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DOKUMENTACJA GEOGRAFICZNA

ZESZYT 2

**The Polish Detailed
Survey of Land Utilization
Methods and Techniques of Research**

J. Kostrowicki

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- 1 **Zagadnienia wodne**, 6 art., s. 249, zł 10.—
- 2 **Nowe kierunki badań osadnictwa wiejskiego**, 7 art., s. 149, zł 10.—
- 3 **Problemy współczesnej biogeografii**, 9 art. — Część I, zł 10.—
- 4 **Problemy współczesnej biogeografii**, 8 art. — Część II, zł 10.—

1962

- 1 **Geografia stosowana** — 10 art. — Część I, zł 10.—
- 2 „ „ — 10 „ — Część II, zł 10.—
- 3 „ regionalna, 8 art., s. 219, zł 10.—
- 4 **Zagadnienia teoretyczne geografii**, 4 art., s. 180, zł 10.—

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- 1 **Teoria ośrodków centralnych**, art. 5, s. 180, zł 10.—
- 2 **Metody statystyczno-matematyczne w geografii ekonomicznej**, art. 5, s. 180, zł 10.—
- 3/4 **Wybrane zagadnienia z oceanografii fizycznej (w druku)**

1964

- 1 **Założenia teoretyczne geografii zaludnienia**, art. 15, s. 140, zł 21.—
- 1 **Zadania i metody współczesnej klimatologii**, art. 10, s. 196, zł 24.—

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THE POLISH DETAILED SURVEY OF LAND UTILIZATION

Methods and Techniques of Research

I. Initial Information

The research into land utilization was first started in Poland on limited areas already before the Second World War¹. After the war, at the initiative of the Central Office for Physical Planning a plan was adopted for a detailed land utilization survey of the whole country. A method of research was elaborated, a number of trial surveys were conducted. But soon it became obvious that the Polish geography could not cope with such an immense work at that time. It was therefore decided to reduce the whole project to the preparation of a general land utilization map based on the pre-war topographic maps drawn to the scale of 1/100,000. All Polish geographical centres worked on the drawing of this map for several years. The work was first sponsored by the Polish Geographical Society and later by the Institute of Geography of the Polish Academy of Science /PAN/, and conducted under the supervision of Professor F. Uhorczyk. The whole work was completed in 1956. Its result was a set of maps to the scale of 1/1.000,000 obtained by means of microphotographing of maps to the scale of 1/100,000 showing various forms of land utilization /arable lands, meadowland, forests, waters, settlements/ and their combinations². The maps have depicted in a most precise

way the distribution of various forms of land utilization in Poland, they could not, however, fully satisfy either the needs of science or practical objectives because of their scale, because they were based on pre-war cartographic material, and also because they presented only the main forms of land utilization.

In the years that followed many attempts were made to draw more detailed and up-to-date maps of land utilization within the scope of regional plans in various parts of the country. But these maps too did not go further than presenting the main forms of land utilization. The problem was tackled from a different point of view in the years 1953-56 when a detailed land utilization survey started. The method of this survey presented in this report has been based on the recommendations of the Commission for Land Utilization of the International Geographical Union, but at the same time it has several original features. To explain these differences it is necessary to dwell for a while on the methods of land utilization survey used up to the present.

The method that may be called classic has been initiated in the inter-war years. It was most widely developed by L.D. Stamp and his staff in the famous British Land Utilization Survey. The method was based on the utilization of topographic maps and direct observations and aimed at a detailed presentation of areas occupied by the main forms of land utilization.

Many other countries followed the British example in conducting land utilization survey. The Commission for the World Land Use Survey based its research on the same method in elaborating the classification and the key of symbols recommended as a basis for survey in all countries of the world.

Technical progress achieved during the last 15 years or so made it possible in many cases to replace the toilsome direct survey on field by air photographs, on the basis of these it is possible to obtain a precise picture of the areas occupied by the main forms of land utilization; only a few details or doubtful questions are to be checked directly on the examined place.

In the under-developed countries with extensive methods of farming this method is probably the only one allowing to map larger areas. Also in highly developed countries in which progress in land utilization consists above all in occupying new lands not farmed so far or utilized for extensive agricultural economy, this system, consisting of the determination of the boundaries of various forms of land utilizations is probably sufficient to meet practical requirements. The practical aims of the British survey were similar, because in connection with war difficulties it was necessary to put again under cultivation areas that have not been farmed at all or else utilized as extensive pastures. The land use survey combined with qualitative classification of soils was a sufficient material to ascertain where the actual form of land utilization could be replaced by some other form to the best advantage.

In many countries, including Poland, progress in the land utilization cannot consist of taking over areas not economically utilized so far of of changing the present forms of land utilization into more intensive ones, because there are no such areas, or, to be more exact, their extent is insignificant and they could only be reclaimed after conducting very expensive investments. The transformation of less intensive forms of land utilization /e.g. grassland, including meadows and pastures, and forests/ into

more intensive ones /e.g. agricultural land/ is also impossible without important outlays /as a rule these areas either too dry or too humid/ and most often it is not recommended because of other considerations too /e.g. climatic, water, health conditions etc./. In this situation progress and rationalization in land utilization consists above all not in replacing some forms of utilization by other ones, but in the intensification of the ways of land utilization within the framework and boundaries of already existing forms with slight changes only.

In these conditions the land utilization survey should be supplemented with material depicting the present ways, orientations, intensity, and even results obtained in various forms of land utilization. A survey of this kind is of particular importance in the countries conducting planned economy, because it may serve as a basis not only for more rational land economy, but also for planning the rationalization and intensification of land utilization, through the introduction of more intensive and rational and thus more productive methods of farming and orientations of utilization of agricultural land, forests, waters, etc.

The classification established in 1949 by the Commission for Land Utilization of the International Geographical Union has a particularly important advantage, namely, although it is based on the first method, it is so general and flexible, so that it is possible to pass from the first to the second method applying the above classification, the results being fully comparable. Going far enough in a research aimed at examining the specific features of land utilization within the various categories of land utilization, the Polish land utilization survey took advantage of this possibility. Many other countries

have proceeded in the same direction, and their methods of survey present various intermediary variations between the classic method and the method adopted in Poland. Mention is due on this occasion to Italian, Japanese, Portuguese, Canadian maps, etc. The second Land Utilization Survey of Great Britain initiated by A. Coleman went in the same direction. All these methods, adapted to the specific conditions of the respective countries, have added a lot to the international classification and the key of symbols, not always unfortunately convergent with the recommendations of the World Land Use Survey.

To sum up, the Polish survey has fully adopted the general classification of the Commission and its key of colours almost without modifications, but it has introduced within its framework a more far-going variegation. As Professor L.D. Stamp put it once the content of the Polish detailed map of land utilization consists of two layers. The first one, seen at a distance, presents a picture of the distribution of the main forms of land utilization well-known from the first method, the second one, only seen at a small distance, differentiates various forms of utilization, as to the ways and orientations of their use. What is more, the Polish land utilization survey has not been limited to map drawing only, but has resulted in collecting a comprehensive material serving for the elaboration of written reports illustrating the problems of land utilization on the area under survey.

The preliminary method elaborated on the basis of these assumptions, and tested on a small area, was presented in 1956 at an international geographical seminar in Aligarh /India/ and then at the 18th International Geographical Congress in Rio de

Janeiro³. The Polish method has aroused some interest which was reflected by the election of Polish representative to the Land Use Commission of the International Geographical Union.

The following period, covering the years 1956 to 1968, should be regarded as a stage of testing and improving the adopted method and assumptions on Poland's national scale. On the basis of numerous sample surveys conducted in various parts of the country a method has finally been worked out, its successive versions being included in three successive instructions⁴; the method was also discussed in many later publications⁵. In the years that followed a survey has been conducted either on areas of particular interest from the scientific point of view, or wherever it was important because of practical considerations. All in all, 24 counties have been surveyed and an area of about 12,000 sq/km was mapped. The work has been conducted first of all by the Agricultural Geography Department of the Institute of Geography of the Polish Academy of Sciences, substantial areas have been surveyed by the Economic Geography Department of the Jagiellonian University, Cracow, and to a narrower scope, also by Geographical Departments of the Warsaw and Toruń universities and the Gdańsk Teachers Training College. Numerous reports have been published based on the material supplied by the survey⁶.

The Polish survey has aroused lively interest abroad. This has found its expression in a number of visits that foreign geographers have paid in this country to acquaint themselves with the Polish methods of research. Polish approach was also demonstrated and discussed in Moscow, Bucharest, Sofia, in various French and British universities, at the British-Polish geographical seminar in Nieborow

/Poland/ and at the sessions of the Commissions for the World Land Use Survey of the International Geographical Union in Stockholm in 1960 and in Honolulu in 1961.

In 1960, a conference of geographers from East-Central and Eastern Europe was held in Warsaw to discuss methods, and problems connected with land utilization survey. Following a several-day long discussion and a weekly trip to the surveyed areas, the participants recognized the survey of land utilization as important both from the scientific point of view and for practical application, and decided to establish closer cooperation in this field, including not only an exchange of scientific papers, publications and researchers, but of whole research teams. As a result of this agreement, already in autumn of 1960, a team of Polish geographers visited Bulgaria to conduct land utilization survey jointly with their Bulgarian colleagues in the Sofia Basin and in the northern foothills of the Balkans. In 1962 a Polish team visited Yugoslavia and conducted a land utilization survey together with Yugoslavian geographers on the area of Adriatic Sea Coast of Montenegro /on Barsko Polje/, on the Karst land of Herzegovina /near Trebinje/ in the sub-Alpine region of Slovenia /near Kamnik/, and in the suburban zone of Belgrade. In 1963 Polish geographers visited Yugoslavia again to conduct a survey on the Dalmatian sea-coast in the vicinity of Omis near Split, in the region of Maribor /Slovenia/ and in the Julian Alps. An expedition was also sent to Hungary to conduct a survey in the region of Badacsony on the Balaton Lake and in the region of Kalocsa on the Danube, south of Budapest. In the same year, Yugoslavian and Czechoslovak geographers conducted a survey in Poland.

In 1964 the common field studies have been carried

on in Yugoslavia in Svetina in the vicinity of Celje and around Izola on Istria Paninsula both in Slovenia /Polish and Yugoslav groups/, in Poland in Iwonicz and Targowiska in the Krosno County, Lower Beskid and in Brodnica near Kartuzy on the Pomeranian Lakeland /Hungarian, Polish and Yugoslav groups, as well as in Czechoslovakia in Nitrianske Sučany and Vestenice in the upper Nitra valley and Drienovec and Čakanovce round Košice /Polish and Slovak groups/.

The first volume containing the results of this cooperation has been jointly prepared for print. It will be published under the title "Land Utilization in East Central Europe, Case Studies", and will bring Polish, Yugoslavian, Bulgarian and Hungarian reports⁸.

The report on work carried on, in the years 1960-64 on the territory of Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Rumania, Yugoslavia, and the U.S.S.R., submitted to the chairman of the Commission for the World Land Use Survey of the IGU points - on the one hand - to the impressive development of land utilization survey in the period under review, and to the spreading of Polish methods particularly in Yugoslavia, Czechoslovakia, Hungary and Rumania, these methods being to a various degree adapted to the specific local conditions.

Experience gained from the survey abroad and the adaptation of Polish methods by foreign geographers have resulted in further improvement of the Polish method, making it more universal and flexible. In particular, to increase a comparability a number of new categories has been added, concerning features not found in Poland or being of secondary importance

/e.g. open and enclosed fields, tenancies, terracing, irrigation, intercultivation/ while common and important in other surveyed countries. The system of defining the orientation in utilization of arable land has been based on more precise method and adapted to the conditions of other countries and the classification of permanent grassland has been expanded.

This new version, constituting a certain stage in development of the Polish method is presented in the present report.

The disadvantage of the Polish method of land utilization survey resides in the fact that it is particularly labour absorbing and thus impossible to be applied in practice for conducting a survey of the whole country, and even larger areas. With the present means of Polish geographical institutes /both staff and financial possibilities/ it would take at least 50 years to conduct a survey of Poland. Apart from this, mass mapping of big areas according to methods already worked out is not the task of research institute. A special service could cope with this task, similar to the geological or pedological services.

Another shortcoming or difficulty of the Polish method of survey is the difficulty in making its results available to the practice. As a rule, maps are drawn in a single copy, and there is only a single copy of the filled questionnaire. This material is kept by the institute conducting the survey. Making it available to those concerned can be done either directly in the institute, or indirectly through publications based on the material collected by the survey/many publications of this kind with white-and-black maps annexed have already appeared/ or else through the publication of maps. The publica-

tion of colour maps is, however, very expensive. Thus, apart from a few maps of limited areas, annexed to various local publications, the first coloured sheet of a detailed map of land utilization was brought out in 1964 and is serving above all methodical purposes⁹. A version of such maps reduced to six colours has been prepared. Nevertheless, the cost of publishing numerous maps of this type within a short period exceeds the financial possibilities of any geographical institute in Poland. To ensure that maps would be available to users also demands the organization of special service. As there is no such service and in all probability there will be none in the near future, and there is a demand for a map of land utklization, particularly on the part of planning institutions, the Institute of Geography of the PAN has recently started work on a simplified land utilization map drawn to the scale of 1/100,000 and published to the scale of 1/200,000 or 1/300,000. Within a few years the area of the whole country could be covered by such a map.

All differentiations shown on a detailed map and essential from the scientific and practical point of view will be shown on the general map; only those being omitted that either cannot be presented on a map drawn to this scale, or if the collecting of necessary data would require too much time.

The simplified general map is mostly office work, based on topographocal maps and air photographs, certain elements being checked on the spot.

The final elaboration of the method of a simplified general map of land utilization in Poland has been envisaged for 1965.

II. Classification of land use

The research encompassed by the Polish land utilization survey comprises the following problems:

A. External conditions of land utilization, viz.

/1/ natural conditions in which land utilization has been developed and continues to be developed on the area under survey;

/2/ technical, economic and social conditions in which land utilization has been developed and continues to be developed on the area under survey.

As regards external conditions of land utilization no direct investigation is being conducted, but all available material and data concerning this problem are being taken advantage of.

B. Internal features of land utilization, including

/1/ social and property features, viz. forms of property, means of ensuring manpower, the size of farms and eventually also the degree of farm fragmentation and scattering;

/2/ organizational and technical features of land utilization i.e. forms, ways and orientations of land utilization;

/3/ production features of land utilization, i.e. the results obtained or the effects of production and their destination.

The above aspects are the subject of land utilization survey *sensu stricto*. But only a part of

them, namely some selected social-property features and organizational and technical ones are presented of the map of land utilization, the remaining ones serving as material for further examination of land utilization on the area under survey and for drawing conclusions with regard to the degree of rational land utilization in the given external conditions, including natural, technical, economic, and social conditions in a given place at a given time.

The various internal aspects of land utilization are examined within the frame of basic forms of land utilization.

According to the classification adopted by the Commission on Inventory of the World Land Use of the IGU the following forms of land utilization are distinguished and recognized as basic categories shown on the map of land utilization:

Categories of the Polish
Land Utilization Survey

Categories of the
IGU Commission

A. Agricultural Land

4. Cropland

1. Cropland
/Arable Land/

2. Horticulture

2. Perennial crops

3. Tree and Other
Perennial Crops

3. Grassland

5. Improved permanent
pasture

B. Woodlands

6. Improved grazing
land

C. Waters

8. Swamps and marshes
/utilisable/

D. Settlements

7. Woodlands

E. Unproductive
land

1. Settlement and associated
non-agricultural lands

2. unproductive land

To mark the above **categories** on the map the **colours** recommended by the IGU have been adopted in **principle**, more far-reaching differentiation being obtained through various shades and intensity of colour and various symbols and signs. The intensity of colour corresponds in principle to the intensity in various categories of land utilization.

A. Agricultural /Farmed/ Land

Agricultural land comprises areas used exclusive or mostly for crop cultivation or stock breeding. As regards external conditions of utilizing land for agricultural purposes, the survey takes advantage of all the material and data concerning natural environment and essential from the point of view of agriculture /survey of various elements and of the whole of natural environment, geological maps, geomorphological hydrographical, pedological, and general physical geographical maps of the area under survey, meteorological and hydrological observations and data, etc./, and general technical, economic and social conditions of the given area /e.g. general economic conditions of agricultural development, prices of agricultural products, distance from and communication and transportation links with the markets, general level of agronomy and technics, social relations on the area under survey, etc./.

As regards social and property relations connected with agricultural land utilization, the survey collects material concerning forms of landed **property** /common, individual, cooperative, state property **etc.**/

forms of land tenure and of ensuring **manpower/ family** farming, hired labour, tenancy/, the **size of farms**, the degree of their concentration or fragmentation, i.e. the so-called agrarian structure, and the available manpower.

Out of the above mentioned aspects only forms of property and land tenure have been marked on the map by means of drawing respective boundaries. As regards big **landed** estates /over 50 ha/ the whole farm has been included into one boundary, its shape and form being thus given prominence; as regards small holdings the boundaries encompass an area of one settlement unit /village or other settlement/, on which the degree of land subdivision being measured by the percentage of small holdings in the total area of the given unit, and farm fragmentation - by the number of lots belonging to one farm have been marked by means of appropriate symbols. In case of **enclosed** fields the system of fencing is also marked on the map.

1. Cropland

Cropland are areas being steadily under cultivation, both ploughed land, or land cultivated with other implements, continual, i.e. not subject to crop rotation /monocultures/ or subject to rotation /with fallow, with land laying down or - without fallow, including fixed or variable rotation/ on the condition that the same plant is not cultivated for more than three years on the given field, and after that period the soil is tilled and the same or other plant is being sown or else the field is **said** fallow. Exception is made to the systems of crop rotation /e.g. ley farming/ in which certain crop /most often fodder one/ grows for more than three years on the same

field but is then tilled and replaced by some other crop. The category does not include crops occupying given area for many successive years not subject to crop rotation /perennial and semi-perennial crops, and also permanent grassland /cultivated or not cultivated, both meadows and pastures/ permanently occupying the area. As the mixed category should be considered the land laid down for many years because of various reasons, periodically used as pastures or not used at all, and also areas on which the shifting cultivation with land rotation has been applied in which after a year or several years of utilization, land is not utilized for a longer or shorter period and bushes or forest grow on it.

Agricultural land also includes gardens, i.e. areas under vegetables and flowers cultivated continuously on the same area without rotation. These areas are regarded as vegetable monocultures.

The organizational and technical aspects of agricultural land utilization include ways of land utilization, i.e. measures and means applied to obtain crops and to preserve soil fertility; the degree of intensity of these measures and means, i.e. the intensity of land utilization and the orientations of land utilization, or else the inclination of the given farm or area to cultivate certain crops.

As regards ways of crop land utilization the survey collects data concerning methods of tillage, crop rotation, manuring, water economy /irrigation and drainage/, terracing, measures preventing erosion, means of combating pests, harvesting methods, etc.

As regards tillage the measures aimed at loosening the texture of soil /hoeing, ploughing harrowing, etc./ are being taken into consideration, the kind of driving force used in tilling the land, the

degree of mechanization, the **quantity** of seeds sown or seedlings planted.

As regards manuring the manure potential of the units under survey is calculated on the basis of the number of animals reduced to big animal units, /500 kg/ per 100 hectares of agricultural land. Apart from this, information is being collected concerning the quantity of manure applied and frequency of manuring various crops, divided into green manure, dung and various kinds of fertilizers.

As regards crop rotation both the period of rotation and the succession of crops is recorded, the eventual fallow land, full manuring /++/ and partial manuring /+/ of various crop being noted respectively.

As regards water economy the irrigation and drainage systems are recorded. For more detail see point /C/ Waters.

As regards terracing of slopes, the height and width of terraces and the methods of strengthening the terraces, etc. **are** recorded.

As regards measures aimed at preventing erosion, we record the scope and kind of these measures /horizontal ploughing of slopes, contour ploughing etc./.

As regards systems of harvesting, the survey distinguishes hand harvesting /using, hoe, sickle, scythe, etc./, machine harvesting /what kind of machine and driving force/, methods of further processing of yields /threshing, grain cleaning, etc./.

Out of the various means of crop land **utiliza-**tion the following are marked on the map of land utilization:

- the system of crop rotation is marked by appropriate symbols;

- the manuring potential is marked by the direction of the inclination of stripes defining the orientation in arable land utilization /respectively livestock breeding/;

- drainage and irrigation and terracing of slopes is marked by appropriate symbols.

The orientation of land utilization reflects the inclination of the given farm or area for the cultivation of given plants. As there are many plants cultivated and some of them either complement each other or are similar from various considerations, the survey of land utilization does not examine each crop separately, but links them into groups with similar agronomic features, particularly with similar requirements as regards habitat, the amount of labour needed for cultivation, manuring as well as their position in crop rotation, examining both the share of various groups in the whole cropped area and that of various plants within the given group.

The division into groups elaborated for geographical typology of agriculture has been applied recently for purposes of land utilization survey¹⁰. This division distinguishes the following groups of crops:

Intensifying crops - this group includes labour-absorbing crops, demanding careful tillage and manuring, enriching the soil in humus and minerals, and thus in turn ensuring higher yields from plants that follow according to crop rotation. The group includes ridged up crops both root crops, and others, irrespective of the aim for which they are cultivated, and also all vegetables and industrial plants.

Structure building /forming/ crops - do not require so many labour absorbing processes, but they enrich the soil with nitrogen, developing its crumb structure, thus being a good forecrop. All the

papilionaceous /leguminous/ plants belong to this group, both edible and fodder plants or those cultivated as green manure, annual and perennial as well,

Extractive or exhaustive crops exhaust the soil; its fertility can be regenerated through special treatment or correct rotation; if this is not observed the soil will be degraded or depleted sooner or later. This group includes mostly cereals, both winter and spring cereals and other plants with similar requirements or performing a similar role in the rotation of crops, cultivated both for consumption, forage or industrial needs /malting barley, cereals for the production of alcohol, etc./. The straw of cereals is partly used as forage and partly as litter, so it is important for the production of farmyard manure.

The majority of cultivated plants can easily be classified to one of the above three groups. Nevertheless there is a small number of transitory forms that can belong either to the first or to the third group, depending on the intensiveness of cultivation /flax, rape, some cultivated herbs/.

The basis for the determining of the orientation in land utilization is the percentage of various groups of crops in the area under cultivation, and next the domination or co-domination of the particular cultivated plants within the given group.

To determine the share of various groups of crops the following limits have been adopted:

percentage	name	symbol
over 80%	outstanding domination /monoculture/	- 5
60-80%	domination	- 4
40-60%	relative prevalence	- 3

30-40%	accompanying position	-	2
20-30%	secondary position	-	1

A group occupying less than 20% of area under cultivation is not taken into consideration when determining the orientation in agricultural land utilization.

The cropped area constituting the basis for the above differentiation does not always have to be identical with the area of arable land. It is smaller if there is fallow land and bigger if aftercrops are cultivated or if the same area brings more than one crop annually. What is essential is the index of utilization of arable land, defined as the ratio of cropped area to the whole arable land.

The plants dominating in a given group are those, the percentage of which is the highest. There may be more than one dominating plant, but the share of the second or third one cannot be lower than 80% of the area under the first dominating plant.

The orientations in land utilization determined according to the above principles, are defined by the names of dominating plants, in groups occupying over 20% of cropped area. To mark various orientations symbols have been adopted taken from the initial letters of the three groups /I, S, E/ and the Latin names of cultivated plants.

Thus for instance the following orientations may be distinguished:

outstanding vegetable		$I_{/5/}lg$
"	or highly wheat	$E_{4/5/}tv$
"	or highly wheat with sugar beet	$E_4 tv + I_i bs$

wheat with sugar beet	$E_{3/2/tv} + I_1 bs$
wheat and sugar beet	$E_{3/2/tv} + I_{2/3/bs}$
wheat and maize	$E_{3/2/tv} + I_{2/3/zm}$
wheat and potatoe	$E_{3/2/tv} + I_{2/3/st}$
rye and potatoe	$E_{3/2/sc} + I_{2/3/st}$
r. ... with potatoe	$E_{3/4/sc} + I_{1/2/st}$
rye, oats and clover	$E_{2/3/sc,as} + S_{3/2/tp}$
rye, potatoe and clover	$E_{2/1/sc} + I_{1/2/st} + S_{1/2/tp}$
wheat, maize and lucerne	$E_{2/1/tv} + I_{1/2/zm} + S_{1/2/ms}$
wheat, maize and sunflower	$E_{2/3/tv} + I_{3/2/zm,ha... etc.}$

The orientation in utilization of arable land is marked on the map by stripes the width of which corresponds to the share of various groups in the total cultivated area, and the colour indicates, the dominating crops in various groups.

In view of particular importance of industrial plants and vegetables, they are marked on the map if only they exceed 5% of the total cropped area; the dominating industrial plants and vegetables are also marked. The domination is defined in the same way as with regard to particular groups of crops.

There is also a specific category to mark waste land that is land that was once cultivated but later left abandoned for several years /at least three

years/. These lands are regarded as a mixed category between arable land and unproductive land or grassland. They are marked on the map with special coloured symbols. The survey collects data pertaining to the reasons of land being uncultivated /natural, social, etc./, the present utilization and possibility of rehabilitation.

As regards the production features of the utilization of arable land, the survey collects data concerning the yields of various crops, the volume a production and the destination of products, i.e. the percentage used for the farmer's own consumption /including forage/ and that destined for the market. As official data are often inexact in this domain, the survey corrects them by means of direct interviews which also allow better to acquaint the interviewer with fluctuations in yields and marketability in various farms belonging to economic units under investigation. This is of essential importance for further elaboration of collected material.

2. Perennial crops

Perennial crops are these occupying the same area for a number of years without any crop rotation. All kinds of trees and bushes belong to this category, both supplying fruit ready for consumption /orchards, plantations of figs, pomegranates, nut trees, chestnut trees, citrus fruit trees, vineyards, plantations of raspberries, currants, gooseberries etc./, those that must be processed to be ready for consumption /plantations of coffee, cocoa, tea, etc./, and also those supplying industrial raw materials /olives, coconut palm, oil palms/ and even forage /mulberries/, and the so-called semiperennial crops, i.e. plantations of herbaceous plants occupying the same area without rotation

for several years /hop, cotton, strawberries, sugar cane, pineapples, some perennial herbs, etc./.

Out of the total organizational and technical features of perennial crops, the survey collects data concerning methods of cultivation, manuring, irrigation and drainage, terracing, tillage, methods combating plant pests and weeds and harvesting methods. As the area of perennial crops is often simultaneously used for the cultivation of some other plants, or else as a meadow or pasture, the survey collects all the data concerning the share, methods of cultivation, species and kinds of plants intercultivated or utilized.

The orientation in utilization of perennial crops is determined on the basis of domination or various species, more or less in the same way as with regard to plants within various groups of crops grown on arable land.

The respective colour on the map shows the area under perennial crops. Against this background coloured signs depict the orientations in utilization of perennial crops and special symbols define ways of their cultivation, e.g. drainage or irrigation, terracing, etc. Areas on which perennial crops are intercropped with accompanying herbaceous plants are considered as mixed category, distinguishing the inter-row cultivation and intercultivation /the best example of the latter being given by the Mediterranean *cultura promiscua*/. Within these two categories along with perennial crops the herbaceous plants are marked, with the same signs and symbols being used as on arable land. Separate signs are used to denote the fruit tree nurseries, workers allotments, etc. Small houseyard gardens being impossible to mark on a map of this scale, are treated jointly with settlements.

The production features of perennial crops i.e. yields, volume of crop and the amount or percentage

of market production collected on the ground of statistical data and direct inquiry are not presented on the map but serve to further elaboration of material collected during survey.

3. Permanent grassland

This category comprises all areas permanently covered with grassy vegetation, both natural and artificial, cultivated and not cultivated mowed or grazed regularly or at irregular intervals, and even not used at all, but fit for exploitation as mowed meadow or pasture.

The organizational and technical features of the utilization of grassland examined within the scope of the survey include ways and features of cultivation including ploughing, drainage, irrigation, sowing, manuring, harvesting /mowing and ways of mowing: by scythe, or machines, the number of hay harvests annually; grazing and systems of grazing: free, fenced, or in leash, and also eventual causes, character and direction of devastation or degradation of meadows and pastures.

The orientation in the utilization of permanent grassland is determined by way of distinguishing various types of grassland with different plant associations growing on it.

First of all, permanent grasslands are divided into natural and artificial, and within these two groups further differentiations is conducted¹¹.

A. Natural and semi-natural grassland

1. high mountain /Alpine/,
2. xerophilous
3. halophytes
4. reeds

B. Artificial grassland

1. bor
2. grond
3. kęg /leng/
4. bog

A. Natural and semi-natural grassland

Both primitive grassland and that which is at least partly the result of natural transformations and climatic processes without clear direct influence of human being, belong to that category.

1. High mountain /Alpine/ grasslands

They are found over upper limit of trees, or sometimes below it in places that because of natural conditions, have not been occupied by the forest. Within this category the following sub-groups are distinguished, differing with regard to situation, soil conditions, vegetation and productivity. All of them are mostly used as pastures.

/a/ high mountain alkaline grassland, composed of low, compact vegetation with a rich variety of species /class Elymo-Seslerietea, characteristic species being *Sesleria varia*, *Sesleria Patrae*, *Carex firma*, *Festuca versicolor*, *Leisleria caerulea*, *Gentiana verna*, *Dryas octopetala* etc./. It is rather dry or slightly humid with high fodder value /index 4.5-5.5/ but low yields.

/b/ high mountain acid grassland, also composed of low compact vegetation, dry or moderate humid /class Caricetea curvulae/, the number of species is more limited /*Carex curvula*, *Juncus trifidus*, *Oreochloa disticha*, *Luzula spicata* etc./, of poor value as fodder /1.5 - 2.5/ and lower yields.

/c/ high mountain associations on areas covered

with snow for the major part of the year /over nine months/. Vegetation is poor /class Salicetea herbaceae with species Saxifraga perdurans, Sedum alpestre, Cerastium lapponicum, C. cerastioides, Gnaphalium supinum, Veronica alpina, Loisleuria procumbens and dwarf shrubs: bilberries - Vaccinium, Salix herbacea etc/. The forage value is extremely poor, yields are very low.

/d/ high mountain associations of perennial herbs growing on humid soils, most often on the banks of streams. The vegetation there is rich /class Betulo-Adenostyletea/, mostly composed of high herbs /Aconitum sp. Adenostyles alliaria, Mulgedium alpinum, etc./, grass /Calamagrostis villosa/, and often also shrubs /Ribes petraea, Betula carpatica, etc./. In this case they are counted to a mixed grassland-woodland category. Fodder value is poor, many species are venomous. Yields are high.

2. Xerothermic grasslands

This category comprises steppes that once covered big areas of south-eastern Europe, and also vegetation found on small areas in the remaining parts of Europe in specific environmental, particularly edaphic and micro-climatic conditions. The following groups are distinguished here:

a. hard rock grassland found on the slopes of calcareous rock in lower parts of the mountain ranges and in uplands. These are dry sometimes loose swards /alliance Seslerieto-Festucion duriusculae/, composed of grasses and herbs /Allium montanum, Dianthus caesius, Festuca pallens, Sempervivum soboliferum etc./. The fodder value and yields are poor. To the south of Europe the share of these and similar associations in the total area gradually increases; in the Mediter-

ranean zone they occupy large areas characterized by specific vegetation. They are used on a large scale there as pastures for sheep and goats.

b. meadow steppes and steppe swards are found on the soft calcareous sediments, gypsum, loesses, chernozem, rendzinas. They occupy extensive areas in south-eastern Europe. In Central Europe they occur in the form of xerothermic swards on southern, western and eastern slopes, on soils with rich content of calcium carbonate, and also on not leached away morainic clays. They are overgrown with dry, variegated vegetation /alliance *Festucion vallesiaceae*/, mostly grasses /*Koeleria gracilis*, *Festuca sulcata*, *F. pallens*, *F. vallesiaca* etc. *Bromus inermis*/ with high percentage of herbs /*Salvia* sp, *Aster amellus*, *Adonis vernalis*, *Anemone silvestris*, *Astragalus onobrychis*, *Cirsium pannonicum*, *Linum flavum*, *L. hirsutum*, *Scorzonera purpurea*, *Onobrychis arenaria*, *Oxytropis pilosa*, etc/. The fodder value is considerable, and yields are high.

c. proper steppes and stipa swards - like the preceding group, occur mostly in south Europe on dry soils, alkaline and neutral, /chernozems, rendzinas etc./, together with the preceding ones, on in drier places and also south to the zone of wooded steppes and meadow steppes. The vegetation is mostly grass growing sparse or tufted, above all the stipa genus /*Stipa* sp, and also *Festuca sulcata*, *F. pseudovina* etc, with the addition of some herbs /*Centaurea* sp, *Cirsium* sp, etc./. The fodder value is poorer, yields are high.

d. dry steppes -- occur on dry alkaline, sometimes slightly saline soils; most often they form a mosaic with proper steppes, semidesert vegetation and salt steppes /solonetz/. Vegetation is sparse, various kinds of perennial grasses dominate /*Artemisia*/. Fodder value is poor, yields are low.

3. Halophyte grasslands

They are found on saline /alkali/ soils both as a result of climatic conditions /low rainfall/ and the influence of seas, or because they are flooded with salt or brackish waters.

a. Associations on solontchaki, solontsi and solodi soils are found in the steppe zone in south and south-eastern Europe, growing on soils with high content of NaCl , Na_2SO_4 , CaCO_3 , which crystallising form salt efflorescence on the surface /solontchaki/, or water-resistant layers in the subsoil /solontsi/. The vegetation is poor, composed of desert halophytes /class Salicornietea - typical species Salicornia herbacea, Salsola sp, Suaeda sp, Puccinella salinaria, Anabasis salsa/ and perennial herbs /Artemisia sp, Aster pannonicum/.

The fodder value is poor and yields are low. If these areas are to be utilized as pastures, salt must be removed. Weaker salted areas /solontsi/ are used as meadows /fodder value 2.5 - 4.0/.

b. Slonawy - associations growing on marshy land impregnated with salt infiltrating from seas or waters flowing from salt springs /class Juncetea maritimi/. They differ from vegetation characteristic of the similar habitat by a greater or smaller share of halophytes /Salicornia herbacea, Salsola kali, Aster tripolium, Plantago maritima, Puccinella distans, Juncus Gerardi, Glaux maritima, etc./, which lower the fodder value.

4. Reeds - natural or semi-natural associations of high grasses with hard stalk, forming stripes of vegetation on the banks of rivers and lakes, and sometimes also in depressions among fields and meadows in places covered with water during the whole

period of vegetation or the major part of this period. As a rule they form uniform associations, and this allows for further division, according to the dominant species, into reeds /*Phragmites communis*/, bulrush /*Scirpus* sp, *Schoenoplectus* sp/, calamus /*Acorus calamus*/, etc. Fodder value is low if any, only when the plants are young. Yields are particularly high. Used often as building material, raw material for the production of paper, for litter, etc.

B. Artificial grasslands

These are associations mostly growing on post-forest habitats on which the forest was destroyed by man or animal grazing. If they are left alone, they turn into woodland again.

The basis of division of these associations is the original woodland habitat and the present vegetation.

The following classification on four main categories of natural forests is used here as a basis: 1. bor /coniferous, podzolizing soils/ and lasobor forests /mixed, coniferous and broad-leaved/ 2. grond forests /broad-leaved, grown on fertile, non acid, nor flooded soils/ 3. łęg /łęg/ forests /broad-leaved, grown on alluvial, non peaty soils/ 4. ols forests /broad-leaved, grown on low, eutrophic, peat bogs/.

1. Bor grasslands

They occur on light soils, usually sands, watered mostly by rainfall or infiltration of ground waters, on the cut off coniferous or mixed forests habitats. They are used only as weak pastures. The following groups are distinguished:

- a. sand /dune/ natural in their initial stage,

covered with sparse vegetation, forming half unproductive lands usually protected to consolidate dunes. In the developed stage they are overgrown with dry pine wood, and after the wood had been destroyed, sparse grasses and herbs remain /classes Corynophoretea and Ammophiletea, species Corynephorus canescens Festuca ovina, Elymus arenarius, Ammophila arenaria, Sedum acre, Jasionne montana, Trifolium arvense, Armeria vulgaris/; on the seacoast dunes halophytes are also found /Salsola kali, Salicornia maritima, Suaeda maritima etc/. The fodder value is low, yields particularly poor, Used as weak pastures; excessive grazing can bring forth the destruction of grassland and turning the area into moving sands.

b. xerophilus swards - covering mostly sandy, or gravelly soils /sandstones/. Low, compact vegetation /class Sedo-Scleranthetea/consisting mainly of herbs /Sedum acre, S. annuum, Sempervivum alpinum, S. tectorum, Scleranthus perennis, Veronica praecox, V. verna, Helichrysum arenarium, Jasionne montana/. The fodder value and yields are very low. Utilized as poor pastures.

c. white bent grass swards growing on poor, acid soils with a higher water table as well as on richer soils which are degraded because of excessive grazing and no manuring. The vegetation is low /ordo Nardetalia/with white-bent grass /Nardus stricta/dominating and some other acidophilous species /Carex pallescens, Juncus squarrosus, Hieracium auricula, Hypericum maculatum, Dianthus aeltoides/. The fodder value is very low with low yields. They are utilized mostly as poor pastures.

d. heath- occur on more compact of damper areas, mostly sandy clays, strongly acid. The dominating plant is heather /Calluna vulgaris/, but there are many other dwarf shrubs /Vaccinium myrtillus, V. vitis-idaea, and also a few grasses and sedges /Sieglingia

documbens/, and herbs /*Antennaria dioica*, *Hieracium umbellatum*/; they are often sparsely overgrown with bushes /juniper, *Genista anglica*, *G. pilosa*, *G. tinctoria*, *Sarothamnus scoparius*, and in Atlantic form with *Ulex europaeus*, *U. manus*, *Erica cinerea*, *E. scoparia*, *E. ciliaris* etc./. Fodder value extremely poor, yields low.

e. bilberry formations-associations found most often in mountains on barren acid soils. These are compact associations of dwarf shrubs /ordo *Rhododendro-Vaccinietalia* *Vaccinium* sp, *Empetrum* sp, *Rhododendron* sp, *Loisleuria* sp/ with an addition of grasses, sedges, and rushes /*Calamagrostis villosa*, *Juncus nana* etc./, smaller percentage of herbs /*Hieracium alpicola*, etc./. Fodder value extremely poor, yields low.

In view of the domination of dwarf shrubs and often considerable share of bushes the last two associations are counted to the mixed woodland-grassland category.

2. Ground grasslands

They have been formed on the place of former deciduous forests /oak, oak-and-hornbeam, beech, beech-and-fir forests/ and also mountain regel /deciduous/ forests growing on alkaline, neutral or slightly acid soils, on compact fertile soils, clayey-sandy, clay, loess, chernozems and rendzinas, not flooded or only flooded for a short period by waters flowing from higher situated lands. The vegetation is rich, variegated, composed of grass, papilionaceae /leguminous/ and herbs /ordo *Arrhenoretalia*/. The following categories are distinguished:

a. top hill grassland occurring on the upper parts of hills among fields or river valleys /gronds/, these areas receiving water only from rainfall of underground water infiltration, not fertilized by flowing

waters. They are composed of low compact variegated vegetation /*Festuca rubra*, *Lolium perenne*, *Phleum pratense*, *Cynosurus cristatus*, *Trisetum flavescens*, *Trifolium repens*, *T. pratense*, *Bellis perennis* etc./. Fodder value is not bad /3-4.5/, but yields are low, particularly on areas with low rainfall /15-30 q/ha/.

b. field fertilized grassland /popławy/ mostly found on inter-field depressions and on the borders of river valleys lower than field level, so that they are fertilized by water flowing from fields or rich deciduous /grond/ forests. The vegetation is rich, composed of grass, papilionaceae and herbs with high percentage of umbelliferous plants /*Poa pratensis*, *Phleum pratense*, *Dactylis glomerata*, *Lolium perenne*, *Cynosurus cristatus*, *Carum carvi*, *Daucus carota*, *Heracleum sphondylium*, *Trifolium pratense*, *T. repens*, *T. rubrum* etc., *Lotus corniculatus*, *Chrysanthemum leucanthemum*, *Campanula patula* etc./, High fodder value /5-7.5/, high yields /35-55 q/ha/.

c. forest fertilized grassland found mostly in mountains /regel meadows/ or uplands amidst forests, and also below forests and above fields, fertilized by water flowing from forests /mostly mixed-lower regel, beech-and-fir, beech, etc./.

The vegetation is quite rich, particularly on areas with higher rainfall, the composition is similar to that of the preceding group, with a greater addition of forest and mountain plants /*Alchemilla* sp., *Geranium* sp., *Veratrum* sp., *Gladiolus imbricatus*, *Trisetum flavescens*, *Crocus* sp., *Colchicum autumnale* etc./. Fodder value is considerable /3.5-5.5/ yields average or high /20-50 g/ha/.

3. Łęg /leng/ grasslands

They occur most frequently in river valleys or along periodical streams; in mountains they also occur

in lower places; on mineral soils of alluvial origin /muds, muck-bog soils/, flooded once or several times annually by current waters which quickly subside and fertilize the soil with their sediments, the vegetation is high, rich, with the domination of grasses with a small quantity of papilionaceous plants, herbs and sedges, which took the place of former kęg forests /ordo Molinietaalia/.

According to the fertility of soil the following groups are distinguished:

a. proper kęg grassland, occurring on fertile mud soils /light-heavy and heavy muds/. Grasses are prevailing /*Poa pratensis*, *P. trivialis*, *P. remota*, *Molinia coerulea*/ with a small addition of herbs /*Angelica silvestris*, *Polygonum bistorta*, *Lychnis flos cuculi*, *Galium boreale*/. Fodder value and yields are high

b. swale kęg grassland growing on marshy or soaked depressions, flooded with water which does not subside as quickly as in the former type. The soil is heavy muds of muck-bogs. The vegetation is lower, the number of species more limited, with the domination of grasses /mostly *Molinia coerulea*/ but with a comparatively larger addition of sedges /*Carex panicea*/ and herbs /*Lychnis flos cuculi*, *Cirsium oleraceum*, *C. palustre*, *C. canum*, *Angelica silvestris*, *Galium* sp, *Caltha palustris*, *Polygonum bistorta*/. The fodder value is poor /2.5-4.0/, the yields are low.

c. sparse kęg grassland occurring most often on light muds and alluvial sands, particularly directly on river banks in place of former poplar and Willow woodland. The area is sparsely grown with high plants; herbs, often of foreign origin /*Inula britannica*, *Rorippa silvestris*, *Elatine hydropiper*, *Solidago* sp, *Cirsium* sp, *Angelica silvestris*/.

4. Bog grasslands

These occur in areas where, as a result of limited outflow of water or impermeability of soil, waters, either from flooding, or - in undrained areas from precipitation - are stagnant, allowing the formation of peat-bogs.

a. high sedge formation, growing in areas flooded for the major part of the year, most frequently situated on the banks of rivers and lakes and in hollows among the fields, on mineral-organic soils, muds or muck-bogs, mainly in areas of former osier shrub formations. They are composed of one or several species of high sedges /alliance-Magnocaricion elatae with - *Carex gracilis*, *C. pseudocyperus*, *C. acutiformis*, *C. riparia*, *C. paradoxa*, etc./ with *Iris pseudo-acorus*, *Glyceria fluitans*, *Phalaris arundinacea* etc. The fodder value is poor /2.0-3.0/, though yields are particularly high /50-75 q/ha/.

b. spring or seepage bog grassland /spring or seepage bielawa/ occurring on alkaline or neutral soils permanently soaked from springs or seepages, on organic-mineral soils, in mountains and uplands. The vegetation /class Montio-Cardaminetalia/ is composed of sedges /*Carex Davaliana*, *C. Buxbaumi*, *C. dioica*/ and other Cyperaceae, e.g. *Eriophorum latifolium*, *Schoenus nigricans*, *S. ferrugineus*, *Tofieldia calyculata* etc/ and herbs /*Cochlearia* sp, *Cardamine* sp etc/. Occur more often in southern Europe. Fodder value is poor /2.0-3.0/, yields are low /20-30 q/ha/.

c. proper bog grassland /proper bielawa/ occurs on permanently soaked soils, on organic low peatbogs, on the place of former alder woodland /ols/. The vegetation /ordo Caricetalia fuscae/ is rather rich, the dominant species being low sedges /*Carex fusca*, *C. canescens*/ with quite a large addition of cotton

grass /*Eriophorum* sp/, rush /*Juncus* sp/, horetail /*Equisetum palustre*/ with an addition of herbs /*Menyanthes trifoliata*, *Ranunculus flammula*, *Viola palustris* etc./, and bog moss /*Sphagnum*/. Fodder value is poor /1.0-3.0/, yields are low or moderate /15-30 q/ha/.

d. Transitional and high /raised/ peat bogs. Vegetation complex on particularly poor habitat, acid, permanently soaked, undrained. The vegetation /class Oxyocco-Sphagnetee/ consists of bog moss /*Sphagnum*/ with the addition of dwarf shrubs characteristic of peat bogs /*Ledum palustre*, *Vaccinium uliginosum*, *Oxycoccus quadripetalus*, *Andromeda polifolia*/ and also heath /*Calluna vulgaris*/ some herbs /*Drosera* sp/, and sedges /*Carex limosa*/. Fodder value extremely poor /1-1.5/, yields low. If these areas are grown with shrubs and dwarf trees, they are qualified to the mixed woodland-grassland category.

The economic activity of man has exerted influence on various grassland associations, improving or degrading them. For instance, as a result of reclamation and improvement of meadows and pastures one can find grasslands characteristic of *łęg* or *grond* vegetation on bog grasslands habitat; *grond* vegetation on *łęg* habitat etc. Such associations are qualified as mixed categories *grond* or *łęg* post bog grasslands, *grond* post *łęg* grasslands etc.

On the other hand, changed conditions on a certain area can bring about the penetration of bog vegetation on *grond* or *łęg* habitats thus bringing about post-*grond* and post-*łęg* bog grasslands. As a result of improper utilization secondary plant formations are growing with lower yields and poorer fodder value.

For instance, excessive grazing without mowing of *grond* or *łęg* grasslands can turn them into associations of white bent grass /*Festuca*/, mostly composed

of poor grasses /*Fardus stricta*, *Molinia coerulea*, *Lolcus mollis*/ and low herbs /*Potentilla aurea*, *Euphrasia minima*, *Galium saxatile*, *Polygala vulgaris*, *P. oxyptera* etc/. The fodder value of these associations is excessively low /1.0-2.5/ and yields do not exceed 15 q/ha.

Excessive trampling of grassland by animals and rich manuring with their excrements and waste from farms transforms ground or leg grasslands into associations of low herbs /*Potentilla anserina*, *Plantago major*, *Ranunculus sardous* etc/ and grasses /*Agrostis alba*, *Poa annua* etc/. The fodder value of these association is poor /2.5-4.5/, yields are moderate or low.

The transformation, turning up or destroying of soil layers on soils rich by nature or fertilized by waste, brings about a development of abundant ruderal associations of herbs, the composition of which depends on the given habitat, the majority being either worm woods /*Artemisia* sp/, or burdocks /*Arctium* sp/, nettles /*Urtica dioica*/, high sorrels /*Rumex obtusifolium*/, tansy /*Tanacetum vulgare*/, thistles /*Carduus crispus*/ etc. Fodder value of these associations is poor /2.5 - 3.5/, yields are high. Young plants are often used as fodder for pigs and poultry.

Excessive grazing of marshy meadows results in the formation of characteristic clumps overgrown with poor vegetation with the domination of rush /*Juncus* sp/ and certain herbs /*Cirsium palustre*, *Blasmus* sp/ and hard sedges /*C. acutifolius* etc/.

A method serving to check the classification of grassland associations and applied in the land utilization survey is the evaluation - on the ground of observations - of the percentage of such groups of plants as sedges, grasses, papilionaceous plants, herbs, reeds, rush, etc.

The survey records the following features pertaining to the productivity of utilized grassland: yields or harvests of green bulk or hay, the number of livestock grazed and eventually the amount of share of production fed on spot and supplied to the market.

Out of the features described above the following are marked on the land utilization map with the help of symbols: the degree of improvement /ploughing, sowing, manuring/, water economy /irrigation, drainage, full reclamation/; means of utilization: mowing /marking the number of hay harvests annually/ grazing /pastures/ mixed mowing and grazing.

The orientations in the utilization of grassland determined by the above types of associations are marked by various shades and intensity of colours reserved for this form of land utilization.

5. Stock Breeding

As stock breeding is directly or indirectly connected with agricultural land utilization essentially influencing ways of farming /manuring, draught power, utilization of permanent grassland/, orientation /cultivation of fodder plants on arable land, orientations in utilization of meadows and pastures/ and also indirectly influencing the effects of land utilization /yields per ha both from arable land and grassland/, the Polish land utilization survey does not pass stock breeding over in its investigation, collecting material pertaining to the number of livestock, their age, breeds and orientations in stockbreeding, and the increase of stock, weight of animals killed or sold, milking capacity of cows, egg laying of hens, the amount of wool obtained from one sheep, etc. The same pertains to keeping animals that

are only indirectly connected with agricultural land utilization, e.g. bees, silkworm, fur animals etc. The collected data serve to further elaboration of material collected during survey. On the map of land utilization livestock breeding is only marked in global figures, mostly in terms of manuring potential measured by the number of big animal units /500 kg/ per 100 ha of agricultural land.

Taking into consideration the average live weight of various animals, the following multipliers have been adopted to calculate the amount of livestock in terms of big animal units:

species	multiplier one actual animal= big animal units
camels	1.2
heavy farm horses	1.2
middle-weight farm horses	1.0
light " " "	0.8
young horses /1-2 years/	0.7
colts /up to one year/	0.5
mules	1.0
donkeys	0.5
cattle: bulls and oxen	1.2
cows and fattening cattle over 2 years old	1.0
young cattle /1-2 years/	0.7
calves /up to one year/	0.3
pigs: boars and sows	0.3
fattening pigs over 75 kg	0.25
young pigs 2-6 months	0.05
piglets /up to 8 weeks/	0.1
sheep: rams, ewes /over one year/	0.15
lambs /up to one year/	0.05
goats	0.15
poultry	0.01

In case of substantial difference in the weight of animals in the area under survey from the average, and also with regard to animals not enumerated in the above list, the multiplier is calculated reducing the average live weight of these animals to 500kg as one big animal unit.

The number of big animal units per 100 ha of agricultural lands is marked on the detailed map of land utilization by the direction in the inclination of stripes used to define the orientation in the utilization of arable land. This method is not very consistent because the stock breeding is not connected with arable land utilization only, and it cannot be easily applied with regard to areas where perennial crops and permanent grassland are the dominating feature. The adoption of this system has been dictated first of all by the idea of making the map clear, not overburdened with details. Now a system is being elaborated of substituting symbols for stripes, so as to present more precisely not only the volume, but also the orientation in stock breeding.

B. Woodland

This category comprises areas covered with trees growing permanently there, with the exception of perennial crop areas cultivated with the objective of gathering annual harvests /mostly fruits/ /see p.21, 22/ from which it differs also by the fact that much less outlay of labour is needed for the utilization of woodland. Woodland can also be utilized for agricultural purposes; either by shifting cultivation or by mowing grass and grazing. These forms of land utilization are qualified as mixed woodland-agricultural ones. On the other hand, collecting natural forest resources /fruits, berries, mushrooms etc/ and hunting is regarded as utilization of woodland.

As regards external conditions of woodland utilization the survey takes advantage of all material essential for the description of forest associations and forestry concerning habitat conditions /subsoil, soil, climate, relief, irrigation/, types of forests, adopting in this field botanical or forestry classification used on the area under investigation, and also data and material pertaining to the external technical economic and social conditions connected with forestry in the given area.

Units serving as material for investigation are woodland complexes determined on the basis of ownership features, the age and composition of tree stand in the area under survey.

The social and property features of woodland areas are examined and presented on the map in the same manner as with regard to agricultural land, i.e. by drawing the boundaries of various forms of property.

As regards organizational and technical features the survey of land utilization collects material illustrating ways of forest management and exploitation on the territory under survey, which give an idea of the system of forest economy as well as density of the forest and orientations in forest utilization.

The following systems of forest economy are distinguished:

1. not managed and not exploited
2. exploitation without management
 - a/ clear felling
 - b/ selective felling
3. full forest economy /management and exploitation/
 - a/ clear felling
 - b/ selective felling
 - c/ limited exploitation

4. management without exploitation
5. full cultivation.

1. Forest not managed and not exploited so far are either primeval forests preserved up to now and not exploited for production, or else national parks and nature reserves. There is also a transitional form, namely some national parks and partial reserves in which management and exploitation is of a limited character.

2. Forest not managed but exploited is to be found mostly outside Europe, in these parts of the world where there still exist big almost unexploited forests. Exploitation is conducted there either by full clearing, or selective cutting of certain species of trees of trees belonging to certain age groups. In Europe this system is applied in small, not rationally exploited forests belonging to small farmers, or to village common land, the exploitation depending on the owner's needs and thus being irregular.

3. Forest management consisting of sowing, planting and cultivating trees along with exploitation is mostly conducted in State-owned forests, local government forests, and in capitalist countries in forests owned by big and medium-size land owners. Various economic systems are applied.

a/ clear felling consists of dividing the woodland area into determined organizational tree units, i.e. sectors /felling-sites/, which after clearing are replanted with uniform stand of the same age, often of the same species trees. As the regeneration of woodland takes place either through sowing of planting trees raised in nurseries, and only to a smaller degree by self-sown seedlings, the composition of forests is often substantially different from the original forest. As a result there are differences

between sectors in the age and often also composition of trees, often independent of differences in the habitat.

b/ selective felling consists of felling trees selected according to various methods but never allowing bigger sectors of afforested land to be completely denuded. The regeneration takes place mostly by self-sown seedlings, with eventual additional sowing and planting by man. As a result trees are of different age and most often of various species, thus more similar to a natural forest. The composition of trees is regulated by additional sowing and planting.

c/ full management with limited exploitation is conducted in the so-called protective forests. Here the following categories are distinguished: /1/ soil protecting forests on sands, dunes, coastal cliffs, steep mountain slopes, valley slopes, etc. /2/ flood protecting forests on the banks of rivers and streams and other water reservoirs, on watershed lines, etc. /3/ health resort and climatic forests protected to preserve specific local climatic conditions, mostly in health resorts and also around towns and industrial centres /so-called high green belts/. /4/ forests protected for scenery conservation.

Management of these forests consists of sowing and planting and also thinning of trees. Exploitation is limited, as a rule single trees are felled. The trees are of various species and different age.

4. Management without exploitation. This category embraces some protective forests, parks and so-called hunting preserves managed but not exploited. The stand structure of trees growing in these forests are more or less shaped or regulated by man so as to best suit the aim the forest is to serve.

5. Full cultivation. This category comprises all kinds of plantations of forest trees, both home and exotic species, planted either for timber, bark, resin, vines /poplar, osier, cork oaks, resinous pines etc/.

Systems of forest economy are marked on the map by appropriate symbols; in addition areas of clear felling economy and all areas on which the age of trees is more or less the same, are marked on the map. The following age groups have been adopted:

- | | |
|-------------------------------|---------------|
| 1. full grown stand | over 80 years |
| 2. felling-age /mature stand/ | 40 - 80 |
| 3. stake /immature/ stand | 20 - 40 |
| 4. young growth | up to 20 |

Apart from this, felling areas are distinguished, i.e. not afforested areas on which all trees were cut and also clearings that have not been cultivated for a long time.

The trees over 20 years of age are also distinguished in the survey by their density. The following categories have been adopted:

- 0.9 - 1.0 full density stand, the crowns of trees overlap each other so that there is no gap in the ceiling,
0.7 - 0.8 incomplete density, when crowns are divided by narrow strips of free space;
0.5 - 0.7 thinned stand, there is enough space between crowns for other single trees;
less than 0.5 - loose stand sparsely scattered trees.

The orientation in forest utilization is represented by the composition of tree stand. With regard to managed forests this can be determined on the basis of management plans for various sectors, checked with the actual stand by direct observation; in not managed forests the data are obtained on the ground of estimates based on the direct observations in the forest.

The share of various species of trees is determined in percentage of the whole bulk of mature trees disposable.

The orientation in the utilization of woodland is marked on the map by appropriate colours; in case of mixed forests species accounting for at least 20% available timber are marked.

In addition respective symbols denote the age and density of the forest; thinned or open woodland being marked not by full colour but by hatching in the respective colour. If the forest is also utilized as pasture or mowed, and also with regard to mixed natural or artificial woodland-grassland formations /irrespective of their being actually utilized or not/ the area is classified as mixed woodland-agricultural land.

Various shrubby formations, either secondary, resulting from forest degradation, or natural ones composed of low offsprings of trees, trees and bushes or only bushes are placed in the same category.

Just as forests, also shrubs and bushes can be dense or sparse, the latter being mostly used as pastures or mowed meadows.

As shrubby formations are often composed of many species and the finding out of dominating species is rather difficult; they are classified in the same manner as grasslands, i.e. on the basis of original forest habitat and the vegetation growing there at present.

The following categories of shrubs and bushes are distinguished:

1. High mountain shrubs

Mostly natural, occurring on poor, skeletal soils, usually above the upper limit of trees. To

this category belong:

a. bilberry dwarf shrubs, mixed woodland-grassland category /see p.30/.

b. mountain pine shrubs /alliances Pinion mughi and Piceo-Pinion uncinatae/ - natural high mountain, less often mountain or submontane formation, covering shallow, acid, sometimes peaty soils. Mountain pine /Pinus montana/ forming dense thickets dominates there, sometimes with green alder /Alnus viridis/ and numerous other bushes such as bushy willows /Salix alpina, S. silesiaca, S. lappona, S. herbacea/, dwarf birch /Betula nana/, rocky currant /Ribes petraeum/ etc., some dwarf shrubs /Empetrum sp, Vaccinium sp/, tall herbs and ferns /Athyrium alpestre, Dryopteris austriaca, Homogyne alpina, Aconitum firmum etc./.

Apart from these, some other types of high mountain shrubs occur in neighbouring countries such as mountain juniper /Juniperion nanae/ and green alder /Pino-Alnion viridis/ associations.

2. Bor shrubs

Mostly secondary formations replacing forest associations occurring on light, sandy, more or less acid soils.

a. juniper shrubs growing mostly on poor, dry, sandy or gravelly soils, sometimes on better soils, degraded as result of excessive grazing. Common juniper usually dominates with poor grasses and other species omitted by livestock /Juncus sp, etc/ growing between,

b. heath - a mixed woodland - grassland category /see p.29/ composed of dwarf shrubs growing on poor, acid soils. On places where the heath is densely overgrown with juniper, greenweeds /Genista sp./ broom /Sarothamnus scoparius/, gorse /Ulex/ etc. it should

be qualified as woodland, marking dominant species.

c. broom shrubs replacing mixed forest /lasobor/ or even some ground habitats on heavier but acid soils. The characteristic species are broom /Sarthamnus scoparius/, greenweeds /Genista sp./ juniper and ferns.

3. Ground shrubs

Natural or secondary formations growing on fertile soils, neutral or alkaline as well as on skeletal lime soils.

a. xerothermic shrubs - natural or secondary mixed associations occurring on shallow lime-stone or gypsum soils, well exposed to the sun /ordo Quercetalia pubescentis/. Dwarfed forms of oaks /Quercus robur, Q. sessilis, Q. pubescens/ elm /Ulmus campestris/ hornbeam /Carpinus betulus/ pine /Pinus silvestris/ and various bushes, such as hazel /Corylus avellana/ cornel /Cornus mas/, dwarf cherry /Cerasus fruticosa/, roses /Rosa gallica, R. canina etc./, hawthorn /Crataegus monogyna/, blackhorn /Rhamnus cathartica/, berberry /Berberis vulgaris/ rhus /Rhus cotinus/, irga /Cotoneaster integerrima/ etc. with numerous grasses and herbs characteristic of xerothermic grasslands /Peucedanum cervaria, Laserpitium latifolium, Cytisus ruthenicus, Inula hirta, Anemone silvestris, Potentilla alba, Dictamnus albus, Geranium sanguineum, Chrysanthemum corymbosum, etc./.

Various similar xerothermic associations have developed in neighbouring southern countries. Among them pubescent oak-lime shrub formations /alliance Tilio-Quercion pubescentis/ composed of dwarf oaks /Quercus pubescens, Q. macedonica etc./ tomentose lime /Tilia tomentosa/, manna ash tree /Fraxinus ornus/, field maple /Acer campestre/, as well as various bushes /Cotinus coggygia, Cerasus mahaleb etc./ and ivy.

Another group is formed by various evergreen shrubform associations covering large areas in the Mediterranean zone known under the names of garrigue, maquis /macchia/, sibiljak, frigana etc. /classes Ononido-Rosmarinetea and Cisto-Lavenduletea as well as alliances Querco-Phillyrion and Quercion ilicis/.

b. thermophilous shrubs - occur on deep or medium deep, usually fertile soils more or less abundant in calcium carbonate /ordo Prunetalia spinosae/. The characteristic species are blackthorn /Prunus spinosa/, hawthorns /Crataegus oxyacantha, C. monogyna/, brambles /Rubus sp/, roses /Rosa canina, R. tomentosa, R. glauca etc/, liguster /Ligustrum vulgare/ etc.

c. mixed ground shrubs - replacing ground /oak-hornbeam or beech/ forests and maintained by steady grazing. Hazel /Corylus avellana/, hornbeam /Carpinus betulus/, buckthorn /Rhamnus cathartica/, red-berried elder /Sambucus racemosa/, verrucose spindle /Econymus verrucosus/, brambles /Rubus sp/ and hawthorns /Crataegus sp/ are dominant there.

d. nitrophilus shrubs - growing on deep, rich but either degraded or saline soils with a high nitrogen content. Lycium halimifolium, Eleagnus angustifolia and various tamarisks /Tamarix/ together with some tall herbs /Artemisia austriaca, Xanthium spinosum etc./ are characteristic species.

4. Łęg /Leng/ shrubs

Natural or secondary formations occurring on various alluvial soils.

a. mixed łęg shrubs - replacing mixed łęg forests on fertile alluvial muds. Bird cherry /Padus avium/, alder buckthorn /Frangula alnus/, snow-ball /Viburnum opulus/ elder /Sambucus nigra/ dogberry tree /Cornus sanguinea/, European spindle tree /Econymus europaea/ and some bushy willows dominate.

b. osier shrubs. In the initial stage these are natural, but otherwise secondary formations covering wet alluvial or strand sands/class *Salicetalia purpureae*/consisting of various bushy willows /*Salix purpurea*, *S. viminalis*, *S. triandra*, *S. repens* etc./, *Hippophaë rhamnoides* with various tall herbs/*Solidago* sp. *Eupatorium cannabinum* etc./.

c. mountain osier shrubs covering mountain or submontane gravel river alluvia /ordo *Myricarietalia*/ Various bushy willows and tamarisks/*Myricaria germanica*, *Tamarix* sp./ are characteristic species.

5. Bog shrubs

Natural or secondary formations covering peat-bogs,

a. alder shrubs - the remnant of destroyed or degraded ols /black alder/ forests growing on low /eutrophic/ peat bogs. Usually dwarfed alder offshoot with an admixture of alder buckthorn /*Frangula alnus*/ and shrubby willows are the dominant species.

b. grey willow shrubs consisting of some bushy willows /*Salix cinerea*, *S. aurita*, *S. pentandra*, *S. livida* etc./ usually together with dwarf shrubs typical of raised peat bogs /*Juncus palustre*, *Vaccinium uliginosum* etc./ and pines are characteristic of intermediate bogs.

c. raised bog associations - a mixed woodland grassland category /see p.34/ covering poor oligotrophic bogs of either the atlantic type /ordo *Erico-Sphagnetalia*/with *Erica tetralix*, *Andromeda polifolia* etc./ or the continental type /ordo *Sphagnetalia fusci*/ without these elements.

The above categories of shrubs are marked with coloured symbols, Sparse shrubs that can be utilized

as a pasture or mowed, are classified as mixed categories and marked on a coloured background representing the respective type of grassland.

As regards the production properties of woodland utilization, the survey collects material concerning evaluation of timber reserves, annual increment of timber in cu m/ha, the volume and kind of gained timber, kind and amount of forest by-products /resin, tanning bark, herbs, berries, fruits, mushrooms, game etc./ gained. These data are not marked on the map, but serve for further elaboration of material collected in the course of survey.

C. Waters

These are areas permanently submerged. Areas flooded for longer periods, over grown with trees, shrubs, grass, or being barren land /strongy, alluvial sands, black swamp/ are marked on the map as mixed water-grassland or water-unproductive categories. The areas of water reservoirs periodically covered with water are marked in the same way.

As regards natural conditions of utilized waters, the survey takes advantage of material concerning the categories of waters and their usefulness on the area under survey.

The following categories of waters are distinguished:

- A. natural and artificial current waters
 - 1. rivers
 - 2. streams, brooks and creeks /torrents/
 - 3. canals
 - 4. other
- B. water reservoirs natural and artificial
 - 1. seas
 - 2. lagoons

3. lakes, old river beds
4. ponds and pools
5. industrial reservoirs and sediment traps
6. dam reservoirs.

The ownership features of waters are determined and marked with boundary lines, just as those of agricultural land and forest.

Within the framework of organizational and technical features, the ways of utilizing water is examined according to the orientation in water utilization.

The following orientations are distinguished:

- /1/ drinking or industrial water collecting
- /2/ communication
- /3/ power production
- /4/ agriculture
- /5/ fishing

/1/ As regards water for drinking and for industrial production the survey collects material and makes respective marks on the map /from deep-drilled wells, springs, rivers, lakes/ and means of water distribution /water mains, aqueducts, canals, etc./, and also the degree of pollution of water conducted away.

/2/ As regards transportation and communication the survey distinguishes and marks with appropriate symbols on the map waters fit for rafting and navigation and installations connected, e.g. canals, sluices weirs, etc.

/3/ As regards power production, the survey distinguishes and marks water dams, power plants and other similar installations, with appropriate symbols on the map.

/4/ As regards agriculture, water supplying installations are marked on the map, and also irrigating and draining canals; in addition symbols are used to

mark areas drained or irrigated with open installations /ditches/ or sub surface ones /pipes, drains, etc./, flood irrigation, spray irrigation, etc.

As regards utilization for fishing purposes the following categories are distinguished and marked on the map:

- /1/ fishing without fish management
- /2/ fish management and fishing
- /3/ fish management in ponds including
 - a/ full-year ponds
 - b/ spawning ponds
 - c/ ponds flooded

for several months and in the remaining part of the year used either as meadows or as pastures /mixed category/.

The survey also collects material pertaining to methods of management, and means and utensils used for catching fish, and shellfish.

From the point of view of orientation in fishing economy the survey applies the following biological classification of waters, to a certain degree defining the species of fishes than can be caught there.

Fresh waters /current and standing/

- 1. extremely oligotrophic
- 2. oligotrophic, partly eutrophized
- 3. eutrophic
- 4. dystrophic

Salt and brackish waters /standing/

- 5. brackish
- 6. salt

1. Extremely oligotrophic waters. Standing waters are characterized by greater depth and poor quantity of mineral compounds dissolved in water /hard

water/. Water is highly transparent, there is an insignificant quantity of organic sediments, weakly disintegrated, water is well saturated with oxygen. These are most often mountain lakes or young glacial lakes.

Current waters /upper reaches of rivers, torrents/ are shallow, the current is rapid, water is clear, hard and well saturated with oxygen. The river bottom is rocky, paved with boulders and gravel.

The dominating species of fish: trout, grayling salmon and salmon trout in the period of spawning.

2. Oligotrophic eutrophized waters /mezotrophic/

Standing waters are characterized by great or medium depth, /usually over 20 m/ small amount of mineral compounds dissolved in water, relatively insignificant sliming of the bottom; the water partly loses transparency. Lake shore vegetation is weakly developed with the domination of characteristic species /Lobelia Dortmanna, Isoetes lacustris, etc./.

The dominating species of fish: lavaret, ablen /Coregonus albula/, smelt ruff /Acerina cernua/.

Current waters /middle reaches of rivers/ are rather shallow, the bottom is covered with gravel and sand the current is not so rapid as in the upper reach.

The dominating species of fish: barbel, aspilus /Aspius rapax/, Chondrostoma nasus, ruff, dace /Leuciscus leuciscus/.

3. Eutrophic waters

Standing waters are shallow /up to 20 m/, saturated with dissolved minerals, much sediments of organic origin, deficiency of oxygen in lower layers. Coastal vegetation is well developed.

Dominating species of fish: bream, pike, tench, roach, perch, bleak.

Current waters /lower reach of rivers/: the current is slow, the river is meandering, the bottom is sandy or slimy, castal vegetation is rich.

Dominating species of fish: bream, carp, Vimba /Vimba vimba/, sheatfish /*Silurus glanis*/ roach, tenci, pike, perch.

4. Dystrophic waters

Rather shallow /up to 6 m/, much slime, water is of a brown colour, often acid, considerable quantity of organic /humus/ compounds, shortage of mineral salts. The surface is often covered with duckweed. Found in woodland amidst peatbogs. Only standing water. On the banks peatbog vegetation.

The dominating species of fish is crucian carp.

5. Brackish waters

They occur in river estuaries, lagoons and coastal lakes linked with sea. etc. The brine is weak, up to 0,2%.

The dominating species of fish are: Vimba, allice shad, twide shad, and ciosa /*Pelecus cultratus*/, and from time to time sea fish also occur there.

6. Salt waters

Sea and salt lakes. Specific flora and fauna.

Artificial current and standing waters /water reservoirs/ are classified according to the same criteria and placed in the respective categories according to their situation with regard to natural waters /river roach/ and internal properties. For instance, water storage reservoirs can be classified as oligotrophic or eutrophic waters, trout ponds - as oligotrophic; carp ponds - as eutrophic waters, etc.

The above categories are marked on the map with

the shades of colour designed for waters, the artificial character of reservoir or current water being also marked.

As regards production of fish, the survey collects data about the amount and species of fish caught and yields calculated in kg of fish per one ha of waters. These data are not marked on the map, but used in further elaboration of material collected during survey.

D. Settlement

This category embraces areas covered with all kinds of constructions with the surrounding area functionally connected with them by common utilization.

The land utilization survey takes advantage of all material concerning external conditions of settlements in the widest meaning of this word, both natural conditions /subsoil, relief, irrigation, climate/ and general technical, economic and social conditions influencing the formation, development and distribution /location/ of settlements.

The social and property relations and organizational and technical features of utilization of settlements are examined within the orientations in their utilization.

The following orientations are distinguished:

1. residential
2. industrial
3. mining
4. agricultural
5. commercial
6. communication
7. public utility
8. recreation
9. service
10. other permanently built-up areas.

These categories are distinguished and marked on the map of land utilization by the intensity and shades of colours used to mark settlement areas; areas serving other aims, but impossible to be marked separately on the map drawn to that scale, are also encompassed by the above categories.

1. residential areas are dwellings destined mainly as human abode and the surrounding areas that cannot be separated from them, e.g. courtyards, gardens and orchards. The same category also includes small industrial enterprises, shops, service points situated in the same buildings as flats and farm buildings surrounding them.

The following systems of layout of residential areas are distinguished:

a/ compact layout: dwellings are built close to each other. Buildings are usually serving various purposes /flats, shops, small-scale industrial enterprises/, but they can also be blocks of flats only. The following types of compact layout are distinguished:

high - over six storeys
medium - 3-6 storeys
low - 1-2 storeys

b/ loose layout - buildings are separated from each other, by free space. They serve various purposes, or else are used only as flats. The following types are distinguished:

high - over six storeys
medium - 3-6 storeys
low - 1-2 storeys.

In the last group the following subdivisions are made:

- 1/ houses without farm buildings, surrounded with gardens **or not**
- 2/ houses without farm buildings in woodland /mixed category/

- 3/ farmsteads and surrounding gardens
 - a/ small farmsteads
 - b/ farmsteads in big landed-estates
- 4/ temporarily utilized buildings.

The above categories are marked on the map of land utilization by appropriate symbols or hatching. Apart from this, as regards residential areas the survey collects data concerning the shape of settlements /detailed plan is desirable/, the shape of farmstead /size, composition and destination of buildings belonging to the farmstead/, the degree and means of equipping the settlement with public utilities /water mains, sewage system, electric light and power, gas/.

2. Industrial areas. Areas belonging to ~~all~~ manufacturing industry enterprises, active as well as inactive, built up and not built up belong to this category. The following are marked on the map by appropriate colours and symbols:

a/ intensively utilized areas, i.e. built up and equipped, on which industrial production is carried on;

b/ extensively utilized areas, i.e. factory grounds, storehouses of raw materials, warehouses of finished goods, sediment traps, etc., of auxiliary importance for the process of production,

c/ reserve areas, not utilized but reserved in view of further extension of the factory. If these areas are temporarily utilized for some other purposes they are classified as mixed category /e.g. industrial - agricultural utilization/.

The above categories are marked on the map by different intensity of colours destined for industrial areas, in addition a respective symbol is added to mark the industrial branch or line. ~~Small-scale~~ industrial and handicraft enterprises situated in resi-

dential buildings, or separate buildings that are too small to be marked on the map drawn to this scale are not separated from residential areas.

Apart from this, the survey collects data concerning the number of workers employed in the given enterprise, sources of power, origin and volume of basic raw materials used for production, volume and destination of finished products.

3. Mining areas. This category embraces areas on which material resources have been exploited, including mines active at present, abandoned mines and those destined for future exploitation. The following categories are marked on the map by respective colours and symbols

a/ underground exploitation, both active and inactive mines

b/ open cast exploitation, both active and inactive

c/ reserved areas and mining fields. If the latter are temporarily used for some other purposes, they are marked as a mixed category, e.g. mining-agricultural category.

The kind of mineral resources won is also marked on the map by appropriate symbols.

Apart from this, the survey collects material concerning the number of workers in mines, source of power, volume and value and kind of production and its destination.

4. Agricultural areas. The following categories are marked on the map by an appropriate colour and symbols

a/ areas of technical services for agriculture /machine centres/; data concerning the number of workers, the size and composition of machine park in the given centre, are collected;

b/ breeding farms /poultry, ~~two~~ animals, bee keeping farms, pig fattening farms etc/, the number of animals and the volume, kind and destination of production is noted;

c/ hothouses, greenhouses, hotbeds, etc., data concerning the volume, value, kind and destination of production are recorded.

5. Commercial areas comprise areas on which trading activity is conducted both in the open air and indoor, and also areas utilized temporarily by the trade. Only objects sufficiently big to be marked on the map are distinguished, destined exclusively or mainly to serve trade purposes, e.g.

- a/ big stores and department stores
- b/ storage areas
- c/ open and close market areas.

Small trade centres, scattered or situated in residential buildings are included in the residential areas.

6. Transport and communication areas. These are areas occupied by all kind of transportation lines, roads and areas functionally linked with them. The following are distinguished and marked on the map with respective colours and symbols:

- a/ transportation areas

1/ railway: railway stations and the surrounding areas, shunting installations, railway stores etc.

2/ motor transportation: bus stations, garages, gas stations and the connected surrounding areas.

3/ air traffic - air ports, aerodromes, hangars, etc.

4/ water transportation - the area of port installations.

b/ roads

1/ railway lines standard gauge, two- and one-track

2/ narrow gauge railways

3/ roads: hard surfaced, surfaced, nonsurfaced /field roads/.

To mark roads, even wide ones, on the map, they must be drawn to a bigger scale than the map itself. In this connection roads of secondary importance should be omitted on the map.

7. Public utility areas encompass built up or open areas occupied by public utility installations /except production works, e.g. power plants, gas works etc./. The following are distinguished and marked on the map:

a/ public parks, green spaces, lawns, etc.

b/ cemeteries

c/ water supply and water works

d/ sewage system

8. Recreation areas. They are built up or open areas utilized for health treatment, sports, recreation and rest. The following categories are marked on the map:

a/ health resorts: built up: sanatoria, water drinking halls, etc.

not built up: parks and lawns in health resorts and spas.

b/ bathing places: managed beaches: sandy
grass
other

c/ tourist centres: shelters, camping grounds;

d/ sports centres: playing grounds, tennis courts, golf grounds, swimming pools, etc.

e/ entertainment places: amusement parks.

9. Service areas. They are built up or open space areas used by health service, schools and cultural and social institutions, etc. Only objects utilized exclusively or mainly for service purposes and possible to mark on the map are marked.

a/ health institutions: hospitals, clinics, health centres,

b/ education and teaching: creches, nursery schools, kindergartens, schools, colleges, universities,

c/ culture: culture houses, cinemas, theatres, museums, cultural monuments,

d/ religion: churches and temples of various denominations, monasteries, etc.

e/ administration: big administrative buildings, government and municipal buildings, etc.

E. Unproductive Lands

Areas not utilized and not fit for utilization without large financial outlays belong to this category. The following kinds are distinguished and marked by colours and symbols:

1/ natural unproductive land, that come to being itself, or with only indirect human influence

a/ barren rocks, debris, rubbles etc.

b/ stone accumulations on river banks

c/ gravel accumulations on river banks and other places

d/ loose sands

e/ glacial stone heaps

f/ cliffs, steep slopes

g/ barren swamps

h/ glaciers and eternal snow fields

2/ artificial unproductive land, that came into being as a result of direct human activity

a/ derelict open cast mines /quarries, gravel pits, sand pits, clay pits, peat holes/.

b/ cavities caused by underground exploitation of mineral raw materials

c/ mixed water-unproductive land /derelict cavities flooded with water, temporarily overflown banks of water reservoirs/

d/ dykes

e/ waste heaps

Both dry bare areas and those under water or grown with trees, shrubs of grass are marked on the map. Some of them can be utilized e.g. as poor grassland or in some other way. In the latter case they are regarded as mixed agricultural-unproductive category marked on the map with colours destined for both these categories.

III. Technique of Research

A. Material used as basis of work

The land utilization survey is based on:

- statistical data /particularly as regards orientation and results of arable land utilization/;
- official data;
- observations collected on the spot with regard to facts not included in statistics and official data. The observation also helps to check the exactness of official and statistical data, to differentiate various facts recorded inside the objects under investigation and to note changes that have taken place

after the data have been collected or the basic map used being drawn

- interviews with local population with regard to facts not included in statistics and official data. The interviews are also aimed at checking the official and statistical data, differentiating facts observed in the examined objects and recording change that could have taken place after the collecting of statistical and official data or drawing the basic map.

The collected information is entered in a special questionnaire-forms, and data envisaged in the instruction are marked on the basic map. Any topographical map not outdated can serve as a basic map as well as aerial photograph to a similar scale, and also cadastral plans, village plans, plans of big landed estates, etc., on the condition that they contain hypsometrical data, particularly in mountainous and undulating areas.

B. Basic activities

The activities connected with land utilization survey consist of three basic stages of work:

1. initial work
2. field work
3. elaboration of material

1. Initial work comprises the following activities:

a/ getting of topographical maps of the area under investigation or photo or other copies of such maps to the scale of 1:25,000 or 1:10,000 (mostly used as basic maps/, aerial photographs and cadastral maps /mostly used as control instruments/ and various special maps: administrative division maps, maps of soils, geological, geomorphological, hydrographic maps etc. used as auxiliary material.

In case of shortage of maps to a suitable scale, maps to a greater scale are minimized or maps to a smaller scale are magnified to correspond with the scale adopted for the land utilization map. In case when all the necessary data have not been marked on the basic /e.g. hypsometry, contours of main forms of land utilization etc/, they should be drawn from other maps before the beginning of field work, and later checked and supplemented by direct observation. In case of shortage of necessary maps the lacking data are introduced on the basis of direct observation during field work.

b/ drawing on the basic map of the limits of administrative units, and basic investigated units /villages, big landed estates, forest districts etc./. If there is no map containing these data, the boundaries are drawn after conducting interviews with the local population as the very beginning of field work.

c/ collecting of statistical data and official material pertaining to the units under investigation in supervising administrative bodies.

/1/ In agriculture material usually pertains to:

a/ total area of units, divided into forms of land utilization

b/ number and size of farms;

c/ area of crops

d/ yields per hectare

e/ amount of livestock

f/ animal production

g/ soils and their classification/a design should be made/.

The failing data concerning agriculture are collected by means of directed observation and interviews with the population.

/2/ In forestry - on the basis of official data one makes /in managed forests/;

a/ rough copies of maps of forests and units containing the respective sectors numbers;

b/ rough copies of maps of habitat types of forest or forest associations;

c/ summation of data concerning forests on the basis of management plans;

d/ collecting of data concerning gained timber and other forest production.

The failing data concerning forestry are collected by means of direct observation and interviews with foresters.

/3/ Water - the collecting of official data concerning ways and orientations in utilizing waters, particularly as regards fishing.

/4/ Settlements - collecting of statistical and official data concerning industry, mining, services etc;

/5/ and apart from this, material concerning the number of population and its biological and professional structure living on the area under survey, are also collected.

2. Field work

The necessary equipment to start field work consists of:

a/ a basic map to the scale of 1:10,000 or 1:25,000

b/ a set of questionnaires /forms/

c/ a set of writing tensils, pencils, hardcolour pencils, erasers,

d/ in a difficult area also a compass.

Field work bogins with acquainting oneself in detail with the area on which the survey is to be conducted and checking the administrative and property boundaries; if boundaries have not been marked on the map - marking them on the basis of direct interviewing of the local population and observation.

The next stage consists of controlling or drawing on the map the main categories of land uses, namely agricultural /farmed/ land, forests, waters, settlements, unproductive lands, as well as second-rate categories i.e. arable land, perennial crops, grassland, drawing their contours on the basic map and marking them with the same symbols on the map and in the questionnaire.

If the map is drawn to the scale 1:25,000, all objects smaller than 0.5 ha or with one side shorter than 100 m are omitted. If the map is 1:10,000, the respective minimum size is 0.2 ha and 40m. Roads are the only exception; they are magnified to such dimensions as to be visible on the map.

The next activity is the exact filling of questionnaires containing data for each form of land use in the area under survey; all the data that have been collected by observation or by interviews are to be recorded in the questionnaire.

In big landed estates the management is interviewed; in small holdings, village bailiffs, agronomists and farmers themselves. At least 15% farms should be encompassed by the interviewing, and it is necessary to select the most representative units. When formulating questions one must have in mind that information already got from official and statistical

data and from other interviewed persons should be checked this way.

If the statistical material concerning the unit under survey is particularly scarce or not reliable, more emphasis should be laid on collecting necessary material by direct observation and interviewing, deviating in case of need from methods recommended in the instruction.

To facilitate work in filling up the questionnaires, alphabet letters have been put in brackets indicating the source from which to get the material in Polish conditions.

/u/ from statistics obtained in Statistical Departments of the County or Commune Council authorities or from agricultural management plans /County Agricultural Board, Geodetical Depts./

/s/ from village mayors

/a/ from village agronomists

/w/ from interviews with farmers, agronomic officers, management of State farms and cooperative farms

/c/ from direct observation.

If material is to be collected from various sources, more letters are indicated in brackets.

The column "Remarks" in the questionnaire is destined for all the data, gained as a result of direct observations or interviews, with regard to which no questions have been formulated. This pertains above all to the specific features of the unit under survey.

3. Setting down the collected material

When field work is nearing completion, the setting down of the collected material begins. The following activities are to be performed:

idem: **Agricultural Problems involved in the Polish Land Utilization Survey.** Land Utilization. Methods and Problems op.cit. pp 59-128.

idem: **Land Utilization Survey as a Basis for Geographical Typology of Agriculture.** Przegląd Geograficzny 32/1960/ Suppl. pp 169-183.

C o n t e n t s

I.	Initial Information	1
II.	Classification of land use	11
III.	Technique of Research	60

Appendices

1. Forms
2. Key of symbols

F O R M S

/being in use in Poland/

Description of the surveyed unit /conclusions
and remarks concerning land utilization and
human economy in nature/:

County
Commune
Village
Map 1:25 000, sheet No

Survey conducted by
Date of survey
Head of the group

I. Orientation in arable land utilization:

		domi- nation	
extractive	ha	%	%
intensifying	ha	%	%
structure forming	ha	%	%
/orientation is defined by the appropriate symbol/			
industrial	ha	%	%
vegetables	ha	%	%

II. Livestock breeding

	number of heads	number of big animal units
--	-----------------	----------------------------

- horses**
- young horses
- total horses**
- sulls**
- cows**
- heifers
- calves
- total: cattle
- boars and sows
- fattening pigs
- piglets
- total: pigs
- sheep
- lambs
- total: sheep
- goats
- total of productive herd
- definition of orientation /with a symbol/

Total of big animal units per 100 ha of agricultural land

III. Soil classification

I class	IV class
II class	V class
III class	VI class

IV. Property relations /structure/.

V. Population

- total
- rural population
- agricultural population able to work
- population able to work calculated per 100 ha of agricultural land

County Commune Village

Arable Land

I. Utilizer /a b/

- 1. State Farms and other State properties
- 2. Collective farms
- 3. Individual peasant farms
- 4. Other /e.g. church property/

II. Agrarian structure /a c/

- 1. Big landed estates over 50 ha
- 2. Small holdings

A. Layout of fields connected with settlements /d/

- | | |
|------------|----------------------|
| a/ compact | b/ scattered |
| 1/ lan | 1/ colonies |
| 2/ niwa | 2/ big peasant farms |
| 3/ block | |

B. Farms and subdivisions /b c/

- a/ Number of lots of arable land per one farm
 - 1/ up to 5 lots
 - 2/ 5-10 lots
 - 3/ over 10 lots
- b/ Percentage of occupied area /a/
 - 1/ farms up to 5 ha cover
 - 2/ farms up to 5 ha cover

III. Agronomy

- a. crop rotation /b c/ year
- b. succession of crops after how many years
-
-
-

c. Tillage /b c/

regular irregular

- 1. first ploughing
- 2. ploughing
- 3. intercrop
- 4. aftercrop
- 5. cultivation of crops
- 6. land reclamation /area covered by drainage and irrigation
 - a/ open ditches
 - b/ subsurface drainage
- 7. activities aimed at preventing erosion
- 8. ploughing in respect to morphology
 - a/ parallel
 - b/ perpendicular

d. manuring /b c/

No	natural, amount of dung /wagons per ha/	artificial, kind of fertilizer and quantity / q/ha /	compost	green manures what kind
----	---	--	---------	-------------------------

- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.
- After how many years the same field is manured with dung

e. Technique of field works /b c/

- 1. ploughing b/ harrowing other draught power:
 - horse
 - ox
 - cow
 - tractor
- 2. sowing: a/ by hand b/ machines...
- 3. harvesting: a/ sickle..... b/ scythe
 - c/ harvester... d/ harvester-tractor...
 - e/ combine..... - tractor...

4. threshing /b/

- a/ flail
- b/ horse-drawn threshing machine
- c/ Diesel-engine " "
- d/ electric motor " "
- e/ steam engine " "

5. Grain cleaning /b c/

- a/ separator b/ winnower.. c/ trieur...

f. machine park /b/

- 1. tractors 5. sheafbinders
- 2. Diesel engines... 6. harvesters
- 3. electric motors.... 7. mowers
- 4. combines..... 8. sowing machines..

g. amount sown in kg/ha /c/

- 1. rye
- 2. wheat
- 3. barley
- 4. oats
- 5. potatoes
- 6. other crops

IV. Yields gained per ha /a c/

- a/ highest b/ lowest c/ average

- 1. rye
- 2. wheat
- 3. barley
- 4. oats
- 5. sugar beet
- 6. fodder beet
- 7. potatoes
- 8.
- 9.

V. Remarks /d/

Waste land

I. Utilizer /a b/

- 1. State Farms and other State property
- 2. Collective Farms
- 3. Individual peasant farms
- 4. Others

II. Ways of utilization /c d/

- 1. not utilized
- 2. partly utilized
 - a/ for grazing
 - b/ other
- 3. barren
- 4. overgrown with
 - a/ grass
 - b/ shrubs
 - c/ trees

III. Causes of land being laid down

- 1. natural conditions
- 2. economic reasons
- 3. ways of rational reclamation

County

Commune

Village

V. Supplementary questions to the statistical data /asked during interviews/ concerning cropped area in the village surveyed

1. What is the share of buckwheat and millet?
2. For what purpose and in what proportion barley and oats are used for /direct consumption, forage, industrial purposes/?
3. What fodder root crops are cultivated and in what proportion?
4. what "other oleaginous" crops are cultivated and in what proportion?
/poppy, sunflower, soybean, mustard, etc./
5. what "other industrial" crops are cultivated and in what proportion?
/hop, tobacco, chicory, medical herbs/

6. What species of clover are cultivated and in what proportion?
/red, white, Swedish, crimson/
7. Is lucerne and sainfoin grass cultivated, what varieties and in what proportion?
8. What fodder crops are included in the category "serradella and other forage crops", in what proportion?
9. What edible leguminous plants are cultivated, in what proportion?
10. For what purpose and in what proportion lupin and serradella are cultivated?
/for fodder or as green manure/

County

Commune

Village

STOCK BREEDING

1. Utilizer /a b/

- 1. State Farms and other State property
- 2. Collective
- 3. Individual peasant farms
- 4. Other

II. Stock breeding /b c/

1. Cattle

a/ breed

b/ type.... milch, meat-milch, meat

number of litres annually

percentage of fat

annual sales of cattle

average live weight

c/ increment of herd... number of animals.....

2. Pigs

a/ breed

b/ type heavy, meat meat-and- bacon
fattening lard

average live weight in kg

3. Sheep and goats

a/ breed

b/ type thin rough wool meat-and-
fleece -milch

average yield of wool per kg

fur

average meat production in kg

average milch yields in kg

4. Horses and other draft animals

a/ breed

b/ type

heavy medium light

5. Pedigree - copulation stations

horses

cattle

pigs

other

6. Poultry

	heads	eggs laid	weight
		/annually/	/in kg/

hens /chicken/

geese

ducks

turkeys

other

7. Fur animals

species number

annual increment

/in numbers/

average annual profit

III. BEEKEEPING

Number of hives

average annual yield of honey in kg

IV. Other /e.g. silk worms/

Remarks:

County Commune Village

PERENNIAL CROPS

Utilizer:

- Research /experiment/ stations,
- State Farms and other State property
- Collective Farms
- Individual peasant farms

1. Orchards

Kind

- a/ farmyard orchards
- b/ commercial orchards
- c/ nurseries of fruit trees
- d/ age of fruit trees
 - young trees %
 - fully productive trees %

e/ share of various species

- apple tree
- pear tree
- plum tree
- cherry tree
- sour cherry /marilla/ tree
- other trees /enumerate/

f/ estimated yields per tree in kg

g/ utilization

- only as orchard
- mixed, also as meadow or pasture
- root crops or vegetables planted between the rows
- fodder crops planted between the rows
- cereals planted between the rows
- intercalary cultivation of

2. Soft fruits e.g. raspberries, currants, gooseberries, etc.

3. Vineyards

4. Nurseries of other trees /not fruit bearing/

5. Allotment gardens

6. Semi-perennial crops

- a/ hop
- b/ strawberries
- c/ rhubarb

Vegetables

Utilizer:

- State Farms and other State property
- Collective Farms
- Individual peasant farms
- Other

1. Kind

- a/ farmyard gardens
- b/ market gardens

2. Hothouses

- a/ greenhouses
- b/ hotbeds

3. Share of various species of vegetables

- cabbage
- tomato
- onion
- cauliflower
- cucumbers
- other

Remarks:

County

Commune

Village

PERMANENT GRASSLAND

I. Utilizer /a b c/

- 1. Under State Farms management
- 2. Collective Farms
- 3. Individual peasant farms
- 4. Others /people's councils, church/

II. Vegetation /in percentage/ /d/

- a/ reeds, rush, bullrush, calamus etc.
- b/ sedges
- c/ grasses
- d/ papilionaceae /leguminous/
- e/ herbs

III. Types of grassland /d/

- 1. mown meadows 2. successively mown and grazed 3. grazed /pastures/

A. Natural grassland

- 1. high mountain
- 2. xerophilous /steppe/
- 3. halophyte
- 4. reeds /on land.... on water/.....

B. Artificial grassland

- 1. bor
 - a/ dune
 - b/ xerophilous
 - c/ white bend
 - d/ heath
 - e/ bilberry
- 2. grond
 - a/ top hill
 - b/ forest fertilized
 - c/ field fertilized
- 3. leg
 - a/ proper
 - b/ swale
 - c/ sparse
- 4. bog
 - a/ high sedge
 - b/ spring and seepage
 - c/ bog proper
 - d/ transitional or raised peat bog

IV. Reclamation and management

- 1. Reclaimed /b c d/ 2. Not reclaimed
 - a/ drainage working not working
 - open
 - subsurface
 - b/ irrigation
 - c/ drainage and irrigation
- 3. Management /b c/
 - a/ manuring
 - b/ sowing
 - c/ ploughing and sowing
 - d/ not tilled
 - e/ degraded
 - f/ weedy /d/
- 4. Hay harvesting /b/
 - a/ manual /scythe/
 - b/ mechanized /horse-driven mower, tractor-driven mower/

V. Yields /b c/

- 1. hay yields in q/ha for the last three years
- 2. number of yearly hay harvests
- 3. grazing
 - a/ free
 - b/ fenced
 - c/ in leash

VI. Remarks:

VI. Undergrowth

VII. Ground cover

VIII. Soils

IX. Annual increment of timber per ha /in the given section/ /a c/

X. Byproducts /in the given section/ /a c/

1. resin
2. tanning bark
3. game shot
4. berries harvested
5. mushroom harvested

B. I. Thinned or degraded woodland, mixed forms /e.g. with pastures/

II. Shrubs and mixed forms

a/ high mountain

b/ bor

1. heath
2. juniper
3. broom

c/ grond

1. xerophilous
2. thermophilous
3. nitrophilous

d/ łqg

1. mixed
2. osier
3. mountain osier

e/ bog

1. alder
2. grey willow
3. raised bog

County
Commune
Village

FORESTS

Forestry district

Utilizer /a b c/

- 1. State
- 2. Collective
- 3. Private
- 4. Common
- 5. Other

A. Material collected from forest management plans /a/

I. Types of forests /according to the local classification/

II. Category of tree stand

III. Density of tree stand

IV. Methods of gaining timber

- 1. Clear felling
 - a/ full grown /over 80 years/
 - b/ mature /41-80/
 - c/ immature /21-40/
 - d/ young growth /up to 20 years/
 - e/ clearings

2. Selective felling
a/ trees of different age

3. Exploitation without management
/approximate age of trees, or trees of different age/

4. Limited exploitation - Protective forests

5. Natural reserves

6. Hunting preserves

7. Full cultivation

V. Dominating species of trees in percent /a/

- 1. pine
- 2. spruce
- 3. fir
- 4. larch
- 5. birch
- 6. aspen
- 7. beech
- 8. hornbeam
- 9. oak
- 10. linden
- 11. maple
- 12. elm
- 13. ash
- 14. alder
- 15. poplar
- 16. willow
- 17.
- 18.

County Commune Village

WATERS

I. Under administration /a b c/

- 1. State
- 2. Collective
- 3. Private
- 4. Other

II. Current waters natural and artificial /ri-
vers, streams, canals, etc./

Give the name /b c d/

- 1. Management and conservation
 - a/ regulated
 - b/ canalized /weirs, sluices, dams/
 - c/ embankments
 - d/ other

III. Standing waters natural and artificial /lakes,
ponds, pools, reservoirs, etc./

Give the name /b c d/

- 1. Management

IV. Periodically submerged areas /back-flows/ /c d/

V. Utilization of water /b c d/

- 1. Water collection utilized not utilized
 - a/ from deep-
-drilled wells
 - b/ from springs
 - ordinary
 - mineral
 - warm /hot
springs/
 - c/ from rivers and
lakes
 - d/ water mains
 - e/ aqueducts

- a/ conduits of water /canals and ditches,
sewage system/
- b/ water pollution
 - 1/ with biological life existing
 - 2/ biological life destroyed
- 3. Water transport
 - a/ suitable only for rafting
 - b/ suitable for navigation
- 4. Tourist facilities and water sports
- 5. Power production
 - a/ power plants
 - b/
- 6. Agriculture
 - a/ open land reclamation active inactive
drainage channels and
ditches
irrigation canals and
ditches
mixed drainage and
irrigation system
 - b/ subsurface reclamation working, inactive
/drains etc./
- 7. Fishing
 - a/ biological type
 - 1/ fresh waters
 - oligotrophic
 - oligotrophic eutrophized
 - eutrophic
 - dystrophic
 - 2/ salt waters
 - brackish
 - salt
 - b/ fishing economy
no fish management
fish culture
species of fish caught
catches in kg/ha - annual average

County

Commune

Village

SETTLEMENTS

I. Utilizer /ab/

- 1. State property
- 2. Collective
- 3. Other institutions
- 4. Private ownership

II. Settlement areas /bcd/

A. Layout

- 1. Compact
 - a/ high
 - b/ medium
 - c/ low
- 2. Loose layout
 - a/ high
 - b/ medium
- 3. Low cottage-type
- 4. Low with farmbuilding /village farmsteads/
- 5. Big landed estates /former big land-ownership and State Farms/
- 6. Temporarily utilized buildings

B. Village plan /scattered, street village, angerdorf, gewandorf, rundling, waldhufendorf/

C. Building material % of dwelling houses
% of farm buildings

- 1. Walls /bricks, stone, timber, concrete, clay/
- 2. Roof /thatch, tiles, asbestos-cement roofing metal sheet/

D. Size and state of buildings and their site within the farmstead

E. The situation of farmsteads with regard to water supply /the site from which water is obtained by various ~~formholdings~~/

F. Extent of electrification of the village

III. Industrial areas /acd/

- A. 1. Intensively utilized areas
- 2. Extensively utilized areas
- 3. Not utilized areas
- 4. Not working objects

- B. 1. Branch of industry
- 2. Employment
- 3. Source of power
- 4. Volume and source of basic raw materials
- 5. Character and volume of production
- 6. Production value
- 7. Destination of productions

IV. Mining areas /acd/

- A. 1. Underground exploitation "active" inactive
- 2. Open-cast exploitation
- 3. Mining fields

- B. 1. Mineral resources mined
 - fuels
 - metal ores
 - chemical
 - ceramical
 - other

C. 1. Employment

- D. 1. Production volume
- 2. Production value
- 3. Destination of production

- V. Agricultural areas /a b c/
 - 1. Technical service of agriculture /type and number of agricultural machines/
 - 2. Poultry farms, pig fattening farms, fur animal farms, volume and value of production
- VI. Commercial areas /a c d/
 - 1. Stores and magazines
 - 2. Marketing /fair/ areas
- VII. Communication and transport /a b c/
 - 1. Areas
 - a/ railway
 - b/ motor traffic
 - c/ air traffic
 - d/ port installations
 - 2. Roads
 - a/ railway lines: standard gauge
narrow gauge
for industrial use only
funicular
 - b/ hard-surfaced roads
improved
not improved
 - c/ field roads
- VIII. Public utilities /a c d/
 - 1. Parks, green spaces, lawns, etc.
 - 2. Cementeries
 - 3. Water supply and water werks
 - 4. Sewage system
- IX. Recreation areas /a b c/
 - 1. Health resorts-built up, parks
managed not managed
 - 2. Bathing places,
 - 3. Tourist hostels and
camping grounds
 - 4. Sport and playing grounds
 - 5. Amusement grounds
- X. Service areas
 - 1. Health - hospitals, clinic etc.
 - 2. Education
 - 3. Culture
 - 4. Religion
 - 5. Administration

County

Commune

Village

UNPRODUCTIVE LANDS

1. Under State administration

- a/ under state collective
- b/ private
- c/ commune
- d/ other

Give the kind of vegetation covering the area, water conditions /dry, flooded/, and utilization

2. Natural unproductive lands /b c d/

- a/ barren rocks
- b/ rubbles
- c/ debris
- d/ stones on river banks
- e/ river gravels
- f/ loose sands
- g/ glacial stone heaps
- h/ cliffs steep slopes
- i/ barren swamps
- j/ other

3. Artificial /derelict/ lands /b c d/

- a/ derelict mining areas covered with water
- b/ cavities covered with water
- c/ dykes
- d/ waste heaps

4. Possibilities and directions of utilization

Remarks:

SPECIAL AREAS

- 1. Not used for agricultural purposes
- 2. Partly used for agriculture /how?/.

**WYKAZ ZESZYTÓW
DOKUMENTACJI GEOGRAFICZNEJ**

za ostatnie lata

1961

- 1 PRACA ZBIOROWA — **Klimat Hali Gąsienicowej**, tekst 20, 29 tabel, 44 ryc., zł 7.—
- 2 PRACA ZBIOROWA — **Z badań Stacji Naukowej IG PAN nad Jeziorem Mikołajskim**, s. 135 + nrb. 28 ryc. + mapa + 2 tab., zł 7.—
- 3 PRACA ZBIOROWA — **Materiały do geografii przemysłu Polski**, s. 245, zł 7.—
- 4 M. BOGACKI — **Objaśnienie do mapy geomorfologicznej 1 : 50 000** Arkusz N 34-93 Kolno, s. 50, zł 7.—
- 5 PRACA ZBIOROWA — **Materiały do geografii zaludnienia Polski i Czechosłowacji**

- 1 S. ZYNDA — **Objaśnienie do mapy geomorfologicznej 1 : 50 000** Arkusz N-33-13.-B. TCPOROW s. 70 + nrb. ryc., zł 7.— (do użytku służbowego).
- 2 D. KOSMOWSKA — **Objaśnienia do mapy hydrograficznej 1 : 50 000** arkusz Czarów, s. 80 + mapy, zł 7.— (do użytku służbowego).
- 3 PRACA ZBIOROWA — **Bibliografia geografii polskiej — 1960** str. 32), zł 7.—
- 4 PRACA ZBIOROWA — **Studia nad wymianą cieplną na Stacji Naukowej IG PAN w Wojcieszowie**, s. 40 + ryc. nrb. zł 7.—
- 5 PRACA ZBIOROWA — **Zagadnienia z geomorfologii i hydrografii**, s. 54 + ryc. nrb., zł 7.—
- 6 J. BĄCZYK — **Geneza Półwyspu Helskiego na tle rozwoju Zatoki Gdańskiej**, s. 180 + 28 ryc. + 26 fot. nrb., zł 7.— (do użytku służbowego).

1964

- 1 PRACA ZBIOROWA — **National and Regional Atlases** (w druku)
- 2 J. KOSIROWICKI — **The Polish Detailed Survey of Land Utilization. Methods and Techniques of Research** (w druku).

Cena zł 15.-

THE POLISH DETAILED SURVEY OF LAND UTILIZATION

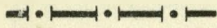
Methods and Techniques of Research

KEY OF SYMBOLS FOR COLOUR MAPS

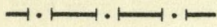
/Dokumentacja Geograficzna 2/64/

I. BOUNDARIES

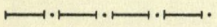
A. Administrative



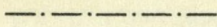
state



province (voivodship)

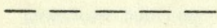


county (powiat)

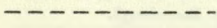


commune (gromada)

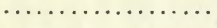
B. Ownership



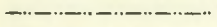
state



collective

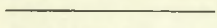


private

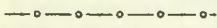


other

C. Limits of main uses



D. Other limits and boundaries

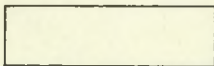


natural reserves

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

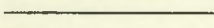


5 to 10

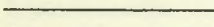
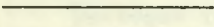


over 10

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



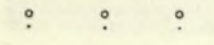
over 50 percent of agricultural land



over 25 percent of agricultural land

B. Arable lands

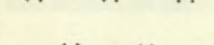
1. crop rotation

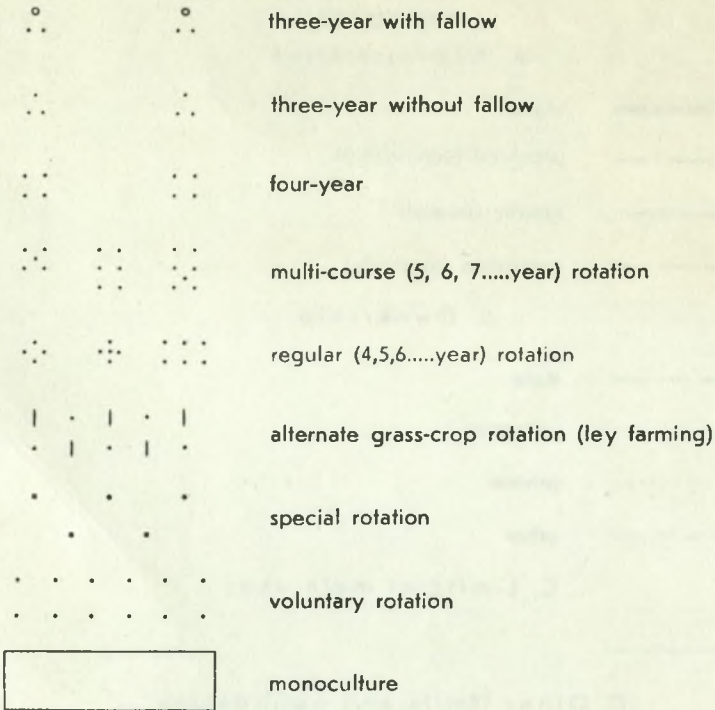


two-year with fallow



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:



wheat



rye



barley



oats



other cereals

b. intensifying crops (mainly root or ridged up)

structure forming crops occupy more than:

20% 30% 40% 60% of arable land with preponderance of:



potatoes



maize



sugar beets



oleaginous



fibre



vegetables



fodder roots

c. structure forming crops (papilionaceous)

structure forming crops occupy more than:

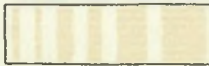
20%, 30%, 40%, 60%

of arable land

with preponderance of:



clover



lucerne



serradella



lupine



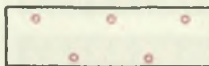
peas



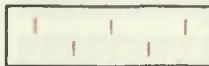
beans

d. share of industrial crops

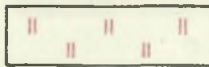
over 5 percent of the cropped area



oleaginous-rape seed and agrimony



fibre plants-flax



-hemp



sugar beet

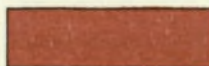
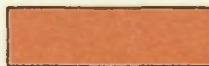


tobacco

3. gardens

home-yard gardens

with built up area

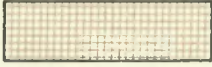


larger complexes of home-yard gardens

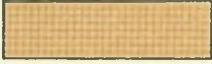


commercial gardens
 heating installations
 hot beds
 green houses

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



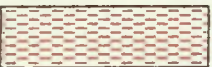
almond trees



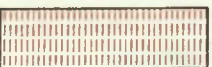
citrus trees
















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*)

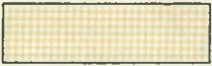
b. post-grond (dry, non acid)



fertilized from arable land



fertilized from forest



without natural fertilization (top gronds)

c. post-łęg (inundated)



on muds

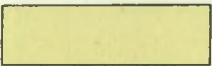


boggy



on sands

d. bog (bielawa)



on peat bogs (meadow bogs)



fed with springs

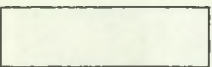


reeds and other aquatic vegetation
on land



on water

3. management



unmanaged



managed

fully



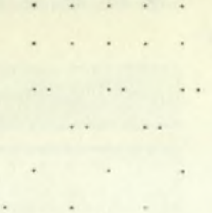
partly



degraded

4. utilization

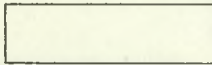
mowing



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

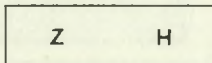


more than 80 units

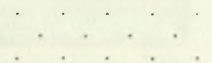
III. FORESTS

A. Dense forests

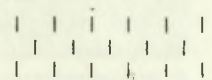
1. exploitation by clearing



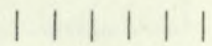
clearings



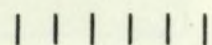
young growth up to 20 years



immature 20-40 years

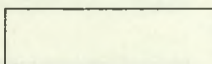


fallable or nearly fallable 40-80 years



old stand over 80 years

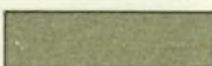
2. exploitation by group or selective felling



mixed age stand

B. Species of trees dominating

1. compact woodlands



pine over 80%

<http://rcin.org.pl>



pine over 20%



spruce



fir



larch



over 80%

} beech



over 20%



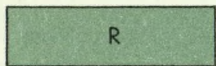
hornbeam



birch

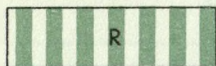


aspen

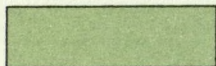


over 80%

} false acacia (*Robinia*)



over 20%

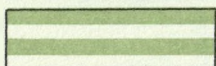


over 80%

} oak



over 20%



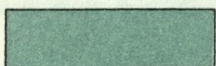
elm



linden



maple, sycamore

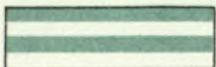


over 80%

} alder



over 20%



poplar



ash



willow

2. special stands



game reserves



forest trees nurseries

3. scattered or degraded woodlands

a. non used additionally



pine



beech



linden



willow



b. used additionally (examples)

C. Brushwoods

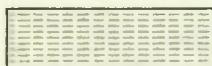
1. on bor habitat



mountain-pine



juniper



heather moorland

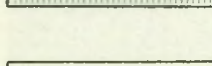


bilberries, whortleberries



other

2. on lasobor (mixed forest) habitat



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



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



false acacia (*Robinia*)



4. on łęg habitat (inundated)

willow



alder



osier holts

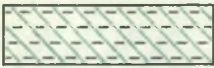
5. high moor associations (peat bog)



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

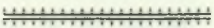


land periodically inundated by reservoir waters

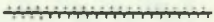
B. Water control constructions



dams



dykes



C. Water utilization

1. by population and industry



water pipe lines



aqueducts

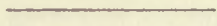


sewage canals

2. by communication



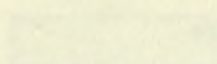
rafting waters



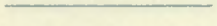
navigable waters



3. for energy production



4. for agriculture surface drainage



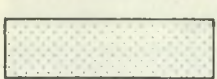
drainage channels



irrigation channels



mixed use channels

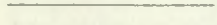


under drainage

acting



non acting or neglected



terracing



5. for fishing

a. fresh water habitats



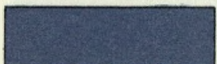
extremely oligotrophic



oligotrophic-eutrophized

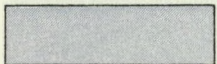


eutrophic

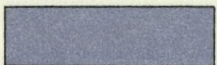


dystrophic

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



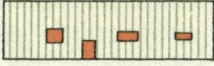
high over 7 storey



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

Z

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

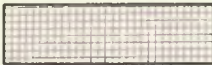


poultry, pig fattening, fur animals farms, etc.

E. Commercial areas



warehouses



market areas

F. Communication areas



1. railway



2. motor car

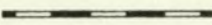


3. port installations

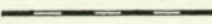


4. airplane

5. railways lines



standard gauge



narrow gauge

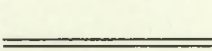


industrial only

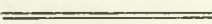


funicular

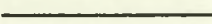
6. roads



hard surface
main



secondary

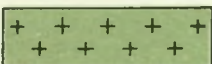


field

G. Public utilities



parks, green areas, etc.

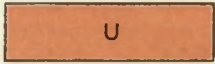


cemeteries



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



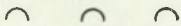
castles, palaces, etc.

VI. UNPRODUCTIVE LAND

A. Because of natural conditions



barren rocks



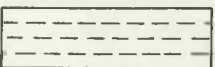
quick sands



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

