots.

(3) Strict distinction should be made between "soils" and "lands". The subject of evaluation are the latter. An evaluation of the territory by the genetic type and granulometric composition of soils is substantial but insufficient. Soil analysis cannot reflect such important particulars as are, for instance, minor units of the arable land, proximity to main farm establishments, steepness of slope, situation overshadowed by forest or buildings, etc. So in principle "equal rights" of different landscape components become asserted, though their specific weight is not the same.

(4) The purpose of cadastre work is to provide the economic and planning organs with all information on the lands in a most reliable way. That is to say, these data should contain all the necessary information on soils, relief, water regime, etc., but they should not include anything unneeded. This last principle implies that all boundaries of soil varieties should be omitted from the soil maps which cannot be considered as of practical importance while working out the technique of land use. Quite often the soil map of a collective farm distinguishes more than thirty soil varieties, each in tens and hundreds of contours; it is obvious that the methods of land use cannot be broken down to such details.

Many of these suggestions have been readily accepted by the conference which also analysed the deficiencies of the present system of land registration.

During the 50ies there started a mass compilation of large-scale soil maps in the USSR, which work is not quite completed even now. This important and progressive undertaking has greatly advanced the knowledge of land. However, experience has shown that soil maps are poorly put to practice by the specialists of agriculture. The geographers opinion the reason for this lies not only in the agronomists not being adequately trained for soil science (though this also plays a certain role), but mainly in that that by its very essence a genetic soil map is only a semi-finished product containing the most important basic data for the compilation of agricultural soil (cadastre) maps. At that time many people thought the drafting of any additional maps, except soil maps, was unnecessary. But the importance of agricultural maps as direct tools of planning agriculture is now recognized by everybody, including leading soil experts (Gerasimov, 1963).

The work of complex land evaluation consists of three main parts: land typology, the appraisal of lands and the compilation of cadastre maps (Armand and Gedimin, 1960).

Land typology includes the compilation of the data of all expressible combinations of soil- and relief conditions, vegetation cover and other physical properties influencing agriculture. An account is also made of the secondary features like erosion, degree of fertility, dissection by gullies, being overgrown with bushes, etc. The various types of land are made up by the above-mentioned elementary plots, which are dispersed apartly but meet the criteria of one type or the other. Micro-types, which for the sake of convenience are named "species" of lands, are joined into more or less homogeneous subtypes, classes, etc., forming a multifarious land classification. It is assumed that any such classification demands a preliminary determination of soil types, reliefs and other components of the landscape. Typology, however, does not contain any elements of appraisal.

Land appraisal consists in a comparison of their relative economic value. Attention is given here to physical properties, as well as to economic factors. For agricultural areas the first are usually assessed according to mean crop value of the leading or most promising culture or group of cultures (in livestock-breeding areas, natural forage plants). The second take into account such factors as the proximity of market places and delivery stations, means of communications, the amount of supplying with equipment, power- and labour force, etc. The evaluation is usually carried out according to the con-

ventional scales established for the separate factors that are recorded. Often evaluation scales contain up to 100 marks which are reduced subsequently into 5 to 10 classes.

Unsolved remains the problem of creating a uniform typology and making comprehensive evaluations for such a vast territory as the Soviet Union where very diverse physical conditions and trends of economy are to be found in the different parts of the country. The majority of authors suggested only regional methods of evaluation.

Actually a cadastre is a series of large-scale maps (for the USSR scale from 1 : 10,000 to 1 : 25,000) which reflect all the land properties and permit us to establish to what type and class each plot of land belongs. As is evident from what has been said above, cadastre maps usually follow the soil contours in one side consolidated as the agricultural types, in other enriched by the boundary lines of another genesis. Technical solutions which are made use of when cadastre maps are composed can be greatly varied. Ordinarily, an attempt to plot on one sheet all the important features renders the map difficult to read. Therefore, the main map is often supplemented with map-schemes (often erroneously named cartograms), which contain additional features and can be, when necessary, superposed upon the main map. Difference should be made between informatory map-schemes (giving data on microclimates, for instance) and recommendatory schemes (indicating norms of fertilizers, erosion control measures, etc.).

A combination on one sheet of a cadastre map and the plan of land organization is also impracticable. The plan of land organization, i.e. the record of the actual use of lands, is subject to frequent changes, which makes the map short-lived. Even when cadastre map and land organization plans are given on separate sheets, the former needs correction from time to time. Typology and land utilization also need a periodic revision.

Beginning with 1956, several geographical departments of universities signed agreements with agricultural organizations and started experimentally evaluating cadastre studies with a view to both scientific and practical ends (Gedimin et al., 1963). In this work a leading role has been played by the Moscow University. By 1959 Moscow geographers had completed large-scale land mapping in Riazan, Kustanai, Ivano-Franko (Stanislav) and Dniepropetrovsk provinces on a territory over 600,000 hectares. Most extensive work has been conducted in the Ukraine, since this republic was the first to change to improved methods of land registration (Harchenko, 1963). The recent soil surveys in the Ukraine have been based on two of the above-mentioned three cadastre studies: land typology and the compilation of agricultural maps. The work of geographers has been highly appreciated by the leading agricultural authorities. It has been pointed out that in those areas where a team of specialists of various geographical sciences, including soil experts, had been engaged in the process of investigation, the maps and descriptions gained were fuller, and better answered the needs of practice, than in other regions where only pedologists were conducting the work.

Similar investigations have been restricted to smaller territories but coupled with economic evaluation in the Baltic republics. The experimental work of physico- and economic geographers of Latvia covered the Culbene

region. A great variety of landscape conditions in this region have proved beyond doubt that "any attempt at determining the properties of agricultural lands on the sole basis of soil characteristics, without due account of the entirety of landscape features, can only result in a completely wrong picture" (Raman and Chislena, 1963, p. 229). Likewise unsatisfactory results have been obtained when attempts were made with "universal" landscape maps. The best solution seemed to be when departure was made from landscape maps with special legends for agriculture.

Similar results were obtained by the Esthonian geographers, though their methods of work have been different. "These stages of research have shown that of greatest help to agriculture is a map of landscape typology which reflects in a complex way the main physical and economic properties of a territory . . ." (Kildemaa, 1963, p. 234).

A qualitative landscape evaluation has become one of the most important branches of the complex geographical studies conducted by the geographers of the universities of Lvov, Chernovtsy, Kiev, Voronezh, Tbilisi and some other cities. Their research which invariably widened the scope and enhanced the efficiency of the work of evaluating lands has been of great help to the various organs of agriculture.

In the process of the theoretical and practical work, the physico- and economic geographers established a close co-operation not only with the representatives of branch lines of geographical sciences, particularly of pedology and geobotany, but also with specialists of land organization, since the next step to follow land appraisal is scheduled to be a new organization of the territory (Zvorikin, 1963).

The Soviet physico-geographers hold landscape conferences in every second or third year, each time in another city. These conferences have become traditional forums where the participants exchange their experiences in cadastre work and where experimental cadastre maps compiled with different methods are exhibited. Of greatest importance were those held in the following cities: Lvov (Tasks and methods . . ., 1956), Riga (Kildemaa, 1959), Moscow (Materials . . ., 1961).

The work of studying and appraising of the resources and establishing the reasonable ways of land use has been assiduously carried on also at the Moscow Division of the Geographical Society. During the period from 1957 to 1960, twenty-three papers were devoted to this subject by the Division of Physical Geography of the Society. The literature was greatly increased by the papers delivered at the All-Union Conference on land registration and qualitative evaluation in March 1960. References concerning these papers and discussions have been published in the issues of Problems of Geography No. 54 (1961), as well as in some numbers of the magazine Geography and Economy. Geographers also took an active part in the Ukrainian conference of soil experts, Kharkov (1958), which dealt with the same problems (Zvorikin and Lebedev, 1959). In 1960 the problems of studying and evaluating lands also occupied a central place in the activity of the third (Kiev) conference of the Geographical Society of the USSR. This conference stressed the importance of a detailed study of land funds, as well as the elaboration of a general method of compiling land cadastres (Decisions of the

3rd Conference . . . , 1960.) In 1963 the Moscow and Lvov Divisions of the Geographical Society organized a Coordination Conference in Lvov on the problems of land registration and evaluation.

On the initiative of geographers participating in the preparatory work of the legal measures for nature defense in the Russian Federation, a law was passed in 1960, paragraph 13 of which says "Ministries, departments and councils of the national economy controlling the use and re-establishment of physical resources shall organize and carry out qualitative and quantitative registration by compiling cadastres, maps of complex evaluations, special maps, etc." (More valuable . . . 1962).

This law and other legislative acts offered to the Soviet geographers further possibilities of participating in the ever-broadening work of land evaluation which has been recently started also in the Russian Federation, Belorussia, and other union republics.

The geographer delegates to the State Committee which was entrusted with the task of co-ordinating the research programmes have also been of great help to the experts who set up principles of cadastre compilation. According to their suggestion, the cadastres should be based on the actual plans of land organization, soil maps, botanical maps of forage areas and maps of agricultural regions. The Land Book which contains data of such plans and maps of the various areas is supplemented with a book on agrotechnique (technical instructions). It has been decided that the particulars of information on the farm units should be summarized in cadastres covering areal units on the district-, province-, republic- and general all-union scales.

The greatest difficulties are connected at the present time with the working out of the methods of an economic land evaluation. It did not seem very feasible to choose as basis the mean yields of the leading crop, as has been suggested at first, since it is rather difficult sometimes even for small territories to determine which culture should be regarded the leading one. Land evaluation when it is reduced to one single culture opens wide chances of arbitrary appraisals, inasmuch as lands which are unsatisfactory for one particular culture may prove quite suitable for another with no less value.

The improved methods of economic land evaluation are primarily elaborated by the researchers of the Geographical Department, Moscow University: K. V. Zvorykin, P. N. Lebedev and A. N. Rakitnikov (1963). According to their concept, the purpose of all evaluations is, in the last issue, a comparison of areas which differ from one another by their particular physical properties, as well as by the established ways and the effective results of agricultural use. Under different branches of specialization the results can only be compared on the basis of value indices. But it is not enough to express the gross production value in monetary units. It is also necessary to take into account the production costs as well. So the value of the land has to be measured on basis of the net profit. And yet these authors admit that figures which show the difference between actual gross production value and production costs contain a great element of hazard. Even a statistical generalization, no matter how large a territory it may cover, cannot eliminate the effects of errors in management that may freely result either from unhealthy traditions of cultivation or blunders in planning.

In order to overcome the element of hazards, the authors suggest a kind of "normative" evaluation that should be based on the critical study of the existing directions and methods of production. Such normative evaluation would furnish data concerning both the best and the worst standards of land utilization. The authors think it necessary to set up their three stages in the classification of land types: relative fertility, necessary meliorations and actual use (Methods . . ., 1962).

But there are further and even more complicated problems with which researchers may be confronted when undertaking the task of a complex economic land evaluation. It is not always the agricultural type of land utilization that may prove to be the most effective in a given territory. Obviously, a method which compares profitability of different branches of economy should be worked out. In lack of such a method it is impossible to make reliable plans in such fundamental matters of transforming and reorganizing the physical properties of lands as are for instance: deforestation in order to gain arable land, or afforestation of fields, appropriation of agricultural lands for big water reservoirs, building projects, mining operations, etc. It should, however, be mentioned that in a socialist country the choice does not depend entirely upon the profit a certain kind of land utilization may bring; consideration should be given to the general needs of the community, problems of health protection of the population, international agreements, etc.

At a more advanced stage of land evaluation, the work involves the assessment of the economic conditions that may have a decisive influence on the development of the region, i.e. regional planning.

The participation of geographers in the work of land evaluation also resulted in a critical revision of the various university programmes. It has been stressed that both practical experience and the theoretical knowledge of the graduates should be improved to such an extent as is required by the needs of the concerned branches of economy. Accordingly, a number of geographical faculties have introduced special courses of land organization, qualitative land evaluation, melioration, collective farms economics: a better training is provided in mathematics and technique of accounting. The Moscow and Lvov universities have set up laboratories of land study and evaluation where both educational and scientific advance are kept in view. It seems highly desirable that special chairs should be established in order to tend the various specialized branches of agrogeography. Of course, the enormous task of periodical evaluations on such a vast area as is the territory of the USSR can only be carried out by a specialized state service. Nevertheless, geographers should be given the chance of acquiring appropriate qualifications, and the various research institutes of geography should be endowed with adequate personnel and material, so that they may play a due role in the elaboration of the working methods of land registration and evaluation.

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POLISH LAND UTILIZATION SURVEY IN THE YEARS 1960–64

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(A) Detailed survey of land utilization

A detailed survey of land utilization in Poland was first attempted by the Department of Economic Geography of the Institute of Geography of the Polish Academy of Sciences in the years 1953–56. Later the scope of the research was considerably extended by the newly established Section, and then the Department of Geography of Agriculture of the Institute of Geography, PAN.

Our work was of an experimental nature in the years 1956–59, which accounts for its rather extensive character. The research work of this period sought, first of all, to gather as much material as was possible from all parts of Poland and from different physical conditions and types of farming. As a result, considerable material and experience have been acquired, which now permitted to elaborate the method of a detailed survey, classification of forms of land use, as well as the cartographic technique of a detailed land utilization mapping (key of symbols). The results made it also possible to publish papers formulating the aim, tasks, method and technique of research.

While accepting and fully preserving the general classification and—without major alterations—also the key of colours as recommended by the Land Utilization Commission, IGU, the Polish survey applied a number of further distinctions prompted by the special features of land use and methods of research in Poland.

The basic method recommended by the Land Utilization Commission, IGU, for all countries of the world is primarily aimed at establishing the areas occupied by the main forms of land utilization. This was to be accomplished by means of topographic maps or aerial photos, as well as of field observation. This method is probably quite satisfactory, especially for practical purposes, in countries where large areas of uncultivated or undercultivated tracts of land call for better and more intensive forms of utilization. However, in Poland, as in many other countries, progress cannot be made by developing so far unutilized areas, or replacing the existing forms of land use by more intensive ones, either because no such lands are available or because such changes would involve costly and not always profitable investment ventures. Finally, such a change would be sometimes inadvisable for other reasons (climate, water conditions, public health, etc.).

Under the actual circumstances, progress and rationalization point, first and foremost, towards the intensification of ways and branches of land use. Therefore the surveys of the existing ways and orientations should be supplemented with further material, possibly including efficiency data of land utilization methods.

The concept and method of the Polish survey, and to a lesser degree also the method of elaboration of the material collected, have already been reported and discussed on many occasions, both at home and abroad. The first geographers' conference of the socialist countries of Europe (Poland, 1960), which discussed the methods and problems of land utilization research, agreed that a closer co-operation in this field was necessary in order to ensure a better knowledge of one another's methods and results.

The researches carried out in selected areas of Poland since 1960, and especially the experiences gained in co-operation* with geographers of other countries, have resulted in a more elastic and comprehensive approach to the problems, and in establishing more precise categories and a more effective method of elaborating the field materials.

The major changes regarding the survey method are as follows:

1. By an extension of the scale, a more precise distinction could be made in both the agrarian structure and the ways of agricultural utilization of the lands. Also the problems of land tenancy, open and enclosed field terracing, irrigation, etc. have been analysed more deeply. Under the conditions prevailing in Poland, those problems are but rarely encountered and of no major consequence. In other countries, however, both land tenancy and land enclosure with hedges (haies), espaliers of trees (bocages), stone walls, fences, ditches, as well as terracing or irrigation, are common occurrences and of vital importance over considerable areas (Yugoslavia, Italy, France), although sometimes they are hampering factors (difficulties offered to mechanization).

That is why, to ensure comparability between Polish and foreign maps, those distinctions as mentioned above have been included into the Polish survey. Similarly, the key of symbols has been extended to include a number of crops which, although rare or unknown in Poland, are widely cultivated in the countries we are co-operating with.

2. A uniform system of crop classification and a method of defining the direction of specialization of arables have been elaborated.

Since the use of arables, of its very nature, changes annually—the topographic presentation of its orientations gives a picture which is not true any longer the following year. Moreover, under conditions of heavily fragmented peasant farming it is a difficult or even impossible proposition to indicate the particular crop plots on a map at the scale of 1 : 25,000 or even

* A group of Polish geographers carried on research in the following countries: Bulgaria (in Sofia Basin and at the northern foothills of the Balkans) in 1960; in Yugoslavia (on the territory of Adriatic Montenegro—Barsko Polje; in Hercegovina-Trebinje, in the sub-Alpine zone of Slovenia—Kamnik and in Belgrade suburban zone—Ritopek, Železnik) in 1962; on the Dalmatian coast—Omiš near Split, in Slovenia in the area of Haloze and Jeruzalem and in the region of Bohinska Bistrica in the Julian Alps—in 1963, and in Hungary (Badacsony at the Lake Balaton, Harta near Kalocsa on the Danube) in 1963. On the other hand, research in Poland was carried on by geographers from: Yugoslavia (in the area of Kartuzy, in Eastern Pomerania, around Jelenia Góra in the Sudeten mountains and in Warsaw suburban zone) in 1963, from Czechoslovakia (in Warsaw suburban zone) in 1963. An attempt was made in 1962 also by W. Biegajlo to check the method of the detailed land use survey in Provence (France). For the year of this present conference, detailed land use field studies in Yugoslavia and Czechoslovakia, as well as with Yugoslavian and Hungarian geographers in Poland, have been planned.

1 : 10,000. From the very beginning, also the share of the crop species have been taken into account by the Polish surveys determining the orientations of arable land utilization. Since there is a great number of such crop species, and some of them are similar or of a complementary nature, it has been thought feasible to combine some of them and so to determine the order of domination or preponderance of the various crops within the particular combined groups. It should be noted that until 1960 the division of crops into cereals, hoed fodders and industrial plants had been commonly used and adopted for this purpose in Poland. It shortly turned out, however, that this grouping had not been based on any uniform criteria, therefore it was inconsistent. Indeed, such a classification cannot serve as a reliable basis when the type of orientation is to be determined. A new grouping considers the agrotechnical foundations, that is to say the specific requirements of the crops as regards habitat, methods of cultivation, amount of outlays (intensity), and especially their role in crop rotation as a fore-crop.

In this grouping all field crops fall into one of the three classes as follows:

(a) the *intensifying crops* require more labour expenditure, careful cultivation and manuring whereby they contribute to enriching the sowing area with humus and increasing yields of crops which follow them according to the given crop-rotation system. This group includes, first of all, root crops and other hoed crops (maize), irrespective of the end for which they are cultivated, as well as all vegetables and industrial plants;

(b) *structure-forming crops* do not require so much care and labour expenditure, nevertheless they enrich the soil with nitrogen and preserve its porosity; thus they are considered good fore-crops for other cultures. The group includes all annual and perennial papilionaceous species, whether edible or fodder, or grown for green manuring;

(c) *extractive (or exhaustive) crops* are the most soil-depleting, and unless soil fertility is regenerated by special measures or by an adequate crop-rotation, soil loses its fertility. This group of crops includes winter- and spring-cereals and other crops with similar requirements in the crop rotation. Proportions between the crop groups in the total sowing area and prevalence or co-prevalence of the crops within the given group can provide the basis when orientations of use of arables are being determined. The following limits have been accepted for the determination of the share of particular groups of crops:

Per cent of share	Description	Symbol
over 80	monoculture	5
60–80	high preponderance	4
40–60	preponderance	3
30–40	follow-up share	2
20–30	secondary share	1

The group which shares below 20% of the sowing area is not taken into account. Crop which has the highest share within the given group is regarded as prevalent although if the next successive crop shares an area equivalent to 80% of the first one, then it is regarded as one of equal status (co-prevalent).

Thus established, orientations of arable utilization are termed after crops which are preponderant in the main groups; these are marked by the initials of the group name (I-Intensifying, S-Structure-forming, E-Extractive) and *Latin names* of the various cultivable plant species. For example, a pronouncedly vegetable orientation is recorded as follows: $I_{4/5/}\,lg$; a high wheat orientation has symbols $E_{4/5/}\,tv$; wheat and beet orientation has symbols $E_{3/2/}\,tv + I_1\,bs$; rye and potato orientation in codes is $E_{3/4/}\,sc + I_{1/2}\,st$, etc.

Orientation of use of arables is recorded on map with stripes whose width represents share of the particular groups in the sown area, while colours indicate crops prevailing in the main groups.

(B) Development of classification and distinction of permanent grasslands

Grassland classification in the Polish survey is based mostly on habitat conditions and plant composition of their vegetation.

Since there are no significant areas of natural grass associations in either Poland or anywhere else in Central Europe, most of their permanent grasslands being artificial ones such as may result from forest clearing and man's other economic activity, the classification refers to the primeval forest habitat, and accordingly it distinguishes meadows and pastures of different types (see key of symbols). Within these main types, several sub-types are singled out by the survey, depending on position and source of their natural fertilization (from forest, arable land, river flooding, etc.).

Field investigations which had been carried out abroad proved that the classification followed so far does not fully correspond to the conditions prevailing in Southern Europe. This relates mostly to natural associations and also secondary xerophilous grasslands or mixed grass-and-bush associations which occupy there considerable stretches of land.

A further development of permanent grassland classification, therefore, considers first of all the natural and semi-natural associations which in Poland are rare. This wider classification includes high-mountain meadows and pastures and xerothermic (steppe) associations. Moreover, a new category of salt grasslands (halophytes) was introduced. In addition, secondary meadows and pastures that supplanted forests have also been classified and a category of bor associations, as well as a slightly different system of division into sub-types, have been introduced. Notwithstanding this developed classification and the new distinctions which have been adopted, the mapping and elaboration of the permanent grasslands—especially semi-natural associations—should be verified by further research in regions where they are of a commoner occurrence. This remark also goes for grass-bush or bush associations whose perfect examples are the Mediterranean shrubby associations known as garrigue, macchia, šibljak, frigana, etc.

(C) Development of the scale of distinctions in settlement areas

As regards settlement areas, additional zones have been distinguished to include tall buildings (over 7 floors) and medium-tall ones (3 to 6 floors) erected both in blocks or dispersedly, loosely scattered residential cottages in forest areas and temporarily utilized buildings (shanties, barns).

The major changes of the system of classification in the Polish survey mentioned above were meant to extend the applicability of its methods to other European countries as well. Still, we are fully aware of the fact that our system of classification is short of covering and, indeed, it cannot cover all the categories of land utilization which can be encountered over the territories of East Central Europe. So the classification should be further developed according to local requirements, preferably by the researchers of the countries concerned, who are familiar with them. (We are prepared and willing to include into our key the classification systems and distinctions elaborated by them.)

The Polish detailed survey of land utilization has also its shortcomings. Its primary drawback, perhaps, is the amount of labour it absorbs which, with the financial powers of the geographical institutes being as they are, renders it practically impossible for them to map bigger areas, let alone whole countries. It is of necessity, therefore, that so far the research has had a sample character, i.e. embracing areas selected from the scientific and practical points of view. It may be well worth while mentioning that the planning authorities in Poland are taking a lively interest in such research.

Difficulties that have arisen in making the results of land surveys available are another serious drawback of the Polish research. Both maps and filled-forms are prepared in single copies and kept by the institutes under whose auspices the research works are being conducted. The filled-forms are made accessible to people interested only for an on-the-spot inspection, or indirectly, in form of publications appearing with the relevant half-tone maps. Maps in colour technique are rather expensive. Therefore, except for some fragments of map annexed to textual publications and one full-sheet, detailed map of land utilization issued for methodic purposes, no greater number of maps are likely to appear in the near future. And this, too, is despite the fact that in order to cut printing costs a new 6 colour version of the detailed land utilization map has been elaborated.

(D) General survey of land utilization

All these difficulties have recently induced the Institute of Geography, PAN, to start work on the method of elaborating a general land utilization map.

The requirements which have been set before us impose on the Polish research a possibly early (within a few years) and at the same time accurate survey of the entire territory of the country, which will embrace the most essential social, proprietorial, organizational, technical and production characteristics of land utilization. In a word, it is to be a survey which can provide the basis for the regional planning of agriculture, forest economy, and suchlike, on the voivodship (province) scale. The survey can furnish, at the same time, points of departure for research into larger areas. So for-

mulated a purpose of the survey requires, however, that the method should not be highly labour absorbing. It has been assumed, therefore, that the map will be mainly office-made, prepared by up-to-date technique of topographic maps, aerial photographs and the existing cartographic studies (land improvement, types of grassland, etc.) with checking on the spot of those elements of land utilization only which could not be ascertained in office conditions or which may give rise to doubts. This general map is being prepared at the working scale of 1 : 100,000 but it is expected that it will be published at the scale of 1 : 200,000 or 1 : 300,000.

The general survey retains almost all the principal distinctions of a detailed map that are important from both scientific and practical viewpoints, leaving out those elements only which cannot be presented on the map in the accepted scale (areas under 20 ha), or whose presentation (collection of material) would require too much time. The basic unit of the research is a commune (in the case of individual farming) or a state farm (over 200 ha). A preliminary draft of the general map includes the following distinctions:

1. Agricultural land. (a) Agrarian structure concerns the forms of ownership and, in the case of individual farms, also the extent of their fragmentation. (b) Arable land. Owing to its scale and on account of the need to cut down the amount of labour, the general map completely ignores crop rotation, and only presents the orientation (main direction) of arable utilization. Here, however, considerable difficulties have been encountered. It was attempted in the first trial to mark the classified groups of crops on the map by stripes (vertical: extractive, horizontal: intensifying, oblique: structure-forming). Keeping to this method, the thickness and direction of stripes indicated percentage of the main crop groups in the total sown area with 20, 30, 40, 60 and 80% accepted as group limits.

On the other hand, colour was accepted to mark the leading role of a particular crop within the main groups. The final picture obtained, however, turned to be not very legible and failed to reflect the proper differentiation in land utilization. This, perhaps, results from the fact that in Poland, and especially in Białystok region where the test general survey was made, the structure of sowing has not shown any remarkable specialization, extractive crops (mostly rye) being clearly dominating almost everywhere, and intensification represented to any considerable extent by potatoes mostly.

In view of the poor role of cereals (extractive) in the specialization, they have not been distinguished with separate symbols but were presented as a background to the map and marked by half-intense colour, against which full-colour stripes have been used to indicate the intensifying crops (vertical stripes) and the structure-forming ones (horizontal stripes). Stripe width represents the participation of the main groups in the sowing area, while colour, as in the first trial, indicates the dominating crops. The oblique stripes play an additional role of symbolizing the share of special cultures as vegetables (rightwise oblique stripe) and industrial crops (leftwise oblique stripe). This method of presenting the orientations of arable utilization on the general map is not a final one, and it requires further refinement.

(c) As regards perennial crops, the general survey follows the classification system of the detailed map (orchards, small fruit plantations, vineyards,

hop fields, workers' household parcels and allotment gardens), but it takes no account of the share of particular species in mixed orchards.

(d) Permanent grasslands are dealt with according to the natural types, limiting division to natural associations (alpine, xerothermic, halophyte grasslands) and artificial associations (bor, grond, leng) and grasslands without further classification of sub-types. A definite shortcoming of the general survey where permanent grasslands are concerned is the exclusion of the way of their utilization (meadows, pastures) and the degree of improvement. Besides, along with state farms and peasant-owned forest areas (distinguished by an absence of management plans), they require by far the most of field observation. On the other hand, drainage or irrigation are taken into account in each form of land utilization.

(e) Stockbreeding regarded as a manure producing potential and expressed in terms of animal units (heads), is recorded by means of symbols. Discussion is still pending whether the structure or breeding orientations ought to be included on the map.

2. Forests. Forest areas are presented on the general map, according to the classification used in the detailed survey, but, a new scale has been introduced to define the participation of tree species, while the number of tree-age groups has been reduced to three: up to 20 years (young), 20 to 60 years (immature) and over 60 years (nearly-felling and felling age).

3. Settlements. Settlement classification and distinctions have only been limited to a slight degree, as was imposed by the scale of the map.

4. Other forms. With regard to other forms of land utilization, the symbols of classification have been preserved, taking into account that the map scale imposes certain limitations as well.

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THE RECENT STATE OF LAND UTILIZATION RESEARCH IN CZECHOSLOVAKIA

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Modern agricultural geography has not a long past to look back upon in Czechoslovakia. Since 1945 few important works on this theme have been published, mainly by geographers of various universities. In the various geographical institutes of the Czechoslovak Academy of Sciences, which had not been united in one Geographical Institute until 1962, no attention was paid to the relevant problems; the only exception was the Geographical Institute of the Slovak Academy of Sciences, Bratislava, one of whose workers has conducted systematical investigations for ten years. The Geographical Institute of the Czechoslovak Academy of Sciences, Brno and Prague, having been established, an intense land utilization research has become feasible. A further impetus has been given to this upswing by the great interest, both practical and theoretical, concerning the problems of agricultural production. It is a special task of several years' research to delimit "the geographico-economic regions of Czechoslovakia".

The most important work done by the agricultural geographers of Czechoslovakia last year was the compilation of material for the National Atlas of Czechoslovakia (in total 7 sheets with 72 maps). Apart from the Geographical Institutes of the CAS and the SAS and the universities of Prague and Bratislava, several other institutes of the cognate scientific branches have been engaged in this work. The atlas will also contain a general map of land use in Czechoslovakia (scale 1 : 1,000,000, Institute of Cartography, Prague). This map is based not on terrain research but on topographic maps 1 : 25,000. Different types of land will be represented: arable land, meadows, pastures, forests, built-over and mining areas, waters, etc. The detailed maps have been generalized and photographically reduced in scale.

The Geographical Institute, CAS, is also busy at preparing a map of land use of the microregion of Příbor, Kopřivnice and Štramberk situated to the south-west of Ostrava. This work forms part of a complex research of that region where mining of coal for coking is planned in the future. As the result of that study, propositions have been made for the location of industrial buildings and new housing settlements, and plan projects have been prepared for the further development of intensive suburban agriculture.

Similar research has been carried out by a group of workers of the Geographical Institute, SAS, and of the Chair of Geography, Comenius University, Bratislava, in eastern Slovakia, in the region where the new "East-Slovakian Ironworks" are built. Land use mapping was undertaken by a group of researchers who followed the methods of Polish geographers. Apart from this, another land use map was made by the geographers of

Comenius University, representing the region of Žiar nad Hronom. As to other geographic works relating to the theme, mention may be made of the maps which show the changes in the agricultural utilization of land as fields, meadows and pastures, and areas under the nine principal crops, in the period from 1930 to 1960. Some of these maps have been included in the National Atlas of Czechoslovakia.

Apart from purely geographical works, there exist many works, as a result of other scientific institutions' activity, that can be used for the mapping of land utilization in the coming years. Of special importance are the so-called "delimitation maps" on the scale 1 : 25,000, prepared by a special working group under the auspices of the Ministry of Agriculture. They furnish a solid basis for the organization of soil protection, and contain useful suggestions concerning a more efficient use of land, with a view to the needs of different branches of the national economy. There are five categories of arable lands marked on those maps according to the gradient of slope, erosion danger and degree of mechanization. Different symbols are used to represent meadows, pastures, woods (areas for afforestation), built-over areas, waters, peat-bogs, mining areas, swamps, and reserve lands to part and parcel. A transparent amelioration map is given to each map; it shows the areas of drainage and areas of recent and future irrigation, wells and propositions for their reconstruction. Tables are added to the maps, arranged in form of the so-called registration cards for the delimitation of agricultural areas, and the forest lands in the administrative area of each municipality. On the cards the areas of the following kinds of land are marked: arable land, meadows, pastures, parks and gardens and vineyards, all lands utilized by agriculture, woodland, ponds, reservoirs, lakes, swamps, built-over and unproductive areas, and reservations. At the same time suggestions are presented for the first and second stages of delimitation, and there are supplementary data showing the degree of the utilization of the soil by mechanization, areas surrendered to afforestation or deforestation, devastated areas, and waters. Further data indicate the altitude (above the sea-level), average annual rainfall and temperature, and the so-called Lang factor.

We can avail ourselves, in the same way, of vast material in the Atlas of Regionalization of Czechoslovak Agricultural Production, edited by the Research Institute of Agricultural Economics. In spite of the critical notes (on the scanty evaluation of economic conditions) the material on the physical conditions evaluated for the growing of various crops makes the atlas an important source of information.

Detailed pedological maps are very important for the workers in agricultural geography, too. Recently, pedological mapping (1 : 200,000) has been carried out for the whole territory of the country, these have been the bases of fixing the so-called types of agricultural production. Detailed pedological mapping on the scale 1 : 10,000 have been based on the most up-to-date complex methods. Those maps are then generalized to the scale 1 : 50,000. The mapping is being realized by the "group of complex-research of soils in Czechoslovakia" delegated by the Ministry of Agriculture. The mapping of the territory of 24 districts has been finished (i.e. about one quarter of the territory).

THE LAND UTILIZATION MAP OF THE KOŠICE REGION

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At present, drawing maps of land utilization is part of the research work which is aimed at delimiting the economic regions in Slovakia. The Chair of Economic Geography, University Bratislava, the Geographical Institute, SAV, and some other institutions of Slovakia have been mobilized to this end within the framework of the state programme. In the past, no modern methods of land utilization could be worked out in Czechoslovakia in a satisfactory way. Therefore the key and text in our detailed map of land utilization have been elaborated after the example set by the PAN. Of course, when adopting the Polish methods of mapping, due attention was paid to the geographical peculiarities of our country, and the key has been modified so as to suit our purposes. The work concerning the key has not yet been completed, still I suppose the presented colour map of land utilization of the region of the East-Slovakian Ironworks (Map 1, scale 1 : 50,000, published as a supplement to the Acta Geologica et Geographica Universitatis Comenianae, Series Geographica, Nr. 4) may be of some use in agricultural typology. This map represents the northern borders of the Alföld (Great Plain) where North-eastern ranges of the Carpathians together with the Central-European and East-Slovakian agricultural types prevail. It is a typical border territory, which just at present is undergoing great changes, owing to socialist collectivization and industrialization. The area of the selected territory covers 1,691 km^2. In 1961 it had about 194,000 population in two towns and 121 rural communities, 45% of its inhabitants being concentrated in the town of Košice. Morphologically the territory consists of the eastern part of the Slovakian Ore Mountains, the eastern part of the Slovakian Karst, the western part of the Slánske Mountains, the Bodva low block mountains, and part of the Košice Basin proper, which represents its nucleus. In the south, along its whole length, it borders on the Hungarian People's Republic. It may be of some interest to compare the forms of land utilization and intensity of the neighbouring regions' economy on both sides of the Czechoslovakian–Hungarian frontier.

The Slovakian Ore Mountains, more precisely its Spiš-Gemerian part, is an old mining area. Even at present the exploitation of iron ore is carried on, though the supplementary branches of processing industry predominate in the industry's structure. There is a deficiency of agricultural land here, and what can be called as such are mostly utilized as pastures and meadows. More extensive arables only occur in Jasov and Rudník. Animal husbandry represents the main direction of agriculture, in which cattle breeding prevails. Over 60% of total animal units of the region falls to the share of this branch

of stockbreeding. The share of sheep and goats exceeds 10% of total animal units in the subregion Medzev where a conspicuous number of these species can well thrive on the natural fodder offered by the local pastures and meadows. Recent development has resulted in a preponderance of pigs in Jasov and Poproč. These are kept in the workers' households, mainly on imported fodder. Of cereals which prevail in a decisive degree, barley holds the lead, of the root crops, potatoes. Almost everywhere in this region, the participation of potatoes, usually about 15% of arables, is lower than that of the cereals. Somewhat higher is the share of the fodder crops, in which production branch clover, mixed spring-fodder come to the foreground, though lately also maize grown for green silo has shown an upturn. The extensive areas stretching over the slopes and valleys of the inner part of the mountain range, as well as on the slopes forming transition to the basin, are utilized as meadows and pastures. In some communities, as e.g. in Medzev, these areas occupy an essential part of the agricultural land (Map 1.). The market production of agriculture is not sufficient to supply the territory with foodstuffs, and also the number of workers employed in agriculture is relatively low, since most of the population are absorbed by the industry, primarily by the mining branch, and the servicing branches (Map 2.). Forest management, however, offers employment for more than 10% and in some communities, e.g. in Zlatá Idka, for a markedly high percentage of the active population (Map 3.). In the mountainous region proper, beech woods prevail, in the highest sites with an admixture of spruce. Fir also occurs. This species of tree had originally occupied more extensive areas, but recent forest management has given preference to the more precious beech and spruce. The region used to cherish highland pasturing and home woodworking industry. In the lower reaches of the mountain range a belt of oaks connects the basin with the forest. In days of old, oaks also covered the greater part of the basin, where they found their natural habitat.

The Moldava subregion includes three parts, which differ from each other by their structure, though all three are, by and large, of an agricultural character. These are as follows: (1) the territory of the Slovakian Karst, (2) the hilly country with basins south of the Slovakian Ore mountains, and (3) the southern part formed by alluvial cones, by the marsh of the Konôpka brook and by the Bodva mountains. The forms of land utilization which are manifold, are determined by the climatic, pedologic and hydrologic conditions, though the market possibilities, which depend on the distance of the place of production from the Moldava, i.e. from Košice, are also important factors in this respect.

1. The territory of the Slovakian Karst is mostly built up of Middle- and Upper-Triassic layers of limestone. The occurrence of pure limestone and associated dolomites is responsible for a large territory having assumed Karst features. It is the Karst plateaus of Jasov, Turňa, Horny vrch, and Dolný vrch which are spotted by sinks and sporadic vegetal cover utilized as pastures, occasionally as forests, that are definitely distinguished by pure karst features and economic characteristics. In contrast to these, the basin shows forms of rather intensive and multipronged economic utilization. In the boundaries of the settlements Hrhov, Dvorniky, Včeláre, Turňa n.

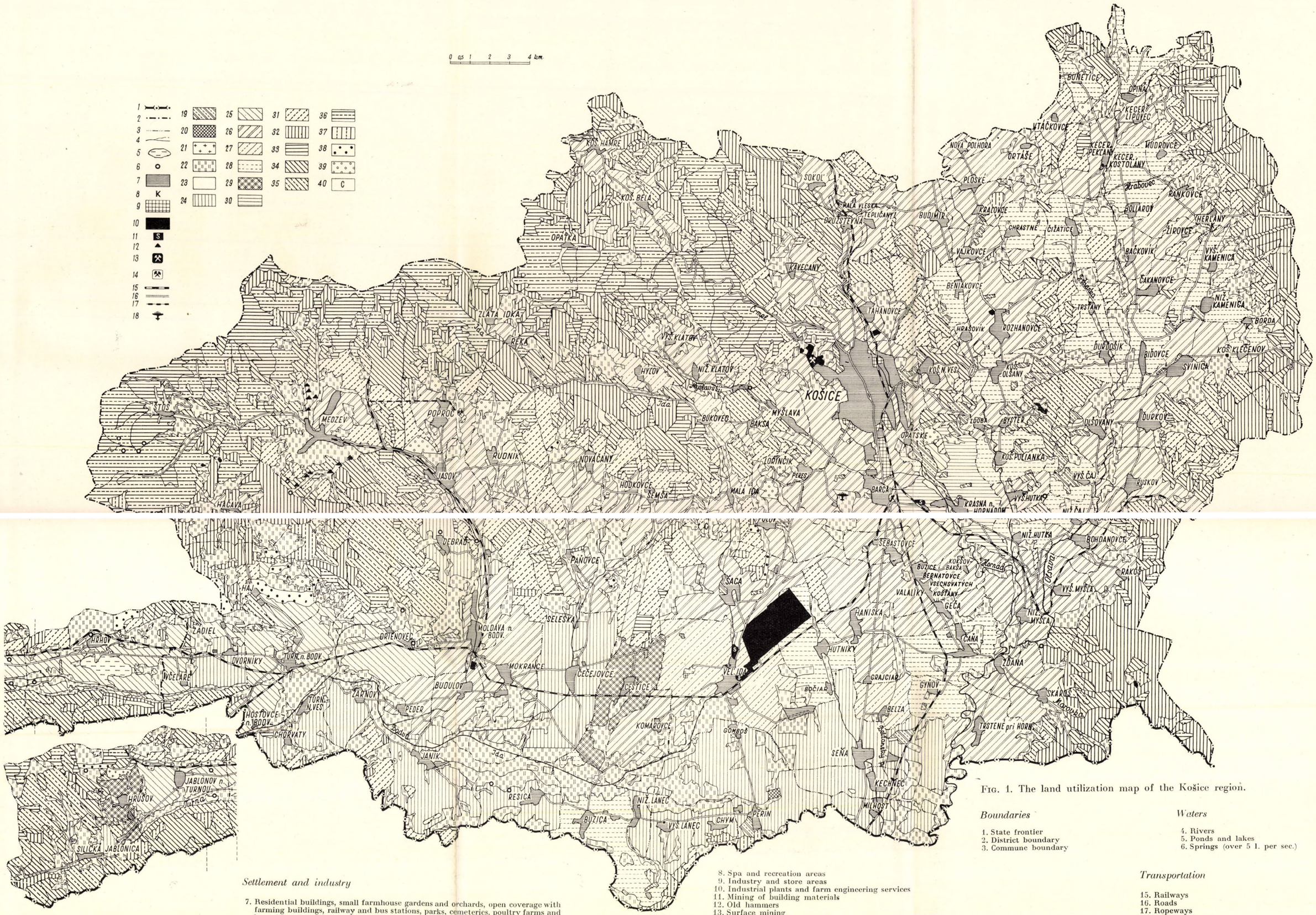

FIG. 1. The land utilization map of the Košice region.

Boundaries

1. State frontier
2. District boundary
3. Commune boundary

Waters

4. Rivers
5. Ponds and lakes
6. Springs (over 5 l. per sec.)

Settlement and industry

7. Residential buildings, small farmhouse gardens and orchards, open coverage with farming buildings, railway and bus stations, parks, cemeteries, poultry farms and fattening stations, etc.
8. Spa and recreation areas
9. Industry and store areas
10. Industrial plants and farm engineering services
11. Mining of building materials
12. Old hammers
13. Surface mining
14. Deep mining

Transportation

15. Railways
16. Roads
17. Ropeways
18. Civil aerodromes

Agriculture

19. Orchards (outside settlements)
20. Glass frames and hothouses
21. Vineyards
22. Meadows and pastures
23. Non-used areas
24. Barley-maize type with lucerne or clover as main produce within fodder crops
25. Barley-maize type with preponderance of maize mowed while green within fodder crops
26. Barley-potato type with clover or maize mowed while green in the first place within fodder crops
27. Rye-potato type with clover or maize mowed while green, in the first place within fodder crops
28. Wheat-potato type with preponderance of clover within fodder crops
29. Wheat-maize type with preponderance of clover within fodder crops
30. Suburban gardening barley and maize mowed while green
31. Oak forests
32. Beech woods
33. Coniferous forests (fir, spruce; mixed: fir with spruce; little enclaves of pine)
34. Oak-beech mixed forests
35. Oak-hornbeam, oak-linden or beech-hornbeam mixed forests
36. Beech-fir and oak-fir mixed forests
37. Other deciduous forests
38. Devastated pastures with isolated trees
39. Forest land for particulars indetermined
40. Glades and clearings

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Bodvou, etc., the root crops have taken over 20% of arables, and since the mild temperature of the basin offers favourable conditions for maize, this plant prevails in this group. Relatively high is the participation of the succulent fodder crops (over 20%), of which the maize for green silo plays primary part. It has come to an overwhelming preponderance in several settlements. In other ones, as eg. Háj and Dvorniký, the clover, occasionally lucerne (Zádiel), takes the lead. Cereals occupy 40% of the arable land with a trend of specialization for barley throughout the whole territory.

The viniculture and fruit growing represent particular features of this territory. Vineyards and orchards situated chiefly on the slopes with southward exposition, namely on limestone motherrock bearing rendzina soils, form a narrow belt along the Turňa outlet of the basin. In general, the viniculture is underdeveloped. Relatively larger areas of well-tended vineyards may be seen in Turňa n. Bodvou, at Drienovec and in some other communities, which is sufficient evidence of the fact that a much stronger viniculture could find very favourable conditions in this region. In the composition of the orchards, which are often alternating with the vineyards in this belt, plum-, apple-, walnut-, and pear-trees are presented. The trees are of various age. In several places they are not tended carefully. As can be seen, fruit growing is only a secondary and a supplementary branch of production. In the southern part of this belt, in places where the layers of the fertile soil are thicker and the slopes milder, fields, chiefly of maize, grass, fodder crops, and cereals, alternate with the orchards. In the past until the phylloxera 'disaster', which reached its worst stage between 1890 and 1900, vineyards were more frequent than in our days.

New geographical phenomena of economic importance are the ponds in Hrhov and Turňa n. Bodvou. They appeared in the places of former moist, poor-quality meadows, where exceedingly favourable conditions were offered for the accumulation of groundwater and precipitation by the small, natural basins which again were probably due to leaching of anhydrite. The Hrhov pond occupies an area of 240 ha^2 (Fig. 1.), and gives a year's yield of over 300 kg of fish per ha, which far exceeds the value of the fodder crops produced from the meadows that used to occupy the place of the pond. Moreover, the ponds have a favourable influence on the water regime, as well as on the biological balance, of the territory.

This Karst region as a catchment area of groundwaters is of special significance for the national economy. The Karst water that comes to light in the form of many profuse springs represents a sizable wealth, the value of which by all likelihood will be rising constantly. Already at present a system of mains is being built which will supply Košice and a number of communities with first-class drinking water.

The beautiful landscapes in the Slovakian Karst offer excellent places for tourist trips. One of the most attractive natural peculiarities is the 3 km long Zádiel canyon which came about as a result of the erosive activity of the Blatnica brook in a transverse fault. The Karst springs of Hrhov and Drienov, the valleys of Háj, Jasov, Hačava, the cave of Drienovec, as well as the above-mentioned plateaus and many other Karst curiosities, can be of great service for the economic development of the territory. Recently, the

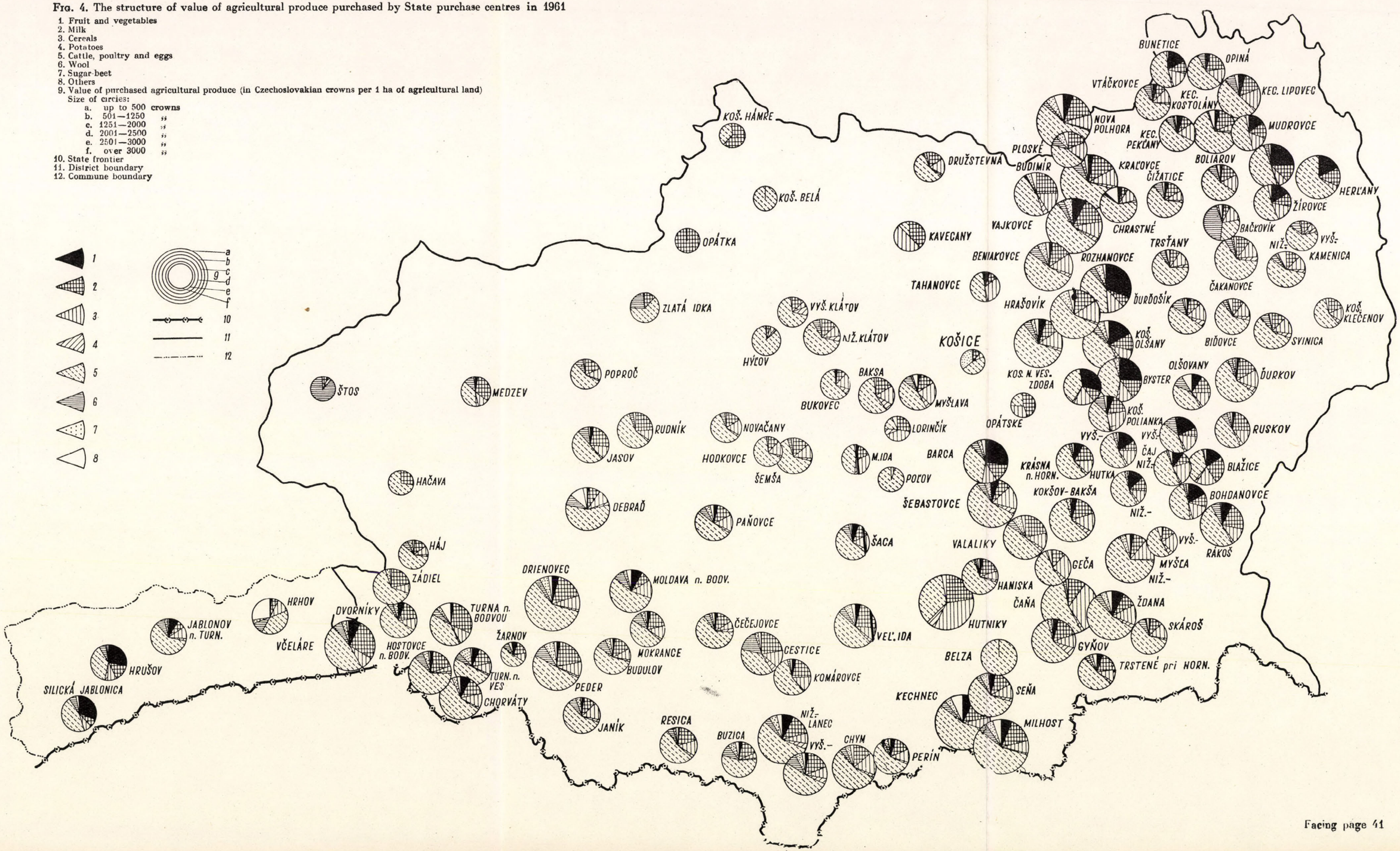
Turňa n. B.—Rožnava railway has created a good communication between this part of the Slovakian Karst and the regions situated in the west.

2. The territory of Konotope (the southwestern part of the subregion) has a different geographical structure. There is a graben running roughly towards the south, subsiding along the northern border of the Bodva hilly country. Owing to the subsidence of this graben, run-off conditions have been disturbed and a large marshy territory was formed. It was by-passed by the ways, as well as by the settlements, in the past. The settlements are situated on its borders, e.g. Velká Ida, Cestice, Mokrance, Čečejovce on the northern, and Perín, Chym, Buzice, Rešica, Janík, Vyšný Lánec and Nižný L. in the uplifted horst along the southern border. The marshy territory proper with alluvial pseudogluey soils is situated in the boundaries of the above communities. Meadows and pastures form a wide belt in this area which favours a special type of economy with an emphasis on cattle- and sheep-pasturing and pig-breeding. There are evident influences of the Alföld to be seen in the way of farming and in the material culture. Farmsteads, which similarly to the so-called "mayers" appeared in a later period than the original settlements, e.g. Gomboš, occur as well. A remarkable process may be seen in the development of agriculture at present. From the social point of view the organization of the State Farms has been of major importance. Further changes have been involved by the appearance of the Unified Agricultural Co-operatives. The former system of small-scale farming has been displaced by the new forms of large-scale utilization of extensive agricultural areas. As a consequence, the outward appearance of the landscape has undergone a material change: stores, machine parks, barns for agricultural tools, and at several places also repair shops, are to be found in the borders of the communities. In the wet territory intense amelioration works have been started, owing to which the level of groundwater has lowered by 2 m approximately, and the process of gleyzation and oxidation has stopped. A considerable portion of less productive pastures has been turned into more productive crop fields. Of the arable land, situated especially in the alluvial cones of the Bodva hilly country, the greater part is sown to cereals, as a rule 40 to 45%, among which barley holds the first place. The next group in order of importance is constituted by the fodder crops which are grown on about 30% of the arable land, and this is a remarkable record evidencing that the percentage of meadows and pastures, however high it be, is short of meeting the requirements of the animal production. Of the roughages, clover should be mentioned as the most important. The third group is represented by the root crops which occupy about 20 to 25% of the arable land. The preponderance of the maize is not so apparent here as in the Turňa outlet of the basin. In several communities, as e.g. in Moldava, Buzica, Komárovce, Mokrance, etc., the production of potatoes was topping the list in 1960. Nevertheless, maize may be considered as the most dynamic crop of the whole southern part of the Košice basin.

In accordance with the established line of production, stockbreeding is intensively conducted in a full series of communities. In the communities Chym, Nižný Lánec, Vyšný L., as well as in Rešica, Moldava, Janík, Péder, etc., over 60 animal units fall to each 100 ha of agricultural land. In the com-

Fig. 4. The structure of value of agricultural produce purchased by State purchase centres in 1961

1. Fruit and vegetables
2. Milk
3. Cereals
4. Potatoes
5. Cattle, poultry and eggs
6. Wool
7. Sugar-beet
8. Others
9. Value of purchased agricultural produce (in Czechoslovakian crowns per 1 ha of agricultural land)
   Size of circles:
   a. up to 500 crowns
   b. 501—1250 ,,
   c. 1251—2000 ,,
   d. 2001—2500 ,,
   e. 2501—3000 ,,
   f. over 3000 ,,
10. State frontier
11. District boundary
12. Commune boundary



munities situated in the north of the Konôpka brook, e.g. in Komárovce, Čečejovce, Cestice, Mokrance, etc., it represents the middle degree of intensity, by 40 to 60 AU/100 ha. In the structure of the stockbreeding of Moldava, pigs occupy the first place, in other communities the proportion of pigs and cattle is fairly well balanced. Sheep-breeding is also of some significance (Map 3.). As to the structure of market production, the animal products, especially meat, milk, wool, and eggs, play the foremost role (Map 4.).

The northern part of the delimited subregion lies in the hilly landscape of the Košice basin. It is a transition belt to the Slovakian Ore mountains, characterized by a frequent occurrence of potatoes and clover. In the structure of its commercial production first should be mentioned meat, cereals, milk, and in places, as e.g. in Drienovec, the sugarbeet as well.

3. The direct hinterland of Košice. This area distinguished by a favourable situation near the Hornád river—south of Košice, in Ťahanovce and Barca—is noted for a kind of suburban agricultural production, particularly for growing vegetables. In the part south of Košice, between the railway and the Hornád river, we come across a peculiar kind of gardening of the Bulgarian type which has been traditionally developed in the environment of this city. The sheds of Bulgarian gardeners, mostly re-built already into permanent dwellings, are placed here in the midst of vegetables and flowers. Around the sheds we can see small delivery vans, by which the producers carry their goods to the market. Nowadays this type of private business is successively ousted by the socialist type of large-scale farming.

The territory in the east and northeast of Košice has an outstanding economic structure. As seen from Map 4. representing the proportions of agricultural workers per 100 ha of agricultural land, a section of the supply-belt around Košice excels with a higher employment in agriculture. Vegetables are grown in almost every settlement of the Torysa valley, as well as in the territory south of Košice, for the vegetables can well thrive on the wet soils of alluvial origin where good conditions readily offer themselves for artificial irrigation. The most common vegetables produced for the markets of Košice are capsicum, tomatoes, cabbage, carrot, and parsley. Likewise important economic features are the commercial orchards in Byster, Košické Olšany, Zdoba, Polianka, Rozhanovce, Vyšná Hutka, Vyšný Čaj and Nižný Čaj (Maps 1 and 3.). The orchards are situated on the slopes, respectively in the Viničná plains and the Varhanovský ridge which represent the original Tertiary bottom of the Košice basin where the brownish podzolic soils with rich lime content are the more valuable since also the climatic conditions are favourable. Fruit-growing here was mainly developed in the inter-war period, owing to the increased market possibilities in Košice. The production of apples and cherries occupies the first place, but plums, pears, and walnuts are grown as well. As far as tillages are concerned, corn-growing prevails with barley in the top line. The distribution of the area falling to the root crops and roughages is not uniform. A discontinuous belt of pastures stretches in the dividing line between the fields and the forest ranges of the Slánske mountains. In the lower reaches this forest complex consists of oak woods with enclaves of thermophilic oak woods; in the higher spheres extensive beech forests are variegated by sporadic patches of beech and spruce. The age of the forests

is variable. Mature forests (40 to 80 years) are alternating with extensive areas of old forests (over 80 years). In the communities on the slopes of the Slánske mountains, the roughages, especially clover occupy more extensive areas. Roughages also prevail in several communities south of Košice, as in Gýňov, Seňa, and Valaliky. In this part, however, the silo maize comes to the fore. Of the root crops the potatoes hold the lead in most of the communities, although maize is preferred in several communities with more southern situation, e.g. in Seňa, Milhošt, Kechnec. The potatoes, maize, roughages, vegetables, and fruits show the greatest dynamics. Potatoes introduced particularly under Joseph II, similarly to the maize, have become so widespread that they are grown in all communities. On the other hand, the former extensive crops, as millet and hemp, retire gradually. Hemp-areas had been recorded from nearly each community not only before World War I, but also in the inter-war period, when hemp still was a much required material of home-made textiles. It is interesting to observe how quickly the crops brought over from other continents, such as potatoes, maize and vine, have extended under the favourable conditions in the Košice region, and how they reinforced the intensification of its agriculture. As to the selection of the crop cultures, man, of course, has had to take into account the physical properties, otherwise Nature herself would have performed the task of selection. The economy of our time is a result of these forces coupled in mutual interaction.

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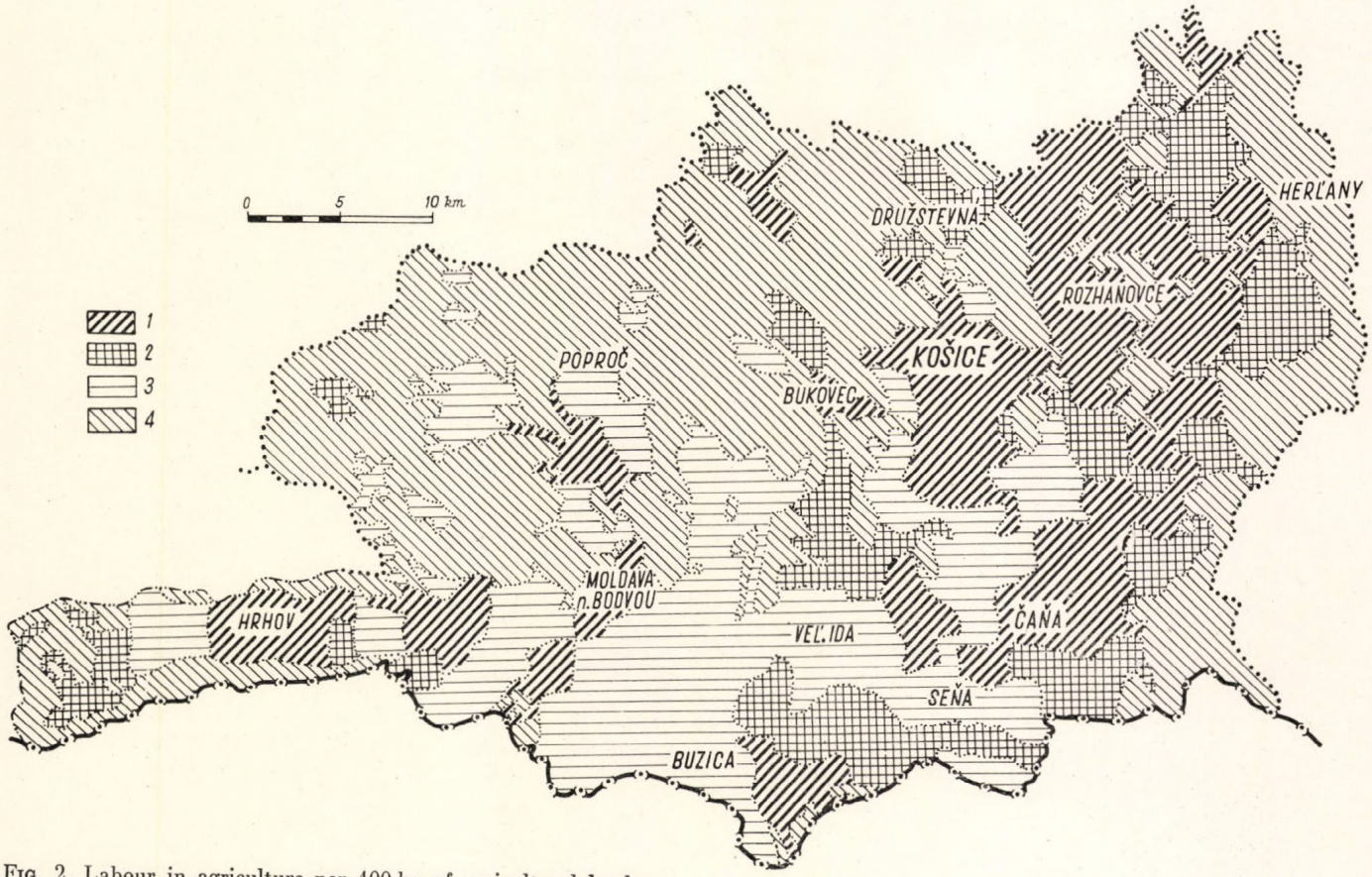

FIG. 2. Labour in agriculture per 100 ha of agricultural land

1. above 20 labourers per 100 ha. — 2. 15—20 labourers per 100 ha. — 3. below 15 labourers per 100 ha. — 4. forests

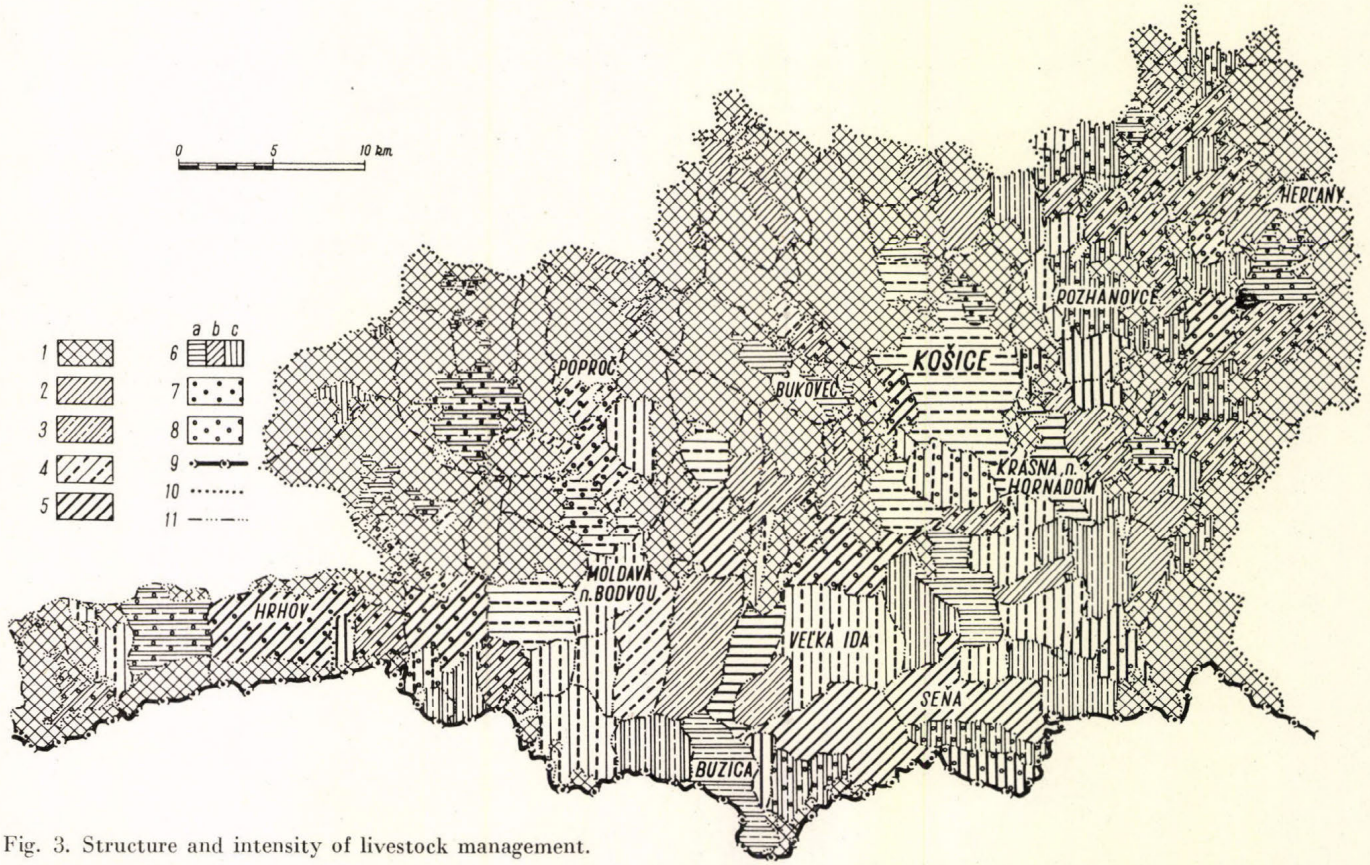

Fig. 3. Structure and intensity of livestock management.

1. Forests — 2. Conspicuous preponderance of cattle (above 60% in animal units) — 3. Preponderance of cattle (51—60%) with conspicuous part of pigs (24—25%) — 4. Cattle and pigs well-balanced (both within 40—50%) — 5. Preponderance of pigs (40—65%) with conspicuous part of cattle (30—40% of animal units) — 6. Intensity of livestock production per 100 ha of agricultural land (in animal units) $a < 60$; b 60—80; $c > 80$ — 7. Sheep and goat above 10% — 8. Sheep and goat above 5% — 9. State frontier — 10. District boundary — 11. Commune boundary

THE REGIONAL PATTERN OF LIVESTOCK FARMING IN THE GERMAN DEMOCRATIC REPUBLIC

W. ROUBITSCHEK

(G.D.R.)

I. International background and method of our investigation

After the regional pattern of land utilization and crop production in the G. D. R. has been investigated in several articles [1, 2, 3], a study of the regional pattern of the livestock and the interrelationship between land utilization and livestock farming will be of major interest—the more so, as a large percentage of the gross production of crops in our Republic forms the basis and starting point for animal products. Besides geographical investigations of livestock-farming are rare [4, 5, 6, 7].

Three problems will be dealt with in this paper:

1. the extent of the livestock in general in each community of the G. D. R.;
2. the extent of important animal species;
3. the relations between land utilization and the pattern of livestock.

It is customary in international research to relate livestock to *100 ha agricultural acreage* (*AA*). The animal unit (*AU* = 500 kg live weight) serves as standard of comparison.

In Germany the various animal species and their age groups are at present converted into *AU* in the following way:

cattle: calves (under 3 mos.)	0·25
young cattle (3 to 12 mos.)	0·5
young cattle (1 to 2 years)	0·7
bulls for breeding	1·5
draught oxen and fattened oxen	1·2
heifers	1·0
cows	1·0
sheep: lambs	0·05
sheep (over 1 year)	0·1
pigs: boars for breeding	0·3
sows for breeding	0·3
young pigs	0·02
porkers	0·13
fattened pigs	0·25
horses: colts	0·5
horses (1 to 3 years)	1·0
horses (over 3 years)	1·0
goats	0·08
poultry: layer hens	0·002
other hens	0·002
geese	0·008
ducks	0·006
other small animal species	0·005

For the sake of comparison on an international scale, we list here some 1960 data of the livestock per *AA* in the G. D. R. and in some other countries (Tables I and II).

TABLE I

Total livestock in various countries and its development in *AU* per 100 ha *AA**

	1950	1955	1960	inhabitants per 1000 ha *AA* 1955
	1	2	3	4
Belgium	125·0	140·5	162·2	519
The Netherlands	115·4	126·1	146·9	466
Denmark	109·4	110·5	115·5	141
West Germany	90·3	88·3	89·7	352
G. D. R.	71·1	85·2	84·6	278
Czechoslovakia	63·6	65·3	67·6	179
Poland	50·8	54·7	60·3	134
Hungary	46·9	49·4	47·3	137
Soviet Union	14·8	15·5	18·1	33
Unites States	14·7	16·5	16·4	38

TABLE II

Animal species in *AU* per 100 ha *AA* in various countries 1960*

	Total	horses	cattle	pigs	goats sheep	poultry
	%					
	1	2	3	4	5	6
Belgium	162·2	9·6**	129·7	15·6	1·4	6·0
The Netherlands	146·9	7·4	110·3	17·4	1·4	10·4
Denmark	115·5	5·3	77·7	27·5	0·1***	4·9
West Germany	89·7	4·9	66·1	15·1	0·8	2·7
G. D. R.	84·6	6·9	53·9	17·3	3·0	3·4
Czechoslovakia	67·6	4·5	47·9	12·2	0·7	2·3
Poland	60·3	13·7	34·1	9·3	1·4	1·7
Hungary	47·3	8·6	20·9	12·9	2·6	2·3
Soviet Union	18·1	2·1	11·5	1·6	2·2	0·6
United States	16·4	0·5	13·4	1·5	0·5	0·4

* Compiled after: Kennziffern der tierischen Produktion führender Erzeugerländer. Mitteilungsblatt zu volkswirtschaftlichen Fragen, Serie Landwirtschaft. Berlin 1963, Akademie-Verlag.

** Only horses in agriculture, *** Only sheep

The tables show that the extent of animal husbandry is essentially determined by the demand for animal products per unit area. This is especially evident when the data of the European countries are compared to those of the Soviet Union and the United States. Other factors are favourable or unfavourable climatic conditions for fodder production, the increase in the demand for foodstuffs based on animal products, particularly in underdeveloped countries, and the export and import policy of the countries concerned.

Belgium and the Netherlands have by far the biggest livestock per *AA*. In these developed countries where (just like in the United States) cattle holds the lead with a high ratio, the fodder, on which the cattle are raised, is produced on the farms, and the dairies supply a large percentage of the animal protein for rearing other animal species.

The high ratio of horses in the total stock of the Hungarian People's Republic and of Poland can be accounted for by tradition and partly by emotional attitudes. The percentage of pigs is dependent on the density of population and on export policy. The percentual share of sheep is particularly high in countries with extended steppe areas (e.g. the Soviet Union with over 12%). As regards poultry, the stock of the Netherlands is rivalled by no other country.

A geographical study must always aim at using the smallest economic or administrative units as starting points or else the target—i.e. to define the regional pattern of the livestock with the greatest possible accuracy—will not be reached.

Methods based on regional or district averages cannot fully meet this requirement. Therefore the livestock of every community of the G. D. R. has been evaluated according to the census of 28th December, 1960.

The following method of calculation has been used:

The various items of the census in heads have been multiplied with the numbers given in the *AU* key. Thus the absolute livestock value in *AU* of every community has been established. Dividing this by the agricultural acreage in hectares, we get the livestock in *AU* per 100 ha *AA*. Finally the figures of the absolute stock have been converted into relative numbers, so that the percentages of the individual animal species could be compared on the community scale (Table III).

The community data given in the tables were classified and entered on maps. Map 7 [7] shows the livestock in *AU* per 100 ha *AA* in 1960. Here the composition of livestock is broken down, by various colour shades, into 10 groups ranging from the group under 50 *AU* to the highest stock with over 130 *AU* per 100 ha *AA*.

Besides the extent of horses is characterized by hachures.

Map 8 [7] shows the extent of cattle in *AU* per 100 ha *AA* in 8 groups in different colours from below 30 up to 90 and more *AU*.

The share of milk cows is represented in hachures.

Map 9 [7] shows in six different colours the extent of pigs from less than 5 up to 25 and more *AU* per 100 ha *AA*, and in five different hachures the extent of sheep.

TABLE III

Examples of calculation: community Hartmannsdorf, district of Zwickau and community Domersleben, district of Wanzleben

Animal species	Hartmannsdorf *AU*				Domersleben *AU*			
	heads	abs.	per 100 ha	rel.	heads	abs.	per 100 ha	rel.
	1	2	3	4	5	6	7	8
calves (under 3 mos.)	70	17·5	3·0	2·2	128	32·0	2·3	3·5
young cattle (3–12 mos.)	139	69·5	11·7	8·6	160	80·0	5·8	8·7
young cattle (1–2 years)	92	64·4	10·9	8·0	70	49·0	3·6	5·3
bulls for breeding	—	—	—	—	3	4·5	0·3	0·5
draught oxen and fattened oxen	3	3·6	0·6	0·4	1	1·2	0·1	0·1
heifers	36	36·0	6·1	4·4	20	20·0	1·5	2·2
cows	412	412·0	69·9	50·9	273	273·0	19·8	29·7
total cattle	752	603·0	102·2	74·5	655	459·7	33·4	50·0
lambs	32	1·6	0·3	0·2	212	10·6	0·8	1·2
sheep (over 1 year)	124	12·4	2·1	1·5	610	61·0	4·4	6·6
total sheep	156	14·0	2·4	1·7	822	71·6	5·2	7·8
boars for breeding	3	0·9	0·2	0·1	5	1·5	0·1	0·2
sows for breeding	83	24·9	4·2	3·1	214	64·2	4·7	7·0
young pigs	314	6·3	1·1	0·8	740	14·8	1·1	1·6
porkers	243	31·6	5·4	3·9	608	79·0	5·7	8·6
fattened pigs	146	36·5	6·1	4·5	514	128·5	9·3	13·8
total pigs	789	100·2	17·0	12·4	2081	288·0	20·9	31·2
colts	1	0·5	0·1	0·1	—	—	—	—
horses (1–3 years)	8	8·0	1·4	1·0	1	1·0	0·1	0·1
horses (over 3 years)	62	62·0	10·5	7·7	62	72·0	5·2	7·8
total horses	71	70·5	12·0	8·8	73	73·0	5·3	7·9
goats	11	0·9	0·2	0·1	120	9·6	0·8	1·0
layer hens	3450	6·9	1·2	0·9	5830	11·7	0·8	1·3
other hens	180	0·4	0·1	0	2406	4·8	0·3	0·5
geese	89	0·7	0·1	0·1	91	0·7	0·1	0·1
ducks	1508	9·0	1·5	1·1	204	1·2	0·1	0·1
other small animal species	607	3·0	0·5	0·4	127	0·6	0	0·1
total poultry and small animal species	5834	20·0	3·4	2·5	8652	19·0	1·3	2·1

Animal species	heads	Hartmannsdorf *AU*			heads	Domersleben *AU*		
		abs.	per	rel.		abs.	per	rel.
		100 ha				100 ha		
	1	2	3	4	5	6	7	8
AU total		806·6	137·2	100·0		920·9	66·8	100·0
AA in ha		589·0				1377·26		
AU/100 ha *AA*		137·2				66·9		

Goats and poultry do not take a leading position in any community in the G. D. R. Thus it has been possible to omit them from the maps.

II. Livestock of the communities in the G. D. R. in *AU* per 100 ha *AA* in 1960

A survey of the data shows that the livestock of the communities in the G. D. R. generally ranges between 50 and 150 *AU* per 100 ha *AA* [7]. The towns with their high demands are distinguished by an outstanding concentration of livestock, above all of pigs. They, however, appear on the map as isolated spots or islands. Areas characterized by a high standard of livestock are to be found where—owing to sufficient rain and fertile soil—a rich fodder production and at the same time a high concentration of manpower prevail. This is chiefly the case in the foothills of the Erzgebirge.

A traditional specialization in vegetable and seed growing, as e.g. around Erfurt and Quedlinburg, has a negative influence on the livestock of the region. Fruit- and horticultures are still less integrated in agriculture than are vegetable- and seed-growing areas. For this reason livestock in fruit-growing areas dwindles into insignificance.

The level of livestock is also influenced by historical factors. The large estates that prevailed up to 1945 in Western Pomerania (in the North East of the G. D. R.), primarily favoured tillage cultures. This explains partly why here the livestock increased at a slower pace than in the South.

The efficiency of animal husbandry is largely determined by the ratio of the available manpower. This was one of the reasons why the regional pattern of agricultural manpower (concentration per 100 *AA*, qualification and age groups) of all farms and communities in the G. D. R. has been investigated according to the situation in the autumn of 1962 [8]. Where high standards of livestock have been recorded, e.g. Gera, Leipzig, Karl-Marx-Stadt and Dresden, 25 to 28 workers per 100 ha *AA* were the regional average in 1960. On the other hand, Rostock, Schwerin and Neubrandenburg, the three northern regions, had only 17·6; 16·5; 17·0 workers per 100 ha *AA*, respec-

tively. Owing to the small numbers of workers, labour input in crop production is smaller in the Northern regions as compared to the South of the G. D. R. Lower rate of work results in lower production values of fodder, which in turn requires a high acreage for fodder per *AU*.

In the sandy areas of the G. D. R. the ratio index of stock ranges generally between 50 and 90 *AU* per 100 ha. Here the fodder yield is low [9]. Parts of the district of Cottbus with 70 to 120 *AU* have developed a higher level of livestock. Here in former times small and medium sized peasant holdings were the overwhelming majority, which had to specialize mainly for livestock husbandry, for the prospects of crop production for the market were rather poor. Since potatoes yield relatively high crops on the sandy soils, pig keeping has taken up the larger share. Further, the independent small-scale farming favoured by industrial workers as a secondary source of living has maintained its significance even today.

In all the areas that are distinguished by a very high share of pasture-land, the percentage of pigs is low, and so is that of the total stock. In such regions the arables are generally of inferior quality, and the pasture-land is not intensively used.

In the Magdeburger Börde, an area that is chiefly engaged in crop production for the market, the standard of stock is also very low. Here only the waste parts of the market crops are utilized by stock-keeping. Pasture-land is less than 5% of the *AA* [10]. Consequently, there is a drop in the stock of cattle as well as in the total livestock.

We find the highest numbers in South East Thuringia (region of Gera) and in the three Saxon regions of Leipzig, Dresden and Karl-Marx-Stadt. With the change of the geological and climatic conditions that takes place along the boundary between the regions of Erfurt and Gera and between Halle and Leipzig, and with the parallel change in the percentage of pasture-land, the livestock increases towards the east to 100 and more *AU* per 100 ha *AA*. These areas have a wide experience in animal husbandry. A high concentration of manpower and profuse rainfall provide conditions for a more intensive fodder production and animal husbandry. But at the same time intensive animal husbandry has been indispensable in order to ensure minimum living standards for an extremely dense working population.

As regards land utilization, Central Thuringia differs essentially from the region of Gera. In Central Thuringia lucerne (alfalfa), together with mangel, dominates, while there is hardly any natural pasture-land. In South East Thuringia grass and clover, complemented by mangel, are important sources of fodder.

Almost all parts of the Saxon regions are characterized by a higher production level of fodder plants, favoured by both the climatic conditions and the high-quality loam soil. Also as a consequence of a relatively high concentration of manpower, top yields on a country scale are achieved here in all fodder plants. These high yields of forage crops constitute an essential precondition of animal husbandry.

A further close interrelation can be observed between the density of livestock and the frequency of Agricultural Co-operatives Type I throughout the regions [11]. In this type prevailing in the foot-hill and highland areas of

the G. D. R., animal husbandry still maintains the character of an entirely private enterprise. Four fifths of the co-operative crop production is utilized as fodder for privately owned animals.

Thus all economic considerations are determined by the needs of animal husbandry.

In the whole Republic the lead in livestock is held by the communities of the Erzgebirge basin and the loamy and mountainous areas in its immediate southern and northern neighbourhood in the region of Karl-Marx-Stadt. They are mainly situated in the districts of Glauchau, Werdau, Zwickau, Hohenstein-Ernstthal, Stollberg, Karl-Marx-Stadt and Rochlitz.

III. The extent of animal species within the total livestock

Cattle husbandry, as compared to other animals, is most of all dependent on the farm's own fodder production. Thus physical conditions decisively influence the concentration of cattle husbandry through the pattern of land utilization. The extent of cattle is largest in the mountainous areas and in the highlands, which are endowed with favourable conditions for fodder plants, and in the lowlands, where a high ratio of pasture-land resulting from the influence of groundwater is available for the purpose.

Communities distinguished by a high number of pigs are scattered all over the territory of the G. D. R. Nearly every larger town or community has its own fattening department. The pig-farming runs largely parallel with the density of population. A high-level pig stock can often be found in state farms. Pigs are only to a small extent dependent on the local fodder conditions. Where pigs are being fattened, there is no dependence at all upon the local forms of land utilization. As a consequence of the low standard of the total livestock, we find a coherent area characterized by a high percentage of pigs in the black-earth regions of Magdeburg and Halle, which are specialized in crop production for the market.

Sheep farming is concentrated in the large farms of the dry areas in the regions of Erfurt, Halle and Magdeburg.

Even today in Thuringia migrating shepherds can be encountered who utilize dry pastures on the slopes of hilly areas. In the Magdeburg Börde the waste of sugarbeet and vegetable fields is being used by sheep. Here wool quality is very high. The extent of sheep has been increased as a consequence of the demand for fine wool, high prices paid by the state and other measures within the agricultural policy of the G. D. R.

There is a general decline in horse-stock. This process is being retarded in areas with strongly inclined slopes, the mechanization of which has not yet reached a satisfactory level.

Occasionally we come across a high absolute number of horses in large towns. The demand for draught-horses in carters' firms and breweries, of course, decreases, but on the other hand there is a rising demand for riding horses. On the level territory of the Börde only a small number of horses are left over, largely due to the progress of mechanization in state farms and agricultural cooperatives.

The remaining animal species, poultry and goats have no importance anywhere, so that the survey of their regional distribution can be neglected.

By the end of 1960 the livestock of all the communities of the G. D. R. (about 9500) was registered and represented cartographically. With regard to the total livestock per 100 ha *AA* and the extent of important animal species, a complete statistical survey of the regional structure has for the first time been made possible. It is by means of our maps that we have been able to assess the actual local distributtion.

The material that was collected with regard to the regional pattern of livestock will furnish the basis for prospective planning of agriculture. Now it is a matter of common knowledge that only complete familiarity with the regional pattern of the individual branches of agricultural production will enable the agrarian to recognize, define and delimit the complex structure of agricultural regions with reliable exactitude.

Since agriculture, in contrast to mining and industry, is a branch of economy in which extended surface-areas are used as means of production, the analysis of agricultural regions can greatly contribute to the analysis of economic regions. The classification of the delimited agricultural and economic regions is the special concern of geography.

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8. See Map 10 "Landwirtschaftliche Beschäftigte/100 ha LN am 30. 9. 1962 in VEG und LPG der Gemeinden der DDR". In: Roubitschek, W., Regionale Untersuchungen zur Arbeitskräfteproblematik in der Landwirtschaft der Deutschen Demokratischen Republik. In: Zeitschrift für den Erdkundeunterricht, H. 1 (1966).
9. Compare Map 7 with Map 5 "Natürliche Standorteinheiten des Ackerlandes der Gemeinden der DDR" which shows the impact of soil quality on livestock-farming and a paper under

the same title by BANNORTH, H. and W. ROUBITSCHEK, in: Zeitschrift für den Erdkundeunterricht, H. 4. (1966).

10. See Map 6, which shows the share of pasture-land and its quality, at the same time giving information on conditions for fodder-production, "Acker-Grünland-Verhältnis 1955 und Bonität des Grünlandes der Gemeinden der DDR", from a forthcoming article by DÖRTLER, K. and W. ROUBITSCHEK. In: Wissenschaftliche Zeitschrift d. Univ. Halle. Math.—Nat. Reihe XVI (1967).

11. See Map 12 "Vorherrschende Eigentumsformen und Betriebsgrößen der sozialistischen Landwirtschaft in den Gemeinden der DDR am 30. 9. 1962" prepared by ROUBITSCHEK, W. for a forthcoming article in: Geographia Polonica and other geographical journals.

THE NATURAL LANDSCAPE AND THE LAND USE

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The research of the natural resources of the whole globe is one of the most important and topical problems of the scientific investigation.

Owing to its research area, geography plays a prominent part in solving this problem of the contemporary science. The geographical research area will always remain, irrespective of its definition and denomination (geographical area, natural geographical area, planetary area, geographical cover, landscape cover, geosphere, biogeosphere, biogenosphere and so on), that complex stratum of the earth able to generate, to maintain and to develop the life from the most simple form of organization to the superior one—the human society. The denomination of the biogenosphere (I. Zabelin) seems to be more acceptable from this point of view.

Geography studies the general rules of the structure of the dynamics and of the territorial differentiation of the biogenosphere necessary to be known for a complex, efficient and reasonable use of the natural resources.

The reciprocal exchange of substance and energy among the elements which compose this stratum of the earth is the fundamental rule which reflects the main characteristics of the biogenosphere structure and dynamics. A permanent exchange of substance and energy occurs among the component elements of the biogenosphere. During this exchange parts of the substance and energy of one element turn to the structure of the other one and a certain form of energy is changing in another one (A. A. Grigoriev, 1962).

The biogenosphere is made up of abiotic, biotic and social-cultural elements (K. Paffen, 1953). The process connected with the reciprocal exchange between the abiotic and biotic elements which are making up on the earth area, in regions where man did not yet act are developing according to the biology, chemistry and physics rules. Specially nowadays processes connected to the reciprocal and complex exchange among all the component elements of the biogenosphere (abiotic, biotic and social-cultural which are developing according to the physics, chemistry, biology and society rules), are making up the largest part of the earth surface.

At the basis of the reciprocal exchange between society and biotic and abiotic elements is the labour process which creates the material goods for the people's necessities. The presence of the abiotic and biotic elements is a permanent and necessary condition in the process of production of material goods, these elements being the main source of labour and substance means. The degree in which society is using the abiotic and biotic elements in a certain territory depends on the technical level reached at and on the character of the social system.

The reciprocal exchange between the society and the other component elements is not done at the level of the whole biogenosphere but on the contrary at the level of the well individualized fields, each with its own characteristics, due to its differentiation.

It is well known that a certain area (natural territorial unit) of biogenosphere, characterized by a certain exchange of matter and energy between the biotic and abiotic elements, by certain characteristics of these elements and consequently by a certain possibility of their utilization, is corresponding to a certain value of the solar radiations on the earth area, to a certain seasonal variation of temperature, to a seasonal distribution of the precipitations.

The results of the reciprocal exchange between the society and the biotic and abiotic elements are unremarkable on the scale of the natural territorial high unities (natural region, area), while on the scale of the low unities (landscape, biotop), they are always noticed. More than that, very often they give the best contribution to the individualization of these unities endowing their personality.

In the short run the reciprocal exchange between society and the other component elements of the biogenosphere is depending on the technical level and the character of the social system, as well as on the characteristic of the biogenosphere of the natural territorial unit where the exchange occurs. This exchange is not constant but always moving, owing to the progress of the biogenosphere developing process, as well as to the ever developing society.

The object of the land use research is based on the way and the level of the biotic and abiotic elements used by the society in view of the material goods necessary to its subsistence within the bounds of a certain territory. The aim of this investigation is the qualitative and quantitative estimation of the various present land uses of a certain territory for a more efficient and more reasonable future utilization as a necessary condition for the protection of the natural resources.

To achieve this end, the landuse research of a certain area must express:

(a) The totality of the landuse forms with their position and occupied surface within the territory. The main forms of use are: agricultural (all aspects landcrops, meadows, gardens, vineyards, lawns, etc.), forester, hydrotechnics, mining, buildings, mixed and various.

(b) The way and the intensity of each useform. The useform is shown by the totality of all measures and applied systems for getting a maximum efficacy of the utilization as well as for protecting the natural resources (e.g. agrotechnical, hydrotechnical, geotechnical measures etc.). The intensity of the utilization is appreciated by the quantity of work used and the capital investment per surface unit.

(c) The efficiency of each form of use based on the necessity of the national and local economy (the total production, the productivity and the efficient utilization, etc.).

(d) The necessary future exchanges of the forms, ways and intensity of the utilisation.

The form, way, intensity and efficiency of the landuse are equally depending on the character of the social system, on the technical present level, as well

as on the biogenosphere characteristics within the territory as the object of research.

In case of the same social-economic conditions and in the presence of a reasonable economic plan the use form is depending on the landscape or landscapes characteristics within the territory. Out of these characteristics those which mainly determine the use form are: the subsoil nature, the development of the seasonal temperature, the quantity and seasonal repartition of the precipitations, the presence or the lack of some water sources suitable for irrigation, the density and the dimension of the relief, the soil fertility, the natural deepness, the vegetable formation.

On the basis of these characteristics, the landscapes within a territory may be classified depending on their aptitude for a certain way of the landuse. The following landscape classification can be distinguished from this point of view:

a) The landscape group able for many forms of utilization. The choice of the using forms can be effected depending on the local and national economic necessities. The mixed utilization can be also used with a high efficiency. This group includes two divisions:

1) The landscapes which do not need any special arrangements for the one or the other of the used way.

2) The landscapes which need special arrangements for some ways of utilization.

b) The landscapes group whose possibility of use is limited. The use form selection is depending in the first hand on the landscape characteristics and secondly on the economic necessities. This group contains five main subdivisions:

1. The landscapes able for agricultural use (with its various subdivisions). This subgroup has three classes:

— The landscapes not needing special arrangements for an agricultural use (one estimate for each differential form).

— The landscapes needing simple arrangements.

— The landscapes using complex arrangements.

2. The landscapes able for forest use have two subdivisions based on the same criterion.

3. The landscapes able for mine operations.

4. The landscapes able for constructions. There are also two classifications in the framework of this subdivision depending on the complementary works necessary to the emplacement of the buildings.

5. The landscape able for hydrotechnical arrangements with two classifications depending on the complexity of the complementary works necessary to these arrangements.*

The way, the intensity and the efficiency of using is depending on the using capacity of the biotops within each using form. The using capacity of a certain biotop also is pending on:

(a) The evolution stage of the biotop before its use stage. This stage is characterized by a certain exchange between the biotic and abiotic elements,

* This is quite a general classification which could be much more developed for each form of use.

by certain features of these elements and consequently by a certain using capacity. From this point of view one distinguishes:

1. Biotops in the rapid exchange stage before being used. This stage is characterized by replacing with a certain dump or by appearing a rock on which later on pioneer plants are to be set up. Owing to a very diminished fertility, the biotops' using capacity (litosoils, regosoils, etc.) for getting the subsistence means is limited. They could have a greater efficiency in getting the work means.

2. Biotops in the instability stage before being used. This stage is characterized by a strengthening of the vegetation by forming open vegetable association. Actioning on the mother rock, the vegetation determines its transformation into soil. The so made-up soil is still keeping characteristics closed by the mother rock.

These biotops' capacity of use (deposits of various origins turned into soil) is greater than that of the previous biotops' class for getting work means as well as subsistence means. In the last case landed improvement works are necessary for their maximum efficiency.

3. Biotops in the relative equilibrium stage before being used. This stage is characterized by the existence of some stable vegetable associations specific to the climate of the natural region where the biotop is situated, of a soil zone relatively independent from the mother rock, fertile, formed by the long processes of the vegetable association and by its particular microclimate. These biotops (land with zonal soil) have a great using capacity. Their use does not need any especial arrangement (but when the biotops are placed in short humided regions necessary steps are taken for restraining the water in the soil or for irrigations).

(b) The evolution stage of the present biotop in the framework of the new evolution course arisen due to the society economic acitivity (real capacity). The biotops' component elements characteristics reflects the new exchange settled between these, as well as between these and the social-cultural elements. From this point of view it can be distinguished:

1. Biotops whose biotic elements have been changed due to the society economic activity, which exchange have no immediate effects upon the abiotic elements. The forest lands, pastures, reed lands, etc. reasonably used are included in this classification.

2. Biotops whose biotic elements have been changed with effects on the abiotic elements. The lands with agricultural use without any arrangements works are included in this classification.

3. Biotops whose biotic and abiotic elements have been altered. The land with agricultural use and arrangements works for this purpose (drainings, irrigation, earth work, etc.) are included in this group.

4. Biotops with changed biotic and abiotic elements. The land used for all kinds of constructions, ways of communications, hydrotechnical works, mine workings, careers, etc., are also included in this group.

The biotops' component elements characteristics which show the real using capacity are the following: the nature of the deposits or rocks, its mineralogical composition, the stratum aquifer deepness, its chemical composition, the angle of slope of the relief element, the orientation of this slope, the total thickness

of the soil, the humus horizon thickness, the soil texture, the content of the nourishing elements, the pH reaction, the seasonal course of the temperature and of the soil humidity, the thickness of the superficial water stratum, its dynamics, its chemical composition, the type and the structure of the vegetable association, the seasonal course of the temperature and humidity in the microclimate air stratum.

Based on these characteristics, a classification of the biotops is depending on its real using capacity and could be stressed in the framework of each use form. The following biotop categories could be distinguished from this point of view.

1. Biotops with an extended use capacity which do not need either special steps or a work capacity and too great investments for getting a medium or a maximum use efficacy.

2. Biotops with a medium use capacity. These are the biotops which for getting a medium up to maximum use efficacy are needing simple arrangements and a work quantity, as well as more extended investments than for the previous category.

3. Biotops with a reduced use capacity which needs a lot of complex steps, as well as a great quantity of work and important investigations for getting a small up to medium use efficacy.

In the short run the research of using land within a certain territory must contain:

(a) The delimitation of the use forms specifying the intensity and efficiency depending on the landscapes characteristics for each of them.

(b) The delimitation in the framework of each useform of the biotops and their classification based on the using capacity.

(c) The critical analysis of the present useforms depending on their relations with the landscapes use aptitude, as well as on the necessities of the local and national economy.

(d) Recommendations for the changes of some using forms or ways for as reasonable and efficient use as possible of the land natural resources.

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THE APPLICATION OF AGRICULTURAL PROFILES IN LAND UTILIZATION MAPS

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The methods of research in any science are closely connected with and depending on the character of the problems it pursues to solve.

In the past, when the main task of geography was to discover new lands and to reveal their ethnography and economy to mankind, description was its main method, through which science could successfully solve its problems.

But modern geography is very different from the descriptive and cognitive discipline it used to be. The main problem of modern geography is to serve mankind's practical and theoretical interests in making a most versatile and intensive use of the already discovered physical resources, in the transformation of nature, and in further developing the economies of the various countries.

One of the main problems of modern economic geography is to reveal on the regional, national and international scale the complicated interrelations and mutual dependences that exist between nature and economy, economy and population, the branches of the national economy and the economic complexes, etc.

By revealing these intricate interconnections, economic geography contributes to a more rational use of the physical endowments, the labour resources, the material-technical bases of production, etc. The economic-geographical research detects, and makes suggestions for the overcoming of many of the disproportions in the regional economies: that is, it studies the geographical distribution of the branches of economy not only from a mere theoretical viewpoint, but also endeavours to improve or change the structural proportions of these branches.

Since modern economic geography is no more able to solve these problems by the aid of the descriptive method, new methods of research have had to be worked out: literary, statistical, cartographical and demonstrative methods of land studies, and the cameral elaboration of the data. To these methods we may add the comparative and the balance methods, which have a wide application in modern economic geographical research. The comparative method is used in delimiting the areal (regional) types of economy, while the method of balance makes good services in revealing disproportions of the system of the national economy (on a territorial scheme).

According to N. N. Baranski, the main task of economic geography is to determine the areal types of economy, which involves the so-called regional approach of the occurrences and objects. As N. A. Kovalskaya notes, this approach brings about a "specific geographical method of studying economy". This regional approach has been definitively accepted in the domain of the

geographical studies on national economies, where increasing attention has been paid to matters of land utilization in recent years. It is necessary to point out that research concerning land utilization must be raised up to the level of modern economic geography; as a branch of science it must be cleared of the oddities of the old descriptive geography. In this respect, precise delimitation of the present forms of land utilization should be carried out in the first stage of research, in which also the possibilities of a more efficient utilization of lands should be clarified.

There are different methods of mapping and studying the forms of land utilization, but in the present work only the questions of how and to what ends agricultural profiles can be applied, will be concerned about. In particular, we would like to prove the validity of this method by the test studies we have conducted in order to reveal some regularities of land utilization and specialization in the southern part of the Upper Tracian Valley in Bulgaria, especially on the Pazardjik—Plovdiv field and in the border areas adjoining to it.

It is chiefly the terrain work, combined with mapping and supplemented with cameral work of data, that constitutes the research of agricultural land utilization. When a large area is to be investigated, the geographer is not always able to scrutinize all the settlements and lands. Therefore the researcher should deal with types of lands, in which he can examine the efficiency of land utilization according to relief, soils, climate, water, plants, animals,

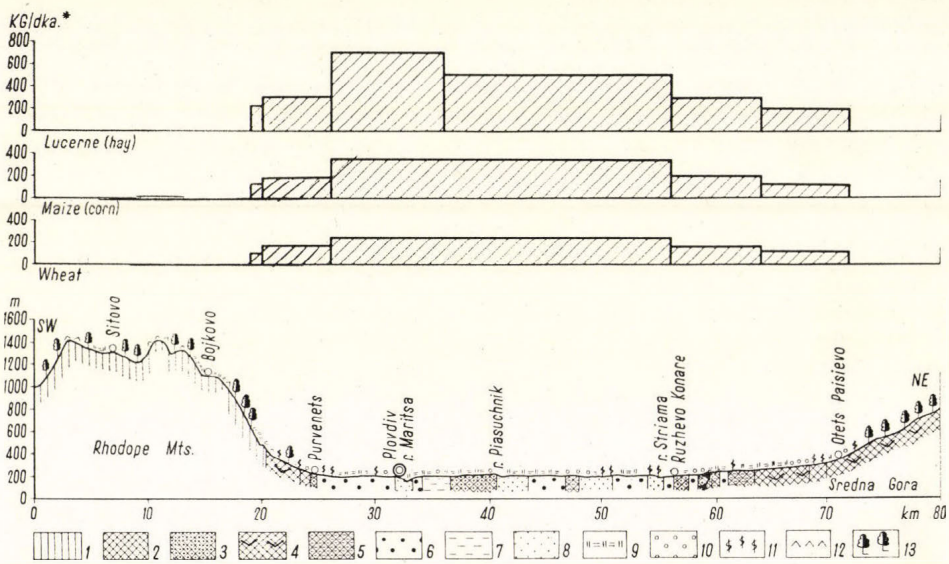

FIG. 5. The profile of the agriculture across the Lowland of the Thrace

1. Brown forest soils — 2. Weakly degraded and degraded brown forest soils — 3. Strongly degraded brown forest soils — 4. Weakly podzolized brown forest soils — 5. Brown meadow soils — 6. Alluvial and deluvial meadow soils — 7. Meadow-swamp soils — 8. Alluvial depositions — 9. Plough-land (arable land) — 10. Orchards and gardens — 11. Vineyards — 12. Pastures — 13. Deciduous forests and bushes (bushlands)

geographical position, etc. Such types of lands in Pazardjik–Plovdiv field and its surroundings are: the alluvial valley of the Maritza river and its tributaries, the southern, at places dissected, slopes of the Sredna Gora, parts of the main range of the Sredna Gora, a part of the northern foot of the West Rhodope, the Rhodope foothill east of Asenovgrad, the steep, dissected slopes of the West Rhodope, parts of the West Rhodope proper with remains of denudated surface, engraved valleys, etc.

The agricultural profiles direct attention to the different types of lands. Generally, the ordinary profiles, which are broadly used by geologers and physical geographers, are of some value for the economic geographer as well, but he mainly relies on the combined agricultural profiles.

Besides the relief and the soils, these profiles represent the plots of land utilized as arables, orchards, vineyards, meadows, pastures, forests, unproductive areas, together with the average yields of the most important crops per decare (computed for the most important grain crops or for all cereals in general), as well as the structure of agriculture (the correlation between the production values derived from the plant growing and stockbreeding branches), and other indices.

Such profiles also reveal the correlation between relief-, soil-, climatic-, hydrological-, and vegetal conditions, on the one hand, and the forms of land utilization together with the lines of specialization of agriculture, on the other. The choice of the scale of the combined agricultural profiles is of great importance for the success of the research. Profiles with large scales are very suitable for both theory and practice: 1 : 10,000, 1 : 20,000, and 1 : 50,000, but for some territories of unvarying physical and economic conditions smaller scales can be used: 1 : 100,000, 1 : 200,000 and even 1 : 300,000.

An important stage in the research work is when several profiles, each of which represents a very important branch of agriculture, are put on the map so as to give also information about their dependence on the physical properties and economic conditions of the region. The fixing of the agricultural profiles must be in harmony with the "key method", which was successfully used by the geographers of the Moscow University. This method permits us to study in detail not only larger areas but also the type-forming agricultural branches and the various agricultural, industrial and other working-places. The profiles must cross the "key areas". V. V. Pokshishevski stresses the importance of the "key method" which has been applied by the economic geographers through analogy of physico-geographical studies.

The economic geographical profiles are of two kinds: longitudinal and transverse. For instance, a longitudinal economic geographical profile is the valley of a river, but since valleys in agricultural regard are rather monotonous, such profile is usually not of major interest for an economic geographical research.

The transverse profiles are of greater importance. They cross territories that are featured by more varied physical and economic conditions, especially when passing through several agricultural zones.

It is essential that the terrain research should be done by routes, which follow the profiles defined in advance on the map. It is also required that the field observations, the mapping and collecting of data in a route should be

made by personal inquiries. These investigations must embrace the smallest agricultural units (co-operative farms and state farms).

Depending on local conditions, especially where the lands of the co-operative farms exhibit diverse physical conditions, the research must be conducted by a team of well chosen collaborators (brigades or groups) whose qualification and scientific activity guarantee that the task of investigation will be carried out successfully.

In Pazardjik–Plovdiv field and its surroundings we chose three profiles, all three following more or less the direction from South to North. These cross the northern slopes of the Rhodope, the Upper Tracian Valley, and the southern slopes of the Sredna Gora. The first profile courses through Milevi Skali, village September, v. Vinogradets, v. Popintsi, etc. The second profile begins from v. Orechovo, v. Sitovo, v. Parvenets, Plovdiv, v. Trud, v. Rujevo, v. Otets Paisi, and v. Domylan. The third profile crosses the northern slopes of the Rhodope and its foot via v. Pilashevo, v. Biala Reka, further the Maritsa river, then takes a direction toward the North through Chirpan's hills on the trace Chirpan, v. Spasovo, and v. Srednogorovo.

The economic geographer must gather in advance some knowledge concerning the development, the geographical distribution and the peculiarities of agriculture of his terrain (region, subregion or microregion). On the basis of preliminary analyses of the summary data as may be supplied by the district council, administrative units, the Central Statistical Office, the Ministry of Agriculture, the State Planning Committee, etc., he may appraise at what level of development and with what areal distribution the various branches of agricultural production are conducted in the investigated territory. Thus he may evaluate the influence of physical conditions, agrotechnics, labour power etc., on the agricultural production. Likewise may he assess whether further material and labour input seems to be justified in view of such factors as are the vicinity of consumption centres, especially the large cities, light- and food industry, or the demands of the home market and export.

It is high time that economic geographers should deal not only with matters of production but also with the needs of consumption. Thus they can easily reveal the interdependences that exist between the general standard of social development and the geographical pattern, distribution, shape, structure of the agricultural production.

When working up the data on the economy of the Pazardjik–Plovdiv field and its surroundings, which territory is about 6870 square metres with a population of 775 thousands (1960), we could analyse not only the influence of physical conditions, labour resources, agrotechnique and transport on the developmental stage and geographical pattern of agricultural production, but we could also esteem the influence of consumption centres (Plovdiv, Pazardjik and other cities, food industry, home markets in Bulgaria and foreign markets).

The urban population of the territory investigated is about 302 thousands, of which 180 thousands are inhabitants of Plovdiv. Of the total agricultural production of this area, the inhabitants proper of Plovdiv consume an annual average of 10 per cent of potatoes, 6 per cent of vegetables, 6 to 8 per cent of apples, 30 per cent of cherries and 80 per cent of milk, all these supplied by the

agricultural zone of the city. These data show that here cities as consumption centres are not factors of great importance for the development of the agricultural production. The main consumers of agricultural products are the food industry and the foreign markets. The tinned-goods factories in Plovdiv, Pazardjik, Krichim, Asenovgrad and Parvomai consume an annual average of 40 to 60 per cent of the produced vegetables, fruits and grapes in Pazardjik–Plovdiv field.

During the course of the research it has been established that the Bulgarian home market consumes an annual average of about 15 to 20 per cent of vegetables, potatoes, fruits and grapes. The foreign markets claim a bigger share (about 50 per cent of tomatoes, 39 per cent of potatoes, 25 per cent of grapes and fruits, and a considerable part of other items) of the agricultural products harvested in Pazardjik–Plovdiv field and its surroundings.

Our efforts have been mainly focussed on the following problems: the structure of the agricultural land utilization, crop ratio of the arables, the structure of plant production, the structure of total production of agriculture (plant growing and stockbreeding), yield average per decare for the more important crops, correlation of yield averages with relief, soil, climate, irrigation, fertilizing, technique of cultivation, plant species, etc.

Serious attention has been paid to the average production per decare by the different types of lands. While tackling these problems, we duly considered the simultaneous influence of the local physical and economic conditions, as well as the effects produced by the demands of markets outside the boundaries of the investigated region.

The above problems were first examined with the method of field work in the profiles, and then followed the camera work. Thus establishing the main regularities concerning the developmental level and geographical pattern of the agricultural production, we have inserted a second stage of research through further longitudinal and transverse routes, in the course of which we extended the collecting and working up of data of agriculture by making additional inquiries in the food- and light industry, and by analysing the data of trade branches, etc. All this enabled us not only to become acquainted with the forms and ways of land utilization (up-to-date or inefficient as the case may be) in Pazardjik–Plovdiv field and its surroundings, but also to reveal some disproportions in the structure of its agriculture.

By repeated inquiries into the profiles and by additional investigations we could definitively establish that the lands of the Rhodope's parts are of less importance for agriculture. At about 400 to 1400 m above sea level these lands which are strongly dissected by the river valleys, as on the north toward the Upper Tracian Valley, end in steep, ravined slopes. On their more elevated parts, they are covered with thin layers of poor quality brown-forest soils, and with maroon soils on the parts with a lower situation.

More than 55 per cent of these lands are occupied by poorly utilized deciduous forests and bushlands used partly as pasture. About 30 per cent of the lands are pastures and natural meadows. The arables take about 15 to 20 per cent of the lands, and are mainly situated on remains of denudated ridges. About 8 per cent of the lands are bare hills useless for both agriculture and forest management.

In the agricultural structure of the Rhodope's parts, adjoining the southern borders of the Pazardjik–Plovdiv field, plant-growing shares about 65 to 70 per cent and stockbreeding about 30 to 35 per cent. Pastures should be utilized here more sensibly, since it is a vital problem of the region that a better developed cattle-stock should provide more dairy products for the population and more manure for the agriculture.

The major part of the cultivated lands are used for grain production (20 to 30 per cent) and for natural meadows (30 per cent). Orchards participate with 10 to 15 per cent, industrial crops and fodder plants with about 5 to 10 per cent in total arables. As to the specialization of agriculture, potatoes with a markedly high production ratio (about 40 to 60 per cent of total plant growing) are mainly produced for seeds. But it is a valuable fodder as well, a decare planted with potatoes gives more fodder values than any other fodder crop. Therefore their growing area should be augmented. Fruit-growing has a fair chance of development, and this mainly refers to cherries, nuts, apricots and some other fruit trees that can be grown without irrigation. Under the present conditions, the grain yield per decare is low, but production costs are also low, that is why we can speak of promising perspectives of a quick development in the near future.

The foot of the Rhodope, lying 250 to 400 m above sea level and covered with maroon soils and forest soils, is distinguished by well-developed vine- and fruit-growing and tobacco cultivation. Typical in this respect are parts of the territory of the following villages: Kuklen, Parvenets (Profile I), Brestovitsa, Perushtitsa, Ustina, etc. At places, the mountain foot is like a narrow strip of land situated between the northern steep slopes of the Rhodope and the alluvial lowlands stretching towards the North (Profiles I and II), but northward Peshtera, and eastward Asenovgrad, in the territory of the villages Isbegli, Topolovo, Dalbok Isvor, Briagovo, Iskra, etc., the mountain foot broadens and turns into a wide hilly land (Profile III). Here plant growing presents 75 to 85 per cent, and cattle-breeding 15 to 25 per cent of the agricultural production. These lands are characterized by a better developed production of grains and industrial crops. Grains occupy 40 to 50 per cent of the arables, but give 25 to 40 per cent of the production value of total plant growing. The industrial crops (tobacco, cotton, sunflower, mint, etc.) occupy 15 to 20 per cent of the arables, but give 30 to 45 per cent of the production value of total plant growing. The tobacco is greatly favoured by the maroon soils developed from the vaporized riolits of the Rhodope; the black soil (chernozem) and the clay soil offer favourable conditions for the cotton, sunflower, mint, and other industrial crops. Fodder plants, orchards and vegetables are less developed. There open wide prospects of developing the vine- and fruit-growing branches (cherries, plums, apricots, peaches and nuts), which have shown a rapid development in recent years.

The major part of Pazardjik–Plovdiv field is a vast plain 150 to 250 m above sea level. Toward the foot of the Sredna Gora it reaches the isolines with 300 m above sea level. Along the Maritsa river and its tributaries (Chirpanska, Vutcha, Chipelarska, Topolnitsa, Luda Yana, Piasachnik, Striama, etc.) the mother rocks are covered with the best alluvial soils (alluvial meadows, alluvial marshes, alluvia, etc.). On the western part of the plain,

the alluvial soil covers a wide riverine along the Maritsa on about 8 km length (Profile I, Septemvri–Vinogradets). These soils overlay a stripe of land of about 35 km length in the middle of the plain (Profile II, Purvenets, Plovdiv, Trud, Rujevo Konare, Otets Paisevo), but on the east of the plain this alluvial cover narrows down in a valley section of about 3 to 5 km width of the Maritsa river (Profile III, Kradjalovo–Chirpan).

Those sections of land which are covered with alluvial soils have been of greatest importance for agriculture in the Pazardjik–Plovdiv field. Plain relief, a low sea level, fertile alluvial soils, a well-constructed system of irrigation together with the rich industrial experience of the population, the vicinity of big consumption centres (Pazardjik and Plovdiv), marketing possibilities both home and abroad, and many other factors have enabled the socialized agriculture to further specialization for vegetables, potatoes, fruits, rice, sugar beet, etc. These plants give a high production value per decare, but their production costs are comparatively low, which is a main point in agriculture.

It is rather peculiar that in the middle parts of Pazardjik–Plovdiv field, and especially where the lands are covered with alluvial soils, plant growing participates with 90 to 98 per cent while cattle-breeding figures only with 2 to 8 per cent in total agricultural production. The underdeveloped cattle-breeding, an obvious sign of a disproportionate specialization in agriculture, is not able to ensure an adequate supply of milk and meat for either the rural or the urban population, and cannot provide enough stable dung, which would be highly necessary for the producing of vegetables, manuring of industrial crops, etc. Therefore, to improve the efficiency of cattle-breeding so as to ensure an adequate supply of milk, and at least part of the meat requirement, and the total of the manure needed by the plant growing branches, is an essential problem of agriculture.

Grain production occupying 10 to 35 per cent of arables represents 10 to 20 per cent of the total plant production value, but it is not sufficient to meet the local demands.

Wheat shows high production values (Profiles II and III) and has good perspectives of development. Also the production of rice is of major importance. The sowing area of grains, except for corn, must not be enlarged.

The industrial crops take 4 to 8 per cent of the arable lands and give 5 to 12 per cent of total plant production. Since the production of sugarbeet and mint pays fairly well, the growing area of these plants should be enlarged, but that of the sunflower should be decreased in order to recover area enough for the more profitable crops.

Vegetables, potatoes and melon fields occupying 4 to 10 per cent, and at places, as in the environment of Plovdiv, even more than 50 per cent of total plant production, are in a favourable position. The co-operative farms of the villages Purvenets, Todor Kableshkov, Krichim, Kalekovets, Popovitsa, etc., produce vegetables, potatoes, water-melons and melons to about 40 to 50 per cent of the total plant production value. These represent the typical farms of vegetable-growing Bulgaria.

Apples hold the lead in all orchards and provide high yields. Vineyards are rather favoured at places, but their area should be decreased and limited

to sandy soils where the production values of other plants are low. Orchards extend on an area of about 5 to 10 per cent and at some places, as in Krichim field, over more than 40 per cent of the arables, their average yield is 15 to 25 per cent (in good crop years even 50 per cent) of the total plant production value. The area utilized by orchards has been rapidly increasing in recent years.

The participation of fodder-plant fields and meadows is rather low in the total agricultural lands, in spite of their high yields per decare and the main importance they have in cattle-breeding. Lucerne is certainly one of the winning plants of the future here, since it is a matter of general understanding that an increase of its area will favourably influence both the cattle-breeding and the plant growing (owing to the role it plays indirectly in natural manuring and directly in improving the fertility, and even the structure, of the soil).

The northwestern and the northeastern boundaries of Pazardjik–Plovdiv field are situated at the southern foot and on the processes of the Sredna Gora at a height of 300 to 600 m above sea level. These typical hilly landscapes bear a cover of thin, barren maroon forest soils, and of chernozem-smolnitsa in the surroundings of Chirpan. Here plant growing provides 80 to 90 per cent, and cattle-breeding 10 to 20 per cent of the total value of agricultural production. Therefore the latter is rather underdeveloped, in spite of the presence of pastures (15 to 20 per cent of the area). Here lands are mainly sown to grain crops (30 to 50 per cent of the arables), industrial crops (10 to 16 per cent). Also vineyards are cultivated on a considerable portion of the agricultural area (10 to 15, at places 30 per cent). Typical vine-growing microregions are found in the surroundings of Vinogradets, Pazardjik (Profile I), Chirnan Spasovo, Bratia Daskalovi and Stara Zagora (Profile III).

The Sredna Gora ranges are covered with brown-forest soils used as pastures, vineyards, rosegardens and meadows. Forest management is also worthy of mention here.

The application of agricultural profiles has proved to be a great help for us in our efforts to carry out multilateral investigations in the various forms of land utilization. Therefore we think we are not carried far away when risking the statement that working with profile method will certainly represent one of the most efficient branches of the economic geographical research.

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THE MAPPING OF LAND UTILIZATION IN YUGOSLAVIA

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The social and economic affairs of postwar Yugoslavia are characterized by the rapid development of an industrialized and socialized agrarian production. This development is reflected in the quick social restratification, in the changes of the agrarian structure and the ways of utilizing lands. Since 1953 the number of active rural population has decreased by some 500,000 people. The secondary and the tertiary sectors of the economic activities have been taking up not only the natural increase of the population but also a large number of the agrarian workers.

TABLE I*

Percentual shape of the active agrarian population

Year	SFRJ	Serbia	Croatia	Slovenia	Bosnia Hercegovina	Macedonia	Montenegro
1948	70·6	74·5	66·2	49·0	77·3	71·7	76·0
1953	60·9	67·4	57·3	43·0	63·6	65·2	58·8
1961	59·1	59·1	45·2	31·5	54·7	55·7	46·6

* The data in the above table are from: Konačni rezultati popisa stanovništva 1948, g., knj. III.; Savezni zavod za statistiku i evidenciju, Belgrade 1954; Popis stanovništva 1953, knj. V; Savezni zavod za statistiku, Belgrade 1960; Statistički bilten br. 250; Stanovništvo i domaćinstva, Savezni zavod za statistiku, Belgrade 1962.

We can follow a process of a very quick social restratification in the villages, which results in the incessant migration of the formerly agrarian population into towns and—very characteristic of Yugoslavia—in the commuting of that part of population which maintain their village homes, but travel daily to work in nearby or not infrequently in comparatively far-off industrial centres. The restratification of the village is due partly to the low economic standards of the small-peasant farms, which predominate in Yugoslavia, and partly to the sudden need for more labour in some rapidly developing non-agrarian economic branches. Nowadays the dual employment of the members of peasant households (as hands at farms and as industrial workers) is quite a common thing in Yugoslavia, and it is precisely this disparity between the levels of income from agrarian and non-agrarian occupations that decisively influences the shape of land utilization and agrarian economy. With the rise of income, the professionally qualified members of the peasant house-

holds become independent of the land, and consequently the spread of education and higher qualifications, and a concomitant rise of income of the former peasants now occupied in non-agrarian working-places, result in a decline of the intensive forms of land utilization in the small-peasant farms. This process shows higher percentages of emigrants and commuters in flatland regions with strong industrial centres. Within the attraction areas of the industrial centres we find now, owing to the mentioned changes and to the declining interest in field work ripe conditions for socialization: in such places big specialized farms have been organized under the name of "agrokombinati".

Processes of this kind, which are all characterized by changes of demogeographic and economic nature, have made it possible to distinguish, as regards the degree of intensiveness of land utilization, four types of regions:

(a) The neighbourhood of towns in flatland areas, where a specialized production within the framework of the socialist sector is being formed (agrokombinati).

(b) The wider neighbourhood of the industrial centres where, under less favourable conditions for arrondissement and modern farming, the land still belongs to peasant households with a dual source of income. The poly-crop production is being readily abandoned, and a degree of specialization is taking place with the prospect of producing for the markets.

(c) The predominantly agrarian regions in the mountainous parts, in the Karst, and in the peripheral sub-Pannonian territory, where no favourable conditions for modern specialized farming exist, and from where the population is emigrating for good, owing to an underdeveloped and unsatisfactory level of land utilization.

(d) Regions which have favourable physical conditions but are situated far from the industrial centres, tend to specialize agricultural production for one branch (vineyards, fruit growing, industrial crops, forestry) under the auspices of the socialist sector (agrokombinati or co-operatives).

On the basis of the results achieved by older researchers (Melik, Ilešič) the Institute of Geography, University of Ljubljana and the Institute of Geography, University of Zagreb have undertaken systematic investigations in some selected places that can be classified in the above-mentioned types of regions. The work started two years ago has only gained in intensity when the Polish colleagues offered their helpful co-operation under the guidance of Professor Kostrowicki. Land-utilization mapping linked up with studies on the agrarian systems of the country have been undertaken by the Special Commission at the Association of Geographical Societies of Yugoslavia. The work is also backed by the teaching staffs and the students of the Chairs of Geography at the Universities. It is now generally accepted that no further progress can be made unless the activities of all Yugoslav geographers are co-ordinated.

Heterogeneous physical conditions and the vast differences in the economic standards of the regions which are mainly due to the uneven development of the pre-war Yugoslavia, largely influence the ways and means of land utilization. For this reason it has been considered imperative that the valuable experiences of the agrarian geographers of the Middle-European States be

taken into account by the experts of our country when weighing the questions of what methods of research would be most suitable to the social and physico-geographical conditions here. The work on the terrain, the investigation with questionaries, and subsequent mapping have been based to a considerable degree on the results of the Polish colleagues headed by Prof. Kostrowicki; the genetic-social aspects have been taken over from the Munich school directed by Prof. W. Hartke. We have also found valuable aid in the relevant literature of Prof. Enyedi, Hungary and Prof. Roubitschek, GDR.

With a view to agrarian land utilization, the Institute of Geography, University of Ljubljana, has started wide investigations into the demogeographic, as well as the agrarian-geographical and social problems of the villages. Since this systematic work has just recently been commenced it is impossible for us as yet to give any final picture of the ways of land utilization and agrarian production, and of the agrarian systems for the whole of Yugoslavia, Slovenia, or for any major region. Therefore our report is restricted to some selected areas investigated in the agrarian-mountainous Mežiška dolina (the Alps, the Karawanke) and the vine-growing eastern Slovenske gorice (sub-Pannonian hill-land). The characteristic feature that these two regions have had in common is a predominance of farming economy which is only very slightly relying on income from extensive farming, but is already more or less subject to modernization and rationalization. Another of their common features is the mingling of private farming with the socialist type of production. In Slovenske gorice the socialist type of economy is making headway in the vineyards; in the Alpine territory towards the forest husbandry. In order to give a better demonstration of the difference in the ways of land utilization and of the agrarian systems within the same region, we present descriptions of Mežiška dolina and of two other settlements with different microgeographical and socio-economic conditions in the vine-growing Slovenske gorice. In both regions we have chosen first one village where, owing to less favourable physical and social conditions, the old poly-crop production and private land-ownership persist (Strojno in the Alpine region, and Runeč in the vine-growing Slovenske gorice) and then two villages with specialized and rather socialized farming production (Koprivna in the Alpine region, and Nunska graba in Slovenske gorice).

The relief in Mežiška dolina shows, on the impermeable rocky stones of Paleozoic and Tertiary origin, light and truncated forms which are covered with a thicker layer of soil, and where the lime-stones from the Mezozoic form the mother rock, steeper formations occur, covered with a thinner layer of soil. Owing to the varying conditions of dissection, exposition and altitude, as well as different socio-historical development, these reliefs can be utilized in widely varying degrees by farming.

Strojna comprises a sizable complex of the mountainous world on the truncated relief forms where numerous levels of flat surface offer, particularly on the sunny sides, favourable conditions for farming. The population here live in solitary little farmsteads distributed in terraces. Since the territory is situated far from all non-agrarian centres and relatively high above sea-level (1000 metres), the modern forms of rural economy can progress here at a slower pace than in other parts of Slovenia, and this is also the reason why the old

forms of poly-crop economy have been retained. The influence of industrialization and modern social-economic development can be traced above all in the process of depopulation; young labour have emigrated, and the ratio of active rural population is as low as 20%. Only half the fields are being tilled, the rest of them are used as extensively utilized meadows, which are neither manured nor sown with grass. Stock-raising for the last twenty years has also shown a decline of about 30%. A four-year rotation system predominates: in the first year crops requiring hilling, in the second year wheat, in the third year rye, in the fourth year oats are sown. On the farming surfaces the ratio of food crops amounts to 25% in corn units of the total crop production. Among the food crops rye, potatoes, and wheat predominate in approximately the same percentage; 80% of the fodder value comes from meadows and pastures, the remaining 20% is covered by barley, oats, and beet grown in the fields. Vegetable production is very low, it amounts only to 8·3 corn units per ha, for food crops 13·4 corn units, and for fodder crops 7·2 corn units.

The stockfarming has not been specialized. Almost three fourths of the total stock in terms of animal units are cattle, half of which (in animal units) are cows, the rest oxen or young animals. One fourth of animal units comes from horses and swine; poultry is very limited in number. The raising of stock represents a leading economic branch within the framework of the entire agrarian economy, and it also strongly supports agriculture by such important contributions as supply of manure, animal power in the field work and in transport. Vegetable production per person of agrarian population amounts to 16·1 corn units and to 1·078 animal units; and per person of the active agrarian populations 84·2 corn units and 5·54 animal units.

Koprivna presents a totally different picture of land utilization and of agrarian economy. It lies in the southern part of the valley in a more strongly dissected relief of the rocky Paleozoic and metamorphic stones. This territory has a rather elevated position; most of the households are situated higher than 1000 metres above sea-level. The layers of soil are comparatively thick, but owing to superabundance of rain and snow (1452 millimetres), as well as to insufficient insolation, the soil is of inferior quality with frequent symptoms of marsh-land. Since the physical conditions along the upper line of settlements are not really favourable, larger portions of land were necessary in the past to provide living for the families—hence big land-ownership is in predominance, on the average 85 ha—whereas in Strojna, where the conditions are better, the average is 22 ha. As long as the farming economy relied on stock-raising and agriculture, no material difference existed as regards economic strength between a big farm in Koprivna and a medium-sized one in Strojna. With the rise of the price of wood and timber, considerable differences appeared in the forms of agrarian land utilization and agrarian systems. The population of Strojna have smaller household plots and no forest, therefore they maintained the poly-crop system of economy; in this place the influence of the general social and economic development is only seen in the process of depopulation and in the fact that the intensive forms of land utilization are gradually dwindling away. The agrarian economy in Koprivna, however, was quick to transform itself into forestry, which is reflected in the

growth of the forest areas. Here the main branches of economy are forestry and stockbreeding. Only 25% of the fields are cultivated. The two chief food crops are rye and potatoes, other crops are practically no longer grown. The food crops give comparatively good yields, as they are, owing to the plenty of stock, amply manured, but the meadows and pastures are not manured. The ratio of food crops is 7·5% of the total crop production; 96% of fodder crops are grown on meadows and pastures. In the stock-farming, the raising of cattle is of chief importance, the production of milk is here also duly emphasized. Horses are used to transport wood, therefore horse breeding is also of major importance; other kinds of domestic animals are kept only for direct use at home. The crop production per ha of cultivated area is 3·2 corn units—for food crops fall 13·4 corn units, and for fodder crops 3 corn units. Per person of the agrarian population there come 61·1 corn units and 4·9 animal units; per person of the active agrarian population 94·7 corn units and 6·34 animal units.

In *Runeč*, Slovenske gorice, the system of farming and land utilization had formerly been characterized by the cultivation of vineyards and orchards. The settlement is situated in the western Ljutomerske ormoške gorice, 280 to 320 metres above sea-level. The hill-land here shows mild relief forms, its gentle slopes are covered with thick layers of sandy soil or clay. The cultivation of vineyards, however, in this territory has declined in recent times, since the rather poor insolation of less steep slopes better favour other and more productive forms of economy, a change to which has also been prompted by the commercial competition of the neighbouring regions with more favourable reliefs.

In recent years the extent of the vineyard areas has decreased by half, whereas the fields and the meadows have expanded considerably. The production values of food crops and of fodder crops are fairly equal (47% to 53%). In food crops, the best yields come from potatoes, wheat and rye, which suggests that the production is mainly conducted in order to meet domestic requirements. A tendency to produce goods for sale is shown by the growing of fruit, which gives one fifth of the food-crop production. In contrast to the Alpine regions, it is only a small percentage of the fodder-crop that is supplied by meadows and pastures, while the participation of clover and maize is markedly high. The long vegetation period, particularly warm autumns, make it possible to grow crops on stubble-fields. On the whole, the four-year rotation system prevails; in the first year crops requiring hilling are grown, in the second year wheat, in the third year rye or barley and in the fourth year clover. As regards stockbreeding, a specialization for cattle is most important, milk production being here the type-determining branch. A high percentage of pigs is characteristic as well. Poultry is likewise significant. The crop production per ha of agriculturally utilized area amounts to 26·2 corn units. Crop production per person of the agrarian population comes to 11·2 corn units, and 0·6 animal units. In regard to the active agrarian population, the same figures per person are 25·5 corn units and 1·12 animal units.

Nunska Graba is a vine-growing area in the oblong valley with relatively steep slopes. Microclimatic conditions are on these slopes extraordinarily favourable for the growing of vine. Precipitations amount to 990 millimetres,

the average June temperature is 20°C. The sum total of temperature in the vegetation period never sinks below 3000°C. The chief climatic handicaps are hail and frost, which, however, are rather rare. Until World War II most of the land was owned by townsmen from Austria (Radgona, Graz), whose high-quality vineyards were cultivated by the local skilled labour. With the nationalization and the abolishment of former possessions, 70% of the vineyard areas have passed into the management of the social sector. Almost all vineyards have been re-arranged into terraces, where a mechanized technique of cultivation is now established. Areas that are not suitable for vine-growing have remained in private possession, they are run economically by farming peasants or by the workers of the "agrokombinati". The production of food- and fodder crops, as well as the role of stock-raising, is similar to that in Runeč. Private vineyards show continuous retrogression; several of them have reached the phase of decay when they are turned into meadows or sometimes fields. By re-arranging the vineyards in a modern terrace system and by improving the qualities of vines, the production of vineyards has been raised from the approximate 18 corn units per ha (such as still persists in the unmodernized private vineyards) to 50 corn units per ha.

The region under discussion shows marked differences as regards total effects of physical conditions and their significance for the social and demo-geographic development of the country. In the period of the self-sufficient economy, when farming represented the only source of living for the peasant household, no essential differences existed between the economic power of a bigger farm in Koprivna, a medium-sized one in Strojna and a small one in Slovenske gorice, as the physical conditions in the Alps were less favourable and in Slovenske gorice more favourable. With the rising prices of wood a strong differentiation has set in between the small peasant holdings and the big estates; the big-owners took advantage of the situation and were quick to raise the price of the big estates with woods, even though under less favourable physical conditions. The introduction of modern agrotechnique has lately caused a change in the valuation of the relief surfaces, and consequently a change in the technique of land utilization. That is in the Alpine regions reflected in fields being changed into meadows, pastures and forest, whereas in the vine-growing parts with better climatic conditions terrace cultures are established, which makes it feasible to use machines. Where the physical conditions for vineyards are not good, the vineyards are replaced by orchards, fields or meadows.

Regions with particularly favourable endowments for crop cultures have undergone great alterations as regards both structure of land ownership and the use of land. In such regions private landed properties had been readily passed prior to World War II into the hands of foreign farmers. Following the nationalization of those areas after the war, a big firm of industrial forestry was established in Koprivna, and a modern socialist vine-growing "kombinat" in Nunska graba. Both of these bear evidence to the fact that intensive land utilization results in a *rapid* increase of production.

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Summing up what has been said in the foregoing, we may state that the influence of modern technology in agriculture has caused a rapid retrogression of small-scale farming, and a rapid economic reorientation, in the regions with less favourable relief conditions. Depending on climatic conditions, structure of land ownership and a lower or higher degree of industrialization, these regions show different patterns of intensive utilization of lands and different directions of production. In Koprivna, where large-scale property relations and less favourable physical conditions predominate, the farmers are quickly taking up stockbreeding and forestry. Of the food crops, they grow potatoes and rye intensively on small areas, all the rest of the farming areas is left for an extensive fodder growing and stockbreeding. The rotation system has been discarded; the potatoes and rye are grown only in fields with most favourable relief conditions and are, as a rule, well manured. In Strojna the old way of production has been preserved in spite of the decrease of labour hands, and it still has the orientation for self-sufficiency. In the Alpine region, where extensive fodder production takes place on meadows and pastures, the crop yields per person of agrarian population expressed in cereal units, and the value of stock in animal units, are considerably higher than in Slovenske gorice, where the production of fodder and food crops is concentrated on smaller areas.

In the Alpine region, where extensive growing of fodder on meadows and pastures is predominant, crop production and the number of stock per ha of farming area are still stagnating on an extremely low level, whereas per person of the agrarian population it reaches, owing to the scanty population, a very high figure; however, in the vine-growing parts the picture is just in the reverse.

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A BRIEF CHARACTERIZATION OF THE AGRICULTURAL LAND UTILIZATION IN HUNGARY

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At the Warsaw Conference 1960, where mainly the methods of research were dealt with, I gave some information on the state of land use mapping in Hungary. Although our methods still hold some contestable elements, the progress made by our research workers since that time in elaborating the technique of land use mapping seems to be worthy of further discussion.

It was our intention between 1960 and 1964 to prepare the general maps (1 : 100,000) of land use in Hungary. (I am convinced that no geographical institute can accomplish a detailed survey on a 1 : 10,000 or 1 : 25,000 scale so as to cover the total area of a nation's territory in the foreseeable future. On the other hand, the selection of characteristic areas will remain a random choice as long as the different types of land utilization are not delimited according to the most important features. Anyway, land use mapping is not the only means of delimiting agrogeographical types in our practice. Our work is mainly based on economic statistics, relating to intensity, productivity, etc., which reflect both the way and the level of agricultural land utilization.)

The general map drafted on 1 : 100,000 scale represents the different forms of land use including particular information on the arable lands. The work of compiling and evaluating statistical data concerning the sown areas of communities and state farms have been carried out with the actual degree of land utilization in view. The maps indicate the average data of community and state farm areas. Since this time the purpose of investigation was to reveal the contiguous territorial types of land utilization, not all of the crops of a given unit area have been represented. We contented ourselves invariably with considering the three groups of crops occupying most of the area, of which we indicated the main crop in all cases. At the Warsaw Conference I set forth the first version of this method as represented on a specimen sheet. The sheets in manuscript cover already the total territory of the country, and the preparation of the fair copies is in progress.

Beside the afore-mentioned work, some maps of 1 : 25,000 scale have been prepared for experimental purposes. The problem of elaborating a code system lies in the fact that the average size of Hungarian co-operative farms varies from 100 to 200 hectares and therefore crops can be represented in accordance with their production area in practice.

The purpose of this large-scale mapping was to disjoin the previously established types of land utilization into finer details and to disclose unit areas of lower degree. A further aim is to evaluate the way of utilization of the natural environment and to make suggestions concerning improvement under the prevailing physical conditions.

In 1964 we undertook co-ordinating our land use mapping with the geomorphological, soil and soil-erosion mappings of the Section for Physical Geography of our Institute. The co-ordination has the following advantages:

1. It permits a particular survey of the physical conditions of agriculture;

2. It has a favourable influence on the advance of applied physical geography by closely connecting the physical and the economic branches of geography. This is of the same importance as the co-operation between physical geography, geology and pedology on the one hand, economic geography and agro-economics on the other.

For the time being the following series have been prepared: (1) geomorphological maps, (2) soil maps, (3) soil-erosion maps, and (4) land use maps based on survey records and economic statistics. After evaluating this series, we shall compile the prognostic land use maps.

The main task is now to make simpler the rather complicated phase of evaluation and to contract parts of the informatory data on the four kinds of maps. The contribution of village teachers to this enterprise and the extension of mapping to larger areas would appreciably promote the practical benefit of land use mapping. However, there remains a question to be answered: Is it possible to contrive a code system which is easy and quick to handle and by means of which we can indicate on one and the same map to what degree the physical factors accord to the actual way of land utilization. Whether it is possible or not, we cannot tell as yet, but at any rate we shall try our best in order to give a positive answer to this question within the shortest time.

According to Professor Kostrowicki,* studies in land utilization, in a wider sense, include the following categories:

1. Material bases: the physical conditions as exploited by man;

2. Social relationships: the owner, or utilizer of the land (ownership relations);

3. Forms;

4. Ways: technical conditions, intensity;

5. Trend: structure of crop production and stockbreeding, composition of orchards, forests, etc.;

6. The output: yields, production values, etc. of land utilization.

I do not mean here to enter into a dispute of methods, I only wish to state that in the course of our investigation we did not put all the categories on one and the same map (we used mostly the general map of 1 : 100,000 scale); otherwise, when establishing the types of land use, we set out from the synthetic economic indices and regarded the *output* as decisive indicator of all preceding categories. The analytical examination determines the type of land use map according to the characteristic features. Our conception differs in some respects from that of the Polish geographers: we think that details should be derived from the whole. But this is not an antagonistic difference. It stems from the particular features of Hungarian agriculture, and from the

* J. Kostrowicki: Le survey polonais de l'utilisation du sol. Land Utilization. Methods and Problems of Research. Geographical Studies No. 31. Warsaw, 1962, pp. 31—59.

fact that the geographical investigations have to be co-ordinated with the regional inquiries made by agro-economic institutions.

1. *The material bases of land utilization.* The scope of this paper does not afford a detailed description of the physiographical environment of Hungary. Therefore it is confined to the presentation of those components as may have a direct influence on the ways and output of land utilization:

(a) The relief features of the country predominated by plains are favourable for agriculture. Some 85 per cent of the agricultural territory is by 200 m below see level, but the areas 200 to 400 m above see level also offer wide possibilities for tillage, pasture and forest management, etc. However, soil erosion causes serious damages in the hilly regions of Transdanubia and in the Northern Mountains as well.

(b) The country occupies the deepest parts of the Carpathian Basin, a negative consequence of which is the small amount and uneven distribution of precipitation. The vegetation period is much warmer and receives more sunshine than one might presume, regarding the distance from the equator. Although under a continental climate, Atlantic and Mediterranean influences are equally frequent in certain areas, or in certain years. The transitional character of the climate is mainly responsible for the diversity of crop production, and consequently for a multilateral land utilization. Crops characteristic of Eastern and Western Europe (rye, oats, potatoes) and South-Eastern Europe (wheat, maize) are just as common as some subtropical plants (paprika, castoroil, Arachis, rice).

Long sunshine periods work upon the quality of certain crops, such as wheat, vegetables, fruits. High gluten content of wheat and the abundant sugar of fruits are due to hot and dry summers.

Owing to the small amount and uneven distribution of precipitation, it is indispensable that fields be irrigated, mainly in the Trans-Tisza Region.

(c) The soil varieties in Hungary are also featured by peculiar traits. A highly productive chernozem covers extensive areas, and so do the sandy and szik soils. Various types of soils are often alternating within one and the same area.

In spite of its small territory, the country possesses rather diverse natural endowments. A great number of crops are utilized in several ways. As there are no large and contiguous crop areas in Hungary, any approach to the types of production presumes a knowledge of the economic micro-features. This fact justifies the application of research methods differing somewhat from those of the larger countries with more uniform agricultural surfaces. Obviously, the multipronged production is not entirely depending on the natural features; it may be attributed in part at least to the subsistence of small-holdings till the recent past.

2. *The social relationship of land utilization, land ownership.* Most recently a basic change has taken place in the forms of land ownership. After a lengthy preparation, and also repeated regressions for which the defective economic measures of 1958 to 1961 were mainly responsible, the socialist reorganization of agriculture has been almost fully completed. At present 96·3 per cent of the agricultural area is owned by socialist farm enterprises.

The socialist reorganization of agriculture was an economic necessity. The

introduction of high technical level to small-holdings was not possible. Consequently, a disadvantageous contrast manifested itself in the pace of development of industry on the one hand, and agriculture, on the other. The gross production of agriculture increased only by 34 per cent from 1949 to 1961, while that of industry increased by 227 per cent. The slow development of agriculture reacted on industrialization, too, because part of the needs of industrial imports can be covered against agricultural produces only.

Transformation of individual farms into co-operatives was the first step of agricultural reorganization. Also the areas of state farms have decreased, since part of these, where infringing on the new co-operative farms, were handed over to the latter.

TABLE I

Share of the socialist sector in the total agricultural area (in per cent)

	State farms	Co-op. farms	House-hold plots	Soc. sector total	Indi-vidual farms	Total
1957	36·6	9·2	2·4	48·2	51·8	100
1958	36·5	9·8	2·3	48·6	51·4	100
1959	34·8	27·3	2·5	64·6	35·6	100
1960	34·0	45·2	2·7	81·9	18·1	100
1961	32·6	60·7	3·0	96·3	3·7	100

Large-scale farming had been represented by the *state farms* for a long time. The majority of them were established at the end of the forties or at the beginning of the fifties. At the start they had to face serious developmental problems. By now, however, they have attained the average of Western Europe (milk: 330 litres per cow, wheat: 30 q/ha, etc.). State farms occupy 33 per cent of the total agricultural area (including 87 per cent of the total woodland which is state-owned), and only 13·3 per cent of the total arable land. They share with 12 per cent in the gross production value of agriculture.

The enlargement of the areas of the farming units is a continual trend. In 1952 some 501 state farms occupied a smaller area than 217 state farms in 1962. Within the span of these ten years, the average size of farms increased from 1323 to 5066 hectares (forest enterprises excluded).

The inner structure of the Hungarian *co-operative farm* conforms to that of the Soviet kolkhoses. However, their system of farming shows an autonomy and greater variety concerning labour organization and the distribution of income. Household plots are relatively insignificant. Owing to a flexible economic policy, the index of agricultural production increased in the years of socialist collectivization.

Some 3700 co-operative farms were organized from about 1·4 million individual farms. The average size of these is 1300 hectares, much less than that of the state farms.

The household plots play an important role in the transition from the individual forms of farming to the collective ones, and occupy only 15 per cent of the collective farming area. A kind of small-scale farming with significant stockbreeding is conducted on them. Large-scale stockbreeding farms will

take several years to be established and require huge investments. In any case, a reduction of the household livestock before conditions of large-scale stockbreeding co-operative farms are raised would result in a perilous decrease of animal produces, affecting both consumption and exportation (40 to 45 per cent of the meat is produced for exports, meat production averaging 91 kg per capita). In per cents the household plots participate in total stock-breeding as follows: cattle 37%, pigs 36%, horses 12%, sheep 9% and the majority of poultry. They obtain forages from the co-operative farms. The household plots furnish 24·1% of the gross production of agriculture which value exceeds the national average. The total co-operative sector shares by 62·8% in the total agricultural production.

The proportion of *individual farms* is becoming more and more insignificant, occupying 3·4% of the total crop area at present. Even these are found mainly in the viticulture regions (10 to 15% of the vineyards), as the small and scattered vine-plots were not suitable to collective management.

According to production level, the farming sectors succeed the following order: state farms, co-operative farms and individual farms.

3. *The forms of land utilization* may be grouped under the following headings: arable, meadow, pasture, orchard, vineyard, forest, reeds and non-agricultural area.

Areal proportions of land utilization, 1962
(in per cent)

Arable	55·2
Garden	2·9
Vineyard	2·3
Meadow	4·9
Pasture	10·1
Total crop area	75·4
Forest	14·7
Reeds	0·3
Non-agricult. area	9·6
	100·0

Field-crop production prevails in the arable lands. It takes 78 per cent of total crop production value. Field-crops are produced even in the hilly regions and on the gentle slopes, which is a consequence of the past land-hunger of small peasants. In the Great Plain 85 to 90 per cent of the arable lands have clayey, brown-forest and chernozem soils of very good quality, and the rest consist of sandy and szik soils.

The form of the utilization of commercial gardens and orchards is not clear-cut. They produce fruits and vegetables in general, and in some places forages as well. A considerable part of the fruit trees are found outside the orchards, planted amongst vine-stocks or in the fields sporadically. Orchards are situated mainly in the sandy regions, where soils do not favour grain-crop production.

Vineyards have been gradually losing ground since the end of World War II. Still they are significant in the southern slopes of the Central Mountains where viticulture is traditional (introduced by the Romans in Transdanubia). The wines of Eger, Tokaj and Badacsony are well known abroad. Another important wine region of relatively recent origin has developed on the Sand Ridge of the Danube-Tisza Midregion.

Up to the second half of the 19th century, farming had been based on the utilization of natural grasslands in the Trans-Tisza Region, where the significance of stockbreeding on natural pastures surpassed that of crop production. The river-controls and the temporary boom of grain-crops were accompanied by the break-up of grasslands in the second half of the past century. From that time on, grasslands dwindled rapidly and were mainly preserved in those areas where soils were unsuitable for crop production. In the Great Plain meadows and pastures primarily occupy sandy and szik soils. Transdanubia is the only Hungarian region where stockbreeding is coupled with dairying.

The geographical distribution of forestlands, taking only 14 per cent of the total territory, is rather uneven, owing partly to relief conditions but also to the fact that the woodlands of the Great Plain had been almost completely deforestated in the Middle Ages. Nowadays the majority of forests are found in the region of the Central Mountains. The afforestation of the Great Plain is in progress.

Agricultural land utilization in Hungary extends practically on the totality of cultivable lands. River control and soil amelioration are insignificant as yet. A rapidly growing industry, a quickly developing system of communication and the concomitant progress of urbanization render it necessary that also the non-agricultural areas should be utilized to a fuller extent. At the same time, the socialist reorganization of agriculture has involved an expansion of the built-over tracts within the agricultural areas as well.

4. *The ways of land utilization* represent the basis for the outputs and standards of land utilization. Since the ways of land utilization mostly depend on economic development and ownership, they have changed much more rapidly than have the forms which contain them.

Before World War II, Hungary had been classed with the most underdeveloped countries of Europe. Of all economic branches agriculture was in the backwardest condition characterized by a predominance of feudal latifundia. Small-holdings mainly produced for self-sufficiency, hindering hereby the advance of specialization. In addition, the widest extremes were shown by a number of capitalistic large-scale farms on the one hand, and dwarfholdings on the other. The agricultural labour force of lackland peasants, one-third of the total agricultural population, served as a permanent and cheap labour reserve. Mechanized production was introduced into a small number of up-to-date farms only, anyway, land utilization was based upon cheap manual labour.

Following World War II, the system of latifundia had been abolished by the land reform, and a great number of small-holdings came into being either as enlarged dwarfholdings or farms of the former lackland agricultural labourers.

In the 1950ies a disproportion manifested itself between the pace of industrial and agricultural developments. Industrialization resulted in the shortage of agricultural labour and increased at the same time the demands of agricultural produces. The new trend of land utilization was started by a large-scale application of modern techniques. However, the small-holdings were as many obstacles in the way of the general mechanization.

It was only at the beginning of the sixties that socialist reorganization of agriculture raised the possibility of a new, up-to-date trend of land use, the most important factors of which are: mechanization, fertilization, amelioration and irrigation. Specialization will result in the decrease of crop species and in a change of the traditional system of crop rotations. Mechanization has made considerable progress in the recent years. The number of tractors doubled within 5 years, at present we have 60,000 tractors. Considering the number of tractors per farm size, Hungary has already attained the level of Central Europe, and exceeded the countries of South Europe and the Balkans. The level of mechanization is not uniform in every branch of agriculture. Cereal production is mechanized for the most part, but in plant-protection, market-gardening and stockbreeding manual labour is still predominant. The mechanization of agriculture is not only a matter of financial means; it must be carried out without causing unemployment in agriculture. At the present phase, when the modernizing of the means of production and the developing of chemical industry are the main objectives, a greater number of unskilled labourers cannot be employed in industry.

The next task is to mechanize agricultural transport. The large-scale farms once organized urgently demand that the means of transport should be augmented. The salability of agrarian products considerably depends upon the capacity of transport.

An important task of up-to-date land utilization is to increase the fertility of soils. This question has been neglected for a long time, so that the nutritive power of the soils diminished and yields decreased during the first decades of this century. An improvement was witnessed in the 1950ies, the speed of which, however, was not satisfactory.

The needs of soils for organic materials cannot be covered by stable manure production, therefore other sources have to be made use of, such as compost, green manure, agricultural and industrial waste materials, etc. The use of chemical fertilizer became more general, but it still lags far behind the countries of Central and Western Europe (some 54 kg/ha chemical fertilizer was used in 1962).

About 20 per cent of the total territory is subject to soil erosion, causing a damage of about 500 million Forints every year. Soil deterioration is particularly regrettable on the slopes under crop; about 70 per cent of the soil deterioration takes place on an area of 500,000 hectares. A comprehensive programme of soil amelioration was drawn up in 1963 with the collaboration of geographers.

Chernozem soil extends over large areas in the Great Plain. Nevertheless, some 40 to 45 per cent of this territory requires amelioration. Here the acid soils can be ameliorated most easily, but the case with the szik soils in the Trans-Tisza Region is a different proposition, since it is very expensive;

therefore they are utilized as pastures or fish-ponds instead of arable cultivation.

The use of chemicals has become general. Together with these, plant protectives are applied to a considerable extent. Weeding by herbicides results in labour savings and in surplus yields as well. From the point of view of land utilization, the droughty climate is the most unfavourable feature of the natural conditions of Hungary. The variability of precipitation causes serious losses in yields. Accordingly, irrigation is the primary need of Hungarian agriculture. A perceptible advance in this field has only been witnessed in the latest years. A developmental plan of irrigation had been scheduled already in the past century. But in spite of the advantages offered by a great number of surface streams even in the most arid areas, and of the several technical projects, merely 17,000 hectares were irrigated in 1939. After World War II a system of irrigation plants has been built, in which the dam of Tiszalök and the Eastern Main Channel branching off therefrom are the most significant. Subsoil- and strata-waters were utilized in order to extend irrigation. Since 1961 the areas under irrigation are expanded at a rapid pace, their territory exceeds 400,000 hectares already. Forages have come to fore between the irrigated crops, as against rice and vegetables of the previous years. If forage production on irrigated lands prevails, then a fundamental change of the foraging conditions in the Great Plain will increase the significance of stockbreeding of the region.

5. *The trend of land utilization* reflects the structure of crop production and stockbreeding as influenced by the physical conditions, ownership and the forms and ways of land utilization.

(a) *The utilization of arables*

The shape of arable utilization in Hungary may be characterized by a high proportion of the sowing area of cereals on the one hand, and by a great number of crop varieties produced on smaller areas, on the other.

The high proportion of cereals is due not only to physical conditions but also to the self-sufficient small-holdings which grew cereals and forages for their own needs even though the farming conditions were not suitable to these crops. Accordingly, a paradox situation arose: the worse the soil for cereals, the larger its sown area was (e.g. rye attained the highest areal proportion in the most arid sandy regions of the country: 35 per cent of the sown area).

Cereals (inclusive maize) occupied 76 per cent of the sown area in 1935 (80 per cent in the Great Plain). The areal proportion of breadgrains amounted to 45 per cent, owing to the significant wheat exports, although considerable state subsidization was required in order to maintain the competitiveness of wheat exports. The imports of manufactured goods was balanced by agricultural produces. Recently, the area of cereals diminished to 65 per cent of total agricultural area, and the major part of this is sown to forage crops. The areal ratio of breadgrains is now almost half of its prewar proportion. This change mainly indicates the intensive transformation of the forms of land utilization. However, mention must be made of the fact that the increase of yields is slower than the decrease of sown areas and therefore wheats are imported regularly.

Within the structural change of cereal production, the sown area of rye decreased first, followed by wheat, whereas the sown area of maize has been enlarged (maize is utilized as forage). The restriction of the production of wheat made it easier to concentrate its area. At present the Central Tisza Region may be regarded as an explicitly wheat-producing region. The old varieties of wheat have been replaced in recent years by the extremely productive Soviet Besostaya and the Italian San Pastore varieties. Consequently, yields began to increase at a faster pace, and by all likelihood wheat production will attain the level of self-sufficiency within a short time. Maize shows the largest areal proportion and is the most important crop in the south-eastern part of the Danube Valley and on the loess ridge of the area beyond the Tisza River. The purchase data of maize are relatively low, because it is mainly utilized as forage by the farms in order to fatten the livestock. Owing to their lack, green forages and hay are often replaced by maize, chiefly in the Great Plain. Although no typical maize regions can be delimited in Hungary, where pig-breeding prevails a high proportion of maize may surely be inferred.

Parallel with the decrease of the sown area of cereals that of the industrial crops, forages and vegetables, etc. have been enlarged. Of the industrial crops, sugar-beet is the most significant followed by some oleaginous and fibre crops (mainly sunflower and hemp) and by tobacco. Since the end of World War II the areal ratio of the industrial crops has been quadruplicated, occupying at present 5 to 6 per cent of total sown area. Industrial crops, the sown areas of which are no more enlarged, have not become typifying factors of any region in Hungary. After World War II the areal ratio of sugar-beet has trebled. The manufacture of sugar produces surplus for exportation as well. Sugar-beet production is concentrated on the clayey soils of the southern part of the Great Plain and on the Little Plain. There are 11 sugar factories working with high capacity and possessing large supply areas in Hungary.

Sunflower seeds are mainly produced in the north-eastern part of the country. During and after World War II, its production was increased. However, the sown area of sunflowers has diminished parallel to the growth of the pig-stock, and about 20 per cent of sunflower oil is exported.

Of the oleaginous crops, poppy is the most remarkable, as Hungary covers 10 per cent of the crude morphin production of the world. Subtropical crops, such as castor oil and arachis, are of less importance. Tobacco is mainly produced in the north-eastern region of the country, and is also consumed by the chemical industry, because of its high nicotine content.

The sown area of roughages has been mainly increased in the recent years, so that it now exceeds the prewar proportion by about 50 per cent. Since the arid climate does not favour roughage production, its sown area had to be increased in the western and south-western part of the country. Of the roughages, lucerne and silage maize have shown a considerable upturn in the Great Plain, partly as a consequence of the development of irrigation. The warm summers abounding in sunshine are advantageous for seed production. The quality of Hungarian lucerne seed is one of the best of the world. The sown area of silage maize has also been expanded, although it is still far from being

able to solve the most serious problem of the Hungarian forage balance, i.e. the lack of protein.

The vegetable growing is particularly important from the point of view of international division of labour as well. Vegetables are grown intermixed amongst arable crops which is a special feature of Hungarian vegetable production. There is only one contiguous vegetable region in the country: the traditional paprika and onion districts of Trans-Tisza Region (Szeged, Makó) with the vegetable supply-belt of Budapest. The home consumption, as well as the exportation, of both raw and canned tomato, paprika, onion and cucumber, to mention the most important species only, has shown a rapid increase lately. Therefore their sown areas have been enlarged by irrigation in the Great Plain and Transdanubia. By all likelihood, the structure of crop production will be changed in favour of forages and vegetables in the forthcoming years.

TABLE II

Sown area of the main crops, 1962

	Area (in 1000 ha)	Total sown area (in per cent)
Wheat	1095	21·3
Rye	232	4·5
Rice	19	0·4
Barley	548	10·7
Oats	84	1·6
Maize	1288	25·9
Sugar beet	125	2·4
Hemp	22	0·4
Tobacco	19	0·4
Sunflower	124	2·4
Potatoes	209	4·1
Paprika	17	0·4
Tomato	17	0·4
Other vegetables	82	1·9
Silage maize	240	4·6
Lucerne	333	6·5
Clover	65	1·3

(b) *The utilization of permanent crops* has always played an important role in the development of Hungarian agriculture. Both fruits and vegetables are traditional branches of agricultural export. The main problem of the development of permanent crops lies in the fact that they are still unsuitable to large-scale production, and the renewal of their existing areas is a more serious task than the enlargement of them. Vine- and fruit-plants are usually intermixed, and the majority of fruit-trees are scattered in other crop areas. The number of fruit-trees has doubled since the end of World War II. At pre-

sent there are nearly 100 million fruit-trees in Hungary. The most important fruit production region is the Danube-Tisza Midregion comprising one-fourth of the total stock of fruit-trees. Although plums are the most widespread, apples are the most precious fruits in Hungary, showing definite features of large-scale production; the volume of export in winter apples increases from year to year. Apricots and peaches also belong to the most valuable fruits. Recently the berry-fruits (raspberry, black current) have become widespread in the mountainous regions. Fruits occupy one per cent of the total territory and contribute with 5 per cent to the gross production value of agriculture.

Viticulture is a specific trait of the land utilization in Hungary. Vine-plants have a long past to look back on, and wines were important articles of export and import already in the Middle Ages. The regions of viticulture, situated on the southern slopes of the mountainous areas, furnish 40 per cent of the gross production value of agriculture. Owing to centuries-old traditions and the special qualities of wine-cellars, Hungarian wines have excellent bouquets and are well-known all over the world. Subsequent to the phylloxera "disaster" of the 19th century, an intense vine plantation work was started in the sandy areas of the Danube-Tisza Midregion. The majority of wines, of a poorer quality though, are produced in this region. There are 14 wine production districts in Hungary producing mainly white wines. With an annual average of 4 million hectolitres, Hungary takes the fourth place in the wine production of Europe. Ten to fifteen per cent of the wines are exported. The area of dessert grapes, temporarily occupying 10 per cent of the vineyards, will be enlarged in the future. Viticulture is in urgent need of new vine-stocks rather than the enlargement of vineyards.

(c) *Stockbreeding*

The trend of stockbreeding is determined primarily by arable forages, since the utilization of natural grasses is of a complementary character. The arid climate favours grain-forages rather than roughages. Consequently, pig keeping plays an outstanding role in the livestock husbandry of Hungary. The production value of stockbreeding still lags far behind that of crop production. The numerical changes of the past decades may be characterized, besides the stagnation of the stock of cattle and poultry, by the particular increase of the ratio of pigs and sheep, and by the considerable decrease of the number of horses.

TABLE III

The structure of livestock (in thousands)

	1935	1956	1958	1961	1963
Cattle	1 911	2 170	1 937	1 971	1 946
Cow	961	891	895	879	803
Pigs	4 674	6 056	5 338	5 921	6 238
Horses	886	729	724	463	360
Sheep	1 450	1 930	2 050	2 643	3 043
Poultry	21 920	22 820	24 880	27 240	27 490

There is practically one kind of cattle to be found in the country: the Hungarian red-spotted cattle, which is a cross-breed of the Swiss Simmenthal and the ancient Hungarian grey cattle. This type is equally good for meat and milk, and was utilized also as draught animal in previous days. However, meat and milk production must be separated in large-scale farming. At present the yields of milk are low in Hungary: 2200 litres per animal, and expensive production costs make its economic efficiency problematic. The high proportion of cows (42 to 43 per cent) indicates the relative backwardness of milk production. As beef is not a much favoured meat in Hungary, a large number of cattle is exported. The increase of yields rather than the numerical raise of the cattle-stock is planned for the future.

The bulk of meat (70 to 75 per cent) and lard is supplied by the *pig-stock*. In relation to the number of inhabitants, only the Danish and the Brazilian pig-stocks are superior to the stock in Hungary. The proportion of porkers has become considerable in the recent years. However, mainly the cross-breeds of porkers and lard pigs are kept, corresponding to the peculiar forage basis, but also owing to the traditional way of feeding. The pig-stock presents the highest production value in the stockbreeding branch of agriculture.

Hungary used to be one of the most renowned *sheep-breeding* countries of Europe. But the break-up of pastures, as well as the restricted markets of wool all over Europe, resulted in a decline of this trade in Hungary. The sheep-stock kept on diminishing nearly up to 1950, from that time on, however, it is increasing (Table III). The sheep-stock consists of merino breeds at present. Sheep are mainly bred for wool, but they are milked as well, and fine-quality curd and cheese are made of their milk. The consumption of mutton is not general in Hungary. Unfortunately, by a poor feeding the breeders make ill use of the unpretentious animal, thus affecting the quality of their wool and meat. Wool yields, which fall short of the prewar average (3·6 kg per animal), must be increased, since 40 per cent of the raw material requirements of the textile industry is covered by imports.

Poultry-breeding recently seems to be of major importance in Hungary than in other East-European countries. Per capita consumption is fairly high (12 kg). The greater part of the poultry stock is bred for meat, small-scale poultry husbandry being rather unfavourable for egg production.

6. *The outputs of land utilization.* The forms, ways and trends make out together the results of land utilization. Although the territory of the country is small and the forms of utilization hardly differ from each other, there are conspicuous regional divergencies in the standards and efficiency of farming, which is mainly due to historical reasons, though also the climatic conditions may have had a role in the development of the diverse regional standards. Accordingly, the more developed ways of utilization are to be listed in the western part of the country, where abundant precipitation and somewhat less severe historical circumstances raised favourable conditions for them. The technical innovations also have had an appreciable influence on the progress of land utilization. After a 40 years stagnation, the crop production shows a noticeable, though not yet satisfactory stride.

The efficiency of land utilization cannot be sized up in natural units only, since the production values of the different produces often vary by regions.

It is the aggregate production value that represents the real efficiency of land utilization. In some countries yields are measured in terms of cereal units which, however, do not fit for rating vegetables and industrial crops.

TABLE IV

Yields of the most important arable crops
(in q/ha)

	1931/40	1950/57	1957/61	1962
Wheat	13·3	14·1	15·0	17·9
Barley	13·4	16·8	17·9	20·9
Maize*	18·4	19·4	23·1	25·1
Sugar-beet	199·1	180·2	212·0	211·6
Sunflower	9·5	10·0	11·0	10·6
Potatoes	67·2	85·0	104·6	90·1
Lucerne**	39·6	34·9	33·6	30·7
Crimson clover**	31·8	34·5		27·6

* grain
** hay

In 1962, the aggregate production value of agriculture amounted to 63·5 billion Forints, of which crops contributed with 57%, stockbreeding 40% and the other branches 3%. Agriculture brought home 19% of the total national income. On an average it produced about 7500 Ft/ha (forestry included). This means an increase of 40% or so as compared to 1949. Still more conspicuous results can be recorded if the achievements are assessed by an approach from the angle of productivity indices: the annual production value per one agricultural worker is 55% higher than it was in 1949 (39,000 Ft).

TABLE V

Main agricultural yields in 1962

	Mill. q.	Animal produces	
Wheat	19·6	Pork and beef	4·5 mill. q.
Barley	11·4	Poultry	1·3 mill. q
Maize	32·4	Lard	9·0 mill. q.
Sugar beet	26·5	Milk	1·8 bill. l.
Sunflowers	1·3	Eggs	1·8 bill pieces
Potatoes	19·0	Wool	94·0 thousand q.
Apple	3·1	Honey	44·0 thousand q.
Other fruits	5·7	Fish	200·0 thousand q.

From the point of view of further development it is not indifferent either in what way the goods produced are made use of. For example, when the results of utilization are consumed within the farm only, the standard of farming is still stagnating somewhere at the level of self-sufficiency economy. In that case living standards manifest themselves in food consumption, and the increase of production is limited.

A system of self-sufficiency has characterized the husbandry of small-peasants for a long time, which is partly still subsisting in the co-operative farms. The former small-holders, now members of the co-operatives, intend to supply themselves with their own-produced bread, milk and meat, in general. Despite of this fact, market has been extended by collectivization. The efficiency of land utilization is realized mainly in monetary values. The chief indicator of the living standard is the degree to which industrial goods are consumed.

The development of commodity production is shown by the fact that while the index of agricultural production increased only by 4% from 1958 to 1962 (the year of 1962 was extremely droughty), the value of commodity production increased by 21%, i.e. five times faster than agricultural production. Crop production and stockbreeding share with different proportions in commodity production: 56% of the commodities consists of animal produces.

7. *The areal types of land utilization.* Beside the analytic examination of the elements of land utilization our investigations aimed at the synthetization of the Hungarian types of land utilization as well. When doing this, we started out from the efficiency of utilization.

The investigations were made in order to determine the basic types relying upon those characteristic branches which denote specialization. Of course, the American standard cannot be used as measure for the intensity of specialization in Hungary.

Hungary has been divided into 14 regions in which practically 6 main types repeat themselves in discontinuous areas.

1. Intensive farming based on cattle-breeding (18·2% of the total agricultural area) where a well developed dairying is supported by an extensive roughage production. Porker-breeding is pursued as a complementary branch. Industrial crop production is relatively significant. Yield and production value per unit area is high. In the western part of the country the type of farming followed a course of development similar to that of the Vienna Basin.

2. The type of farming of the mountainous districts (9·6% of the total agricultural area) may be characterized by cattle-breeding and is to be found in Transdanubia, in the northern region of the Central Mountains, in basins and valleys, and on the gentle slopes. Yields are low in general, however, that of the arable crops are fairly high, owing to the natural conditions. Fruit production began to develop recently. On the mostly barren pastures of the mountains sheep are kept. Cattle are fed on forages produced in the valleys.

3. The type of fruit production and viticulture (21·4% of the total agricultural area) is characteristic of the southern foreground of the Central Mountains and the sandy areas of the Great Plain. Stockbreeding plays a secondary role, and crop production serves mainly the food-supply of the local inhabit-

ants. In the Nyírség (north-eastern part of Hungary) this type is complemented with potato- and industrial crop production. Cattle-breeding is relatively significant.

4. The type of vegetable production (7·8% of the total agricultural area) developed originally in the supply-belt of Budapest, but now it is extending east- and south-eastwards and occupies the northern part of the sandy area of the Danube-Tisza Midregion. This type, as well as the former one, is marked by intensive features and a high production value per unit area. The backward conditions of stockbreeding and the excessive use of manual labour are serious problems to be solved. The specialized branches are still insufficiently mechanized.

5. The type of wheat production and pig–poultry breeding (35·1% of the total agricultural area) is regarded by foreigners as characteristic of the whole of Hungarian agriculture. Developed in the loamy area of the Great Plain, it may be featured by arable crop production almost exclusively (the szik soils are very poor pastures for sheep). Coarse-grain production is the most important factor determining the trend of stockbreeding. The way of utilization is underdeveloped, but the efficiency may be considered fair.

6. The mixed type (7·9% of the total agricultural area) does not comprise any characteristic branch of production. This type, being a large-scale continuation of the self-sufficient small-holdings of former periods, will be gradually liquidated.

I. BOUNDARIES

A. Administrative

state

province (voivodship)

county (powiat)

commune (gromada)

B. Ownership

state

collective

private

other

C. Limits of main uses

D. Other limits and boundaries

natural reserves

II. AGRICULTURAL LAND

A. Agrarian structure

1. fragmentation of land holdings (farms)
average number of arable plots per 1 land holding (farm)

up to 5

5 to 10

over 10

2. subdivision of land (percentage of agricultural area)
land holdings (farms) up to 5 ha

over 50 percent of agricultural land

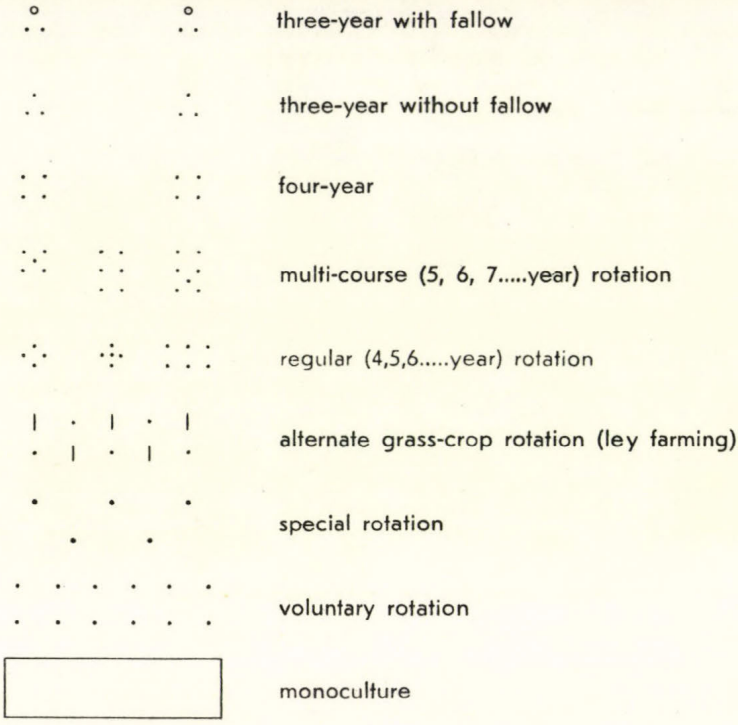
over 25 percent of agricultural land

B. Arable lands

1. crop rotation

two-year with fallow

two-year without fallow



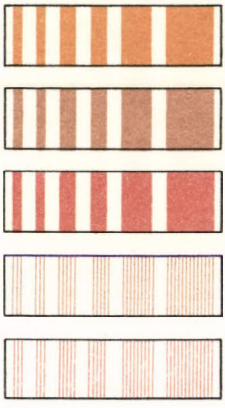
2. orientation in arable land utilization

a. exhaustive crops (mainly cereal)

exhaustive crops occupy more than:

20% 30% 40% 60% of arable land

with preponderance of:

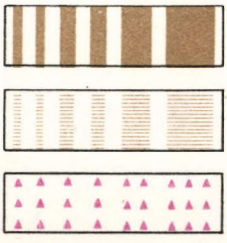


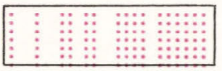
b. intensifying crops (mainly root or ridged up)

structure forming crops occupy more than:

20% 30% 40% 60% of arable land

with preponderance of:





oleaginous

fibre

vegetables

fodder roots

c. structure forming crops (papilionaceous)

structure forming crops occupy more than:

20% 30% 40% 60% of arable land

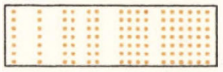
with preponderance of:

clover

lucerne

serradella

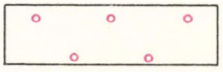
lupine



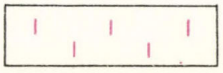
peas

beans

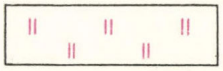
d. share of industrial crops
over 5 percent of the cropped area



oleaginous –rape seed and agrimony

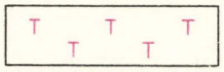


fibre plants–flax



–hemp

sugar beet



tobacco

3. gardens
home-yard gardens

with built up area

larger complexes of home-yard gardens

commercial gardens

heating installations

hot beds

green houses

4. idle land

non utilized

utilized for grazing

C. Perennial crops

1. orchards

home-yard orchards

with built up area

larger complexes of home-yard orchards

commercial orchards

unproductive

productive

kinds of fruit trees

prevailing species:

apple trees

pear trees

plum trees

cherries trees

sour cherries

peach trees

apricot trees

olives

almond trees

citrus trees

2. fruit trees nurseries

3. small fruit bushes

4. vineyards

5. semiperennial crops

a. rhubarb, strawberries

b. lavender

c. hop

d. other

6. non fruit trees nurseries

7. allotment gardens

8. intercultivated arable and perennial crops

arable crops prevailing

perennial crops prevailing

9. perennial crops with intercalary

vineyards

meadow or pasture

intensifying crops

exhaustive crops

structure forming crops

D. Permanent grasslands

1. natural associations

a. alpine meadows

on alkalic site

on acid site

b. xerothermic associations

on hard rock

on soft rock (steppe)

2. non natural associations

a. post-bor (dry, acid)

on dunes (loose growth)

on dunes (compact growth)

on flat land *(Nardeta)*

b. post-grond (dry, non acid)

fertilized from arable land

fertilized from forest

without natural fertilization (top gronds)

c. post-tęg (inundated)

on muds

boggy

on sands

d. bog (bielawa)

on peat bogs (meadow bogs)

fed with springs

reeds and other aquatic vegetation

on land

on water

3. management

unmanaged

managed

× × × fully

v v v partly

degraded

4. utilization

mowing

one harvest

two harvests

alternate, mowing and grazing

grazing

E. Animal breeding

Number of animal units (500 kg) per 100 hectares (250 acres) of agricultural land (shown by directions of coloured strips)

up to 60 units

60—80 units

more than 80 units

III. FORESTS

A. Dense forests

1. exploitation by clearing

Z H clearings

young growth up to 20 years

immature 20—40 years

fallable or nearly fallable 40—80 years

old stand over 80 years

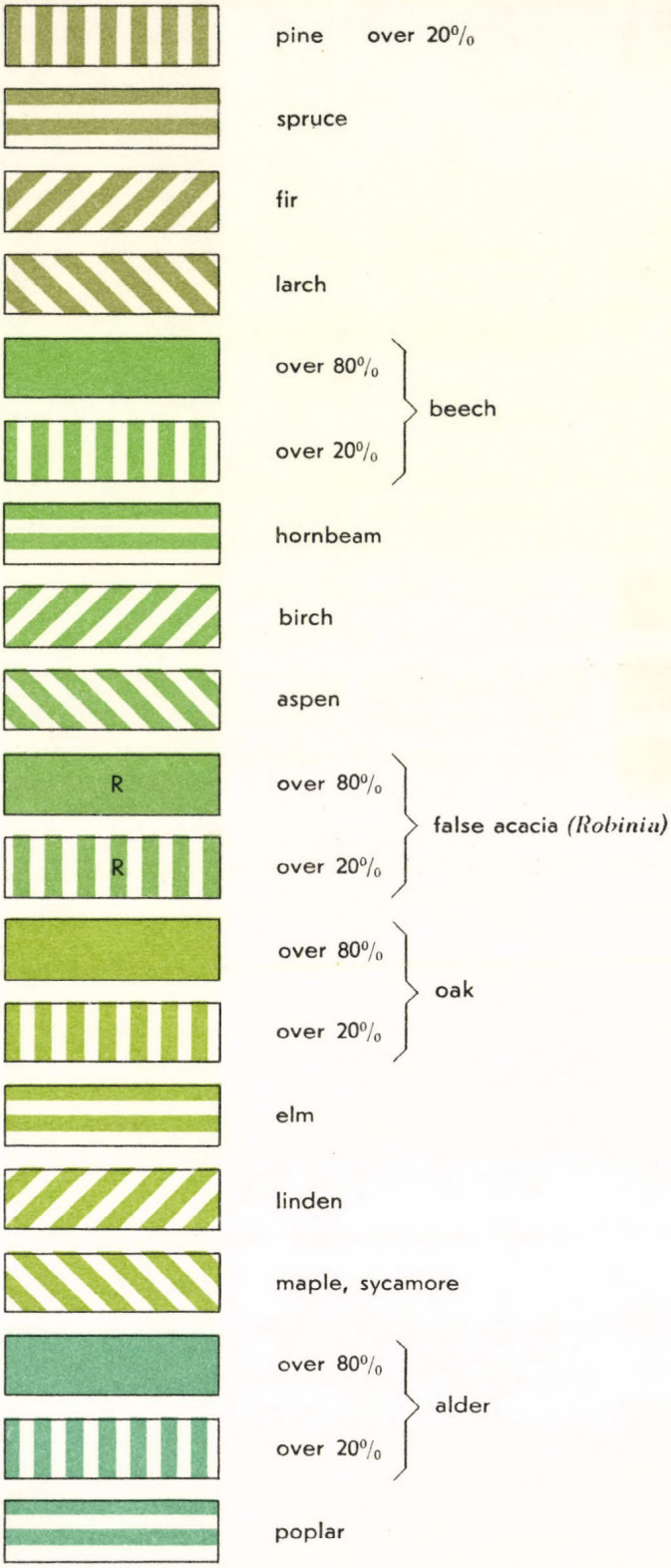
2. exploitation by group or selective felling

mixed age stand

B. Species of trees dominating

1. compact woodlands

pine over 80%


pine over 20%
spruce
fir
larch
over 80%
over 20%
beech
hornbeam
birch
aspen
R
R
over 80%
over 20%
false acacia (Robinia)
over 80%
over 20%
oak
elm
linden
maple, sycamore
over 80%
over 20%
alder
poplar

false acacia *(Robinia)*

4. on łęg habitat (inundated)

willow

alder

osier holts

5. high moor associations (peat bog)

dwarf shrubs

dwarf shrubs with pine or mountain pine

intermediate moor overgrown
with leafy trees and shrubs

IV. WATERS

A. Kinds of water

1. current waters

2. standing waters

artificial reservoirs (ponds)

retention reservoirs

land periodically inundated
by reservoir waters

B. Water control constructions

dams

dykes

C. Water utilization

1. by population and industry

water pipe lines

aqueducts

sewage canals

2. by communication

rafting waters

ash

willow

2. special stands

R

game reserves

forest trees nurseries

3. scattered or degraded woodlands

a. non used additionally

pine

beech

linden

willow

b. used additionally (examples)

C. Brushwoods

1. on bor habitat

mountain-pine

juniper

heather moorland

bilberries, whortleberries

other

2. on lasobor (mixed forest) habitat

3. on grond habitat

fresh (shade) associations (hazel, hornbeam, alder, raspberries, etc.)

dry (heliophilous) associations (gorse, wild roses, blackberries, black thorn, macchia, etc.)

navigable waters

3. for energy production

4. for agriculture

surface drainage

drainage channels

irrigation channels

mixed use channels

under drainage

acting

non acting or neglected

terracing

5. for fishing

a. fresh water habitats

extremely oligotrophic

oligotrophic—eutrophized

eutrophic

dystrophic

b. salt waters

brackish

salt

V. SETTLEMENT AND ASSOCIATED NON AGRICULTURAL LAND

A. Residential areas

1. compact lay out

high over 7 storey

3—6 storey

1—2 storey

2. loose lay out

high over 7 storey

3–6 storey

1–2 storey without farm buildings

among trees

with farm buildings (small farming)

large scale (large scale farming)

temporarily used

B. Industrial areas

intensively built up

extensively built up

non utilized

working non working

mills

C. Mining areas

1. deep mining

working non working

mines

oil or gas wells

2. open cast mining

working

non working

P sand

Ż gravel

G clay

K quarry

3. mining fields

used as arable lands

used as pastures

non utilized

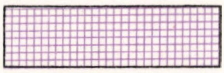
D. Agricultural—industrial areas

technical service of agriculture

poultry, pig fattening, fur animals farms, etc.

E. Commercial areas

warehouses



market areas

F. Communication areas

1. railway

2. motor car

3. port installations

4. airplane

5. railways lines

standard gauge

narrow gauge

industrial only

funicular

6. roads

hard surface

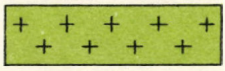
main

secondary

field

G. Public utilities

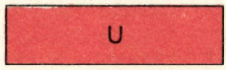
parks, green areas, etc.



cemeteries

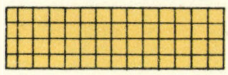
water works

H. Recreation areas



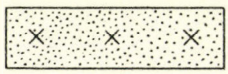
health resorts constructions

amusement areas

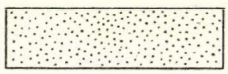


play or sport grounds

beaches:



managed



non managed

I. Other constructions of tourist interest

churches and monasteries

tourist houses and camps

ruins

castles, palaces, etc.

VI. UNPRODUCTIVE LAND

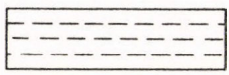
A. Because of natural conditions

barren rocks

quick sands

gravel fields

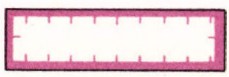
stone fields



swamps

B. Derelict lands

1. diggings



dry

filled with water

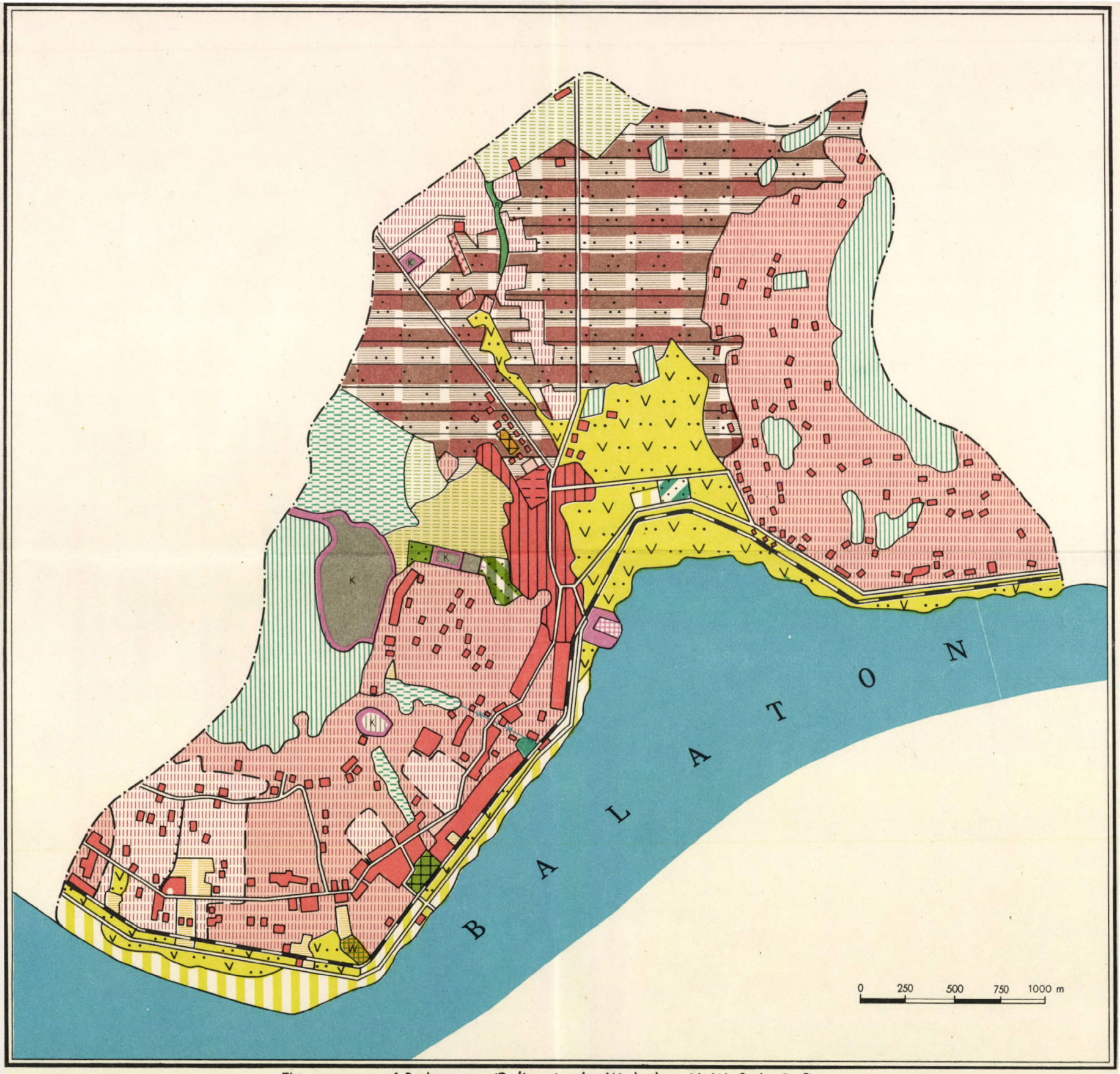
peat hags

2. heaps (waste, etc.)

barren

overgrown, with trees or shrubs

VII. SPECIAL AREAS



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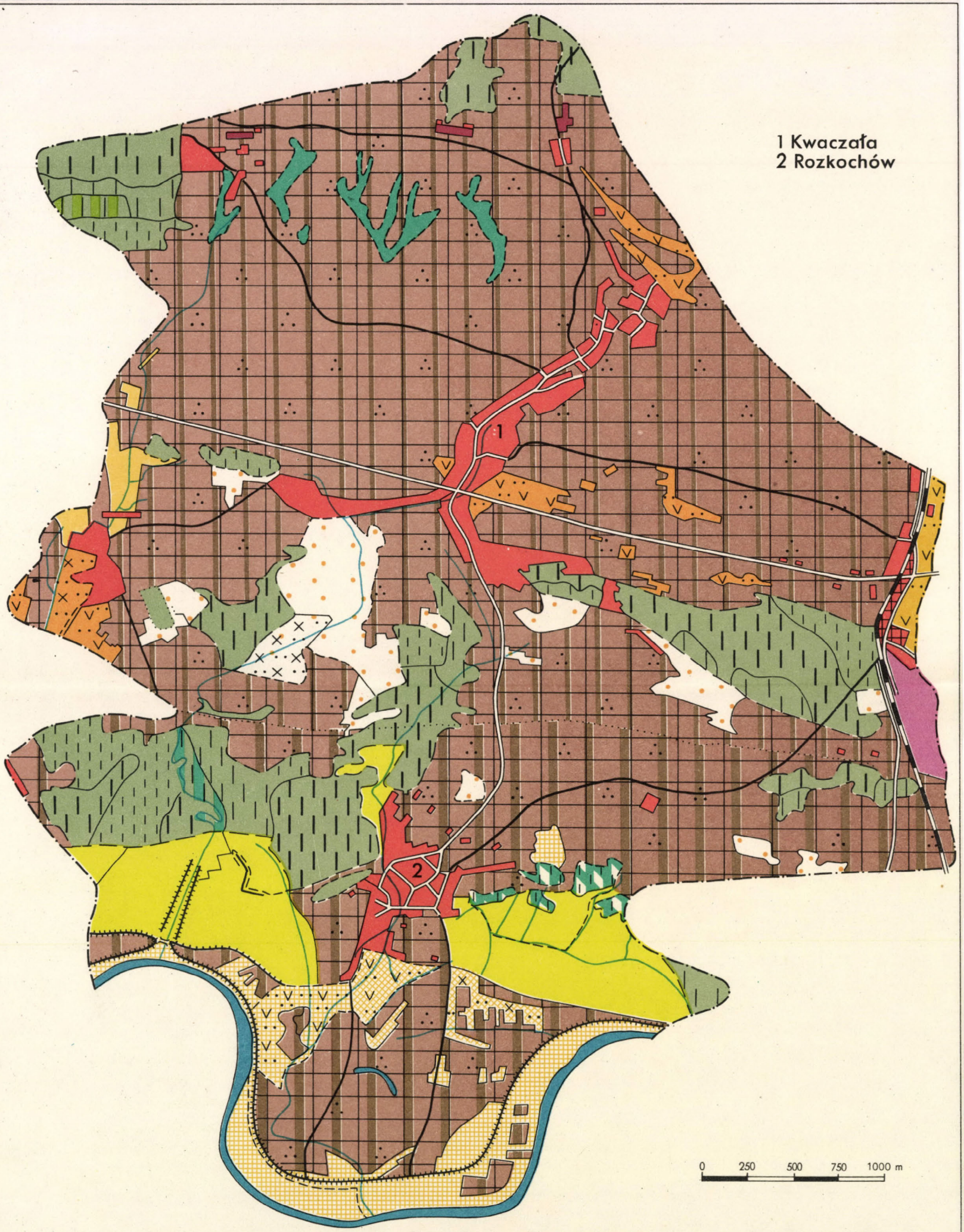

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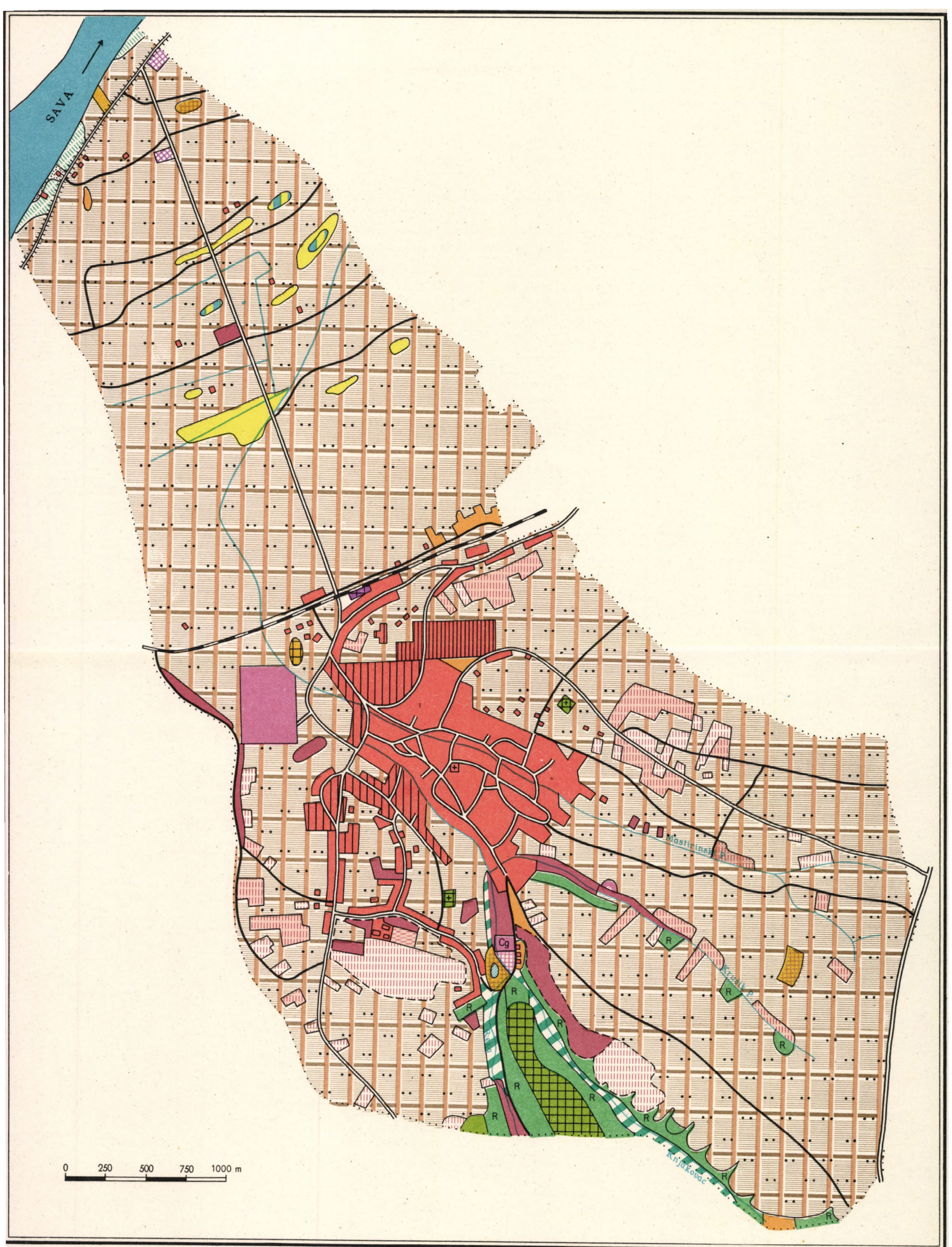

The commune of Železnik (J. Kostrowicki, D. Kowalczyk, W. Jankowski, R. Szczęsny).

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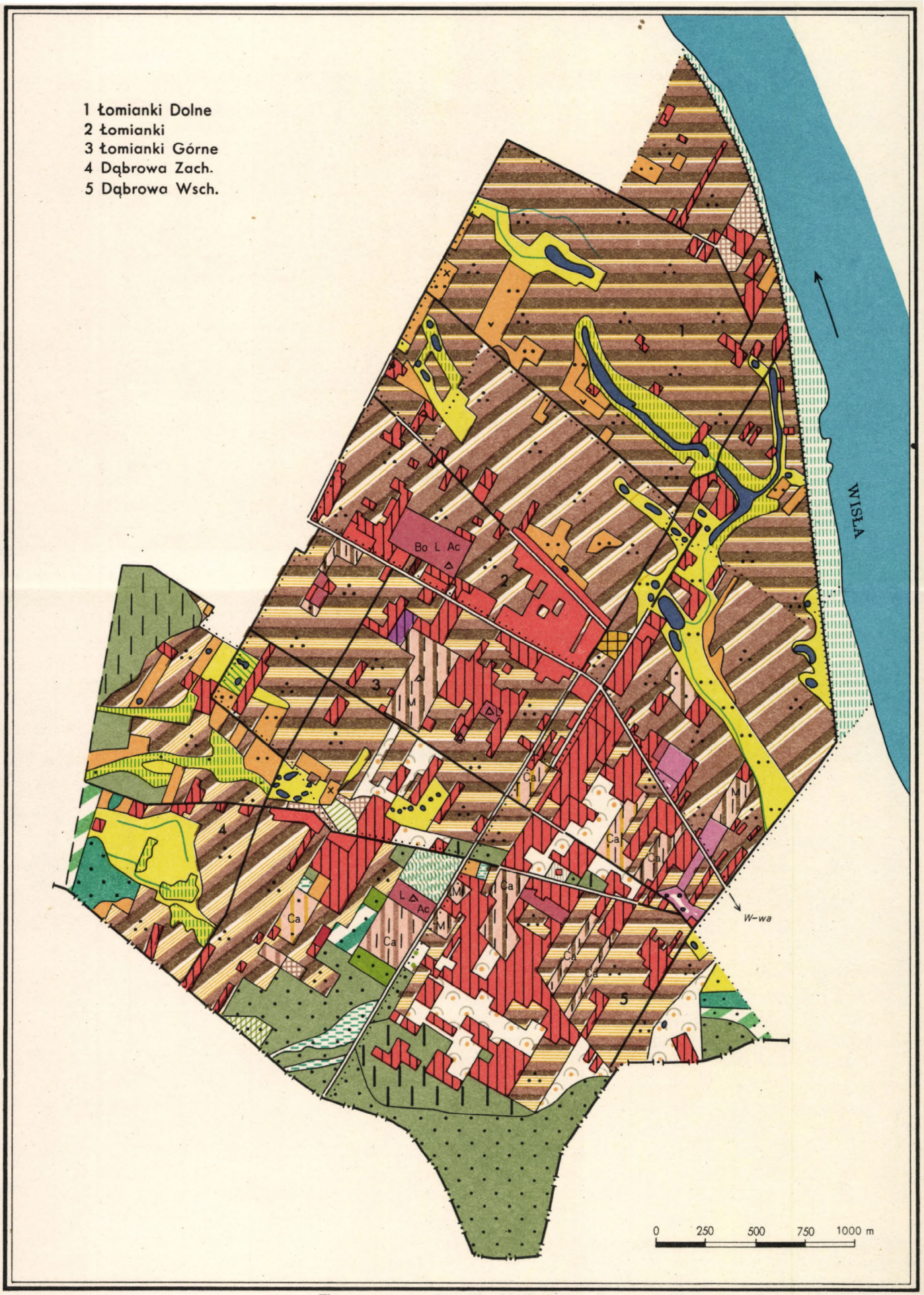

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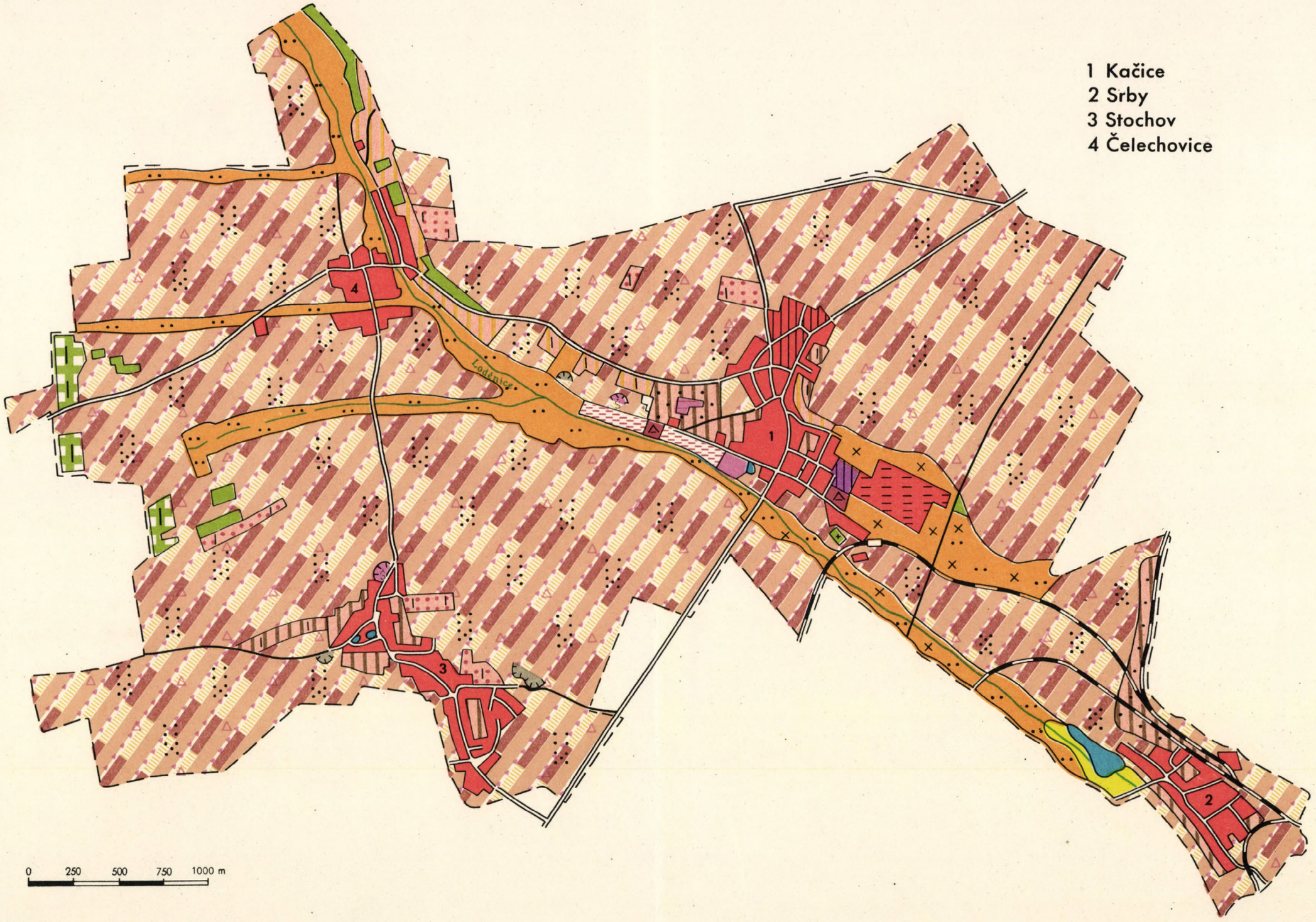

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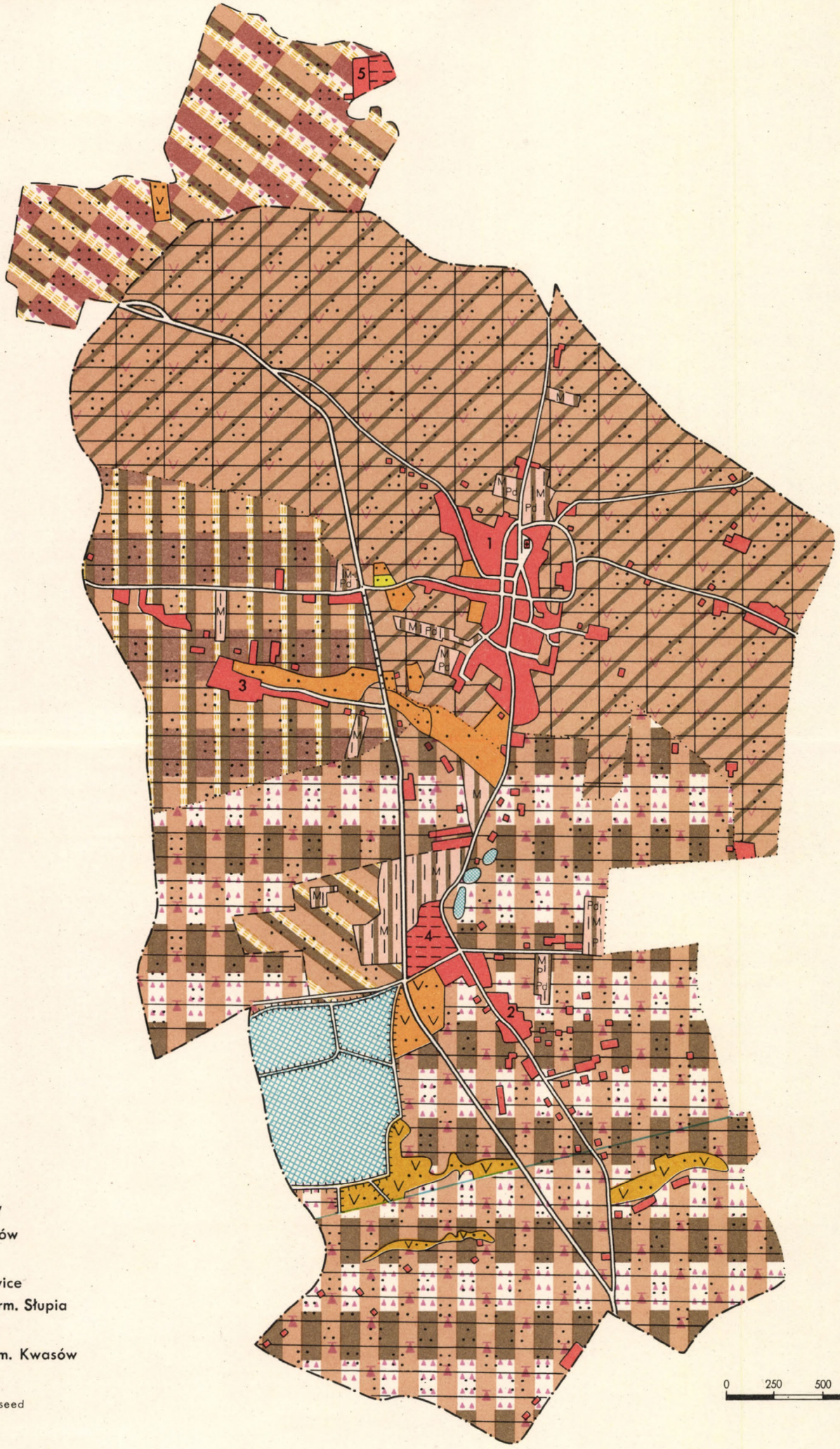

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