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ECOLOGICAL PRECONDITIONS OF FARMING IN AGRICULTURAL COOPERATIVE AT BORŠICE NEAR BUCHLOVICE /CZECHOSLOVAKIA/

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/English version is abridged/

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1. Introduction

In 1988 Agricultural Cooperative Boršice near Buchlovice started negotiating with the Institute of Landscape Ecology of the Slovak Academy of Science the possibility of working up an ecological study on optimization of economic activity in the region.

After field cartography of derived landscape structure the work was held up at the Cooperative´s instance and resumed in 1989. There were two tendencies inside the establishment. On the one hand a part of the management realized the idleness of the last method of farming /in particular soil utilization/ leading above all to a disasterous water erosion with all consequent results. On the other hand a strong pressure on assertion of economically attractive, so called maize programme, made itself felt.

In September 1989 the work was resumed and from close cooperation among members of the Cooperative management, Institute of Landscape Ecology SAS and The Group for Applied Landscape Ecology resulted a great programme how to work up the study. Already at that time the sponsors as well as the processers were willing to get acquainted with and to admit the real state of affairs and the consequences of the economy and seek possible solutions.

The change of the political system helped significantly to the overall situation. Abolition of the bureaucratic, administrative and ruling machine of the state, aroused citizens´activities and granting equal rights to all forms of ownership led to a real chance to realize changes hardly believable in the past. Proposals of the study processers which were previously considered too radical and unrealizable became real in a very short time. That´s why we present the results in two variants: compromising which should be realizable in a short time and so called ecological, in our opinion representing the desirable state of landscape, which the Cooperative should be aiming at. Farther we have inserted

prognosis of the Cooperative development, namely presumptive influences and tendencies which will affect activities of the Cooperative and resulting changes and hazards for economy. This study should be grasped above all as a thorough analysis of the present-day situation and prospects from the ecological point of view, which should be starting and specifying basis for working up economic continuities of the development of the Cooperative.

2. Demarcation of interest territory

Agricultural Cooperative Boršice near Buchlovice cultivates 3 534 hectares of farm land. Their landed property extends from the valley meadows of the river Morava up to central parts of the Chřiby Mountains. Into the region fall nine villages and the establishment came into existence by a merger of five smaller, previously independent cooperatives.

3. Methodology and pace of activities

When elaborating the study we got out of the methodology principles LANDEP /Ružička, Miklós, 1982/ and we observed its individual steps. LANDEP /landscape ecological planning/ is a systematically arranged complex of applied landscape--ecological methodologies and methods aiming at ecologically optimum utilization of the landscape. In a more concrete term it is a proposal of the most advantageous lay out of the required social activities in the region /Miklós in Ružička, 1986a/.

The basic steps of the methodology are:

a/ Data gathering and analyses - accesible data about the properties of the landscape are adapted and homogenized, or if need be we work out some data ourselves /e.g. inclination of the relief/.

b/ Syntheses - aiming at forming complex homogenous space units with precisely fixed properties.

c/ Interpretation - forms special purpose-made revaluation of the landscape /e.g. model of water erosion/ from the analytic indicators.

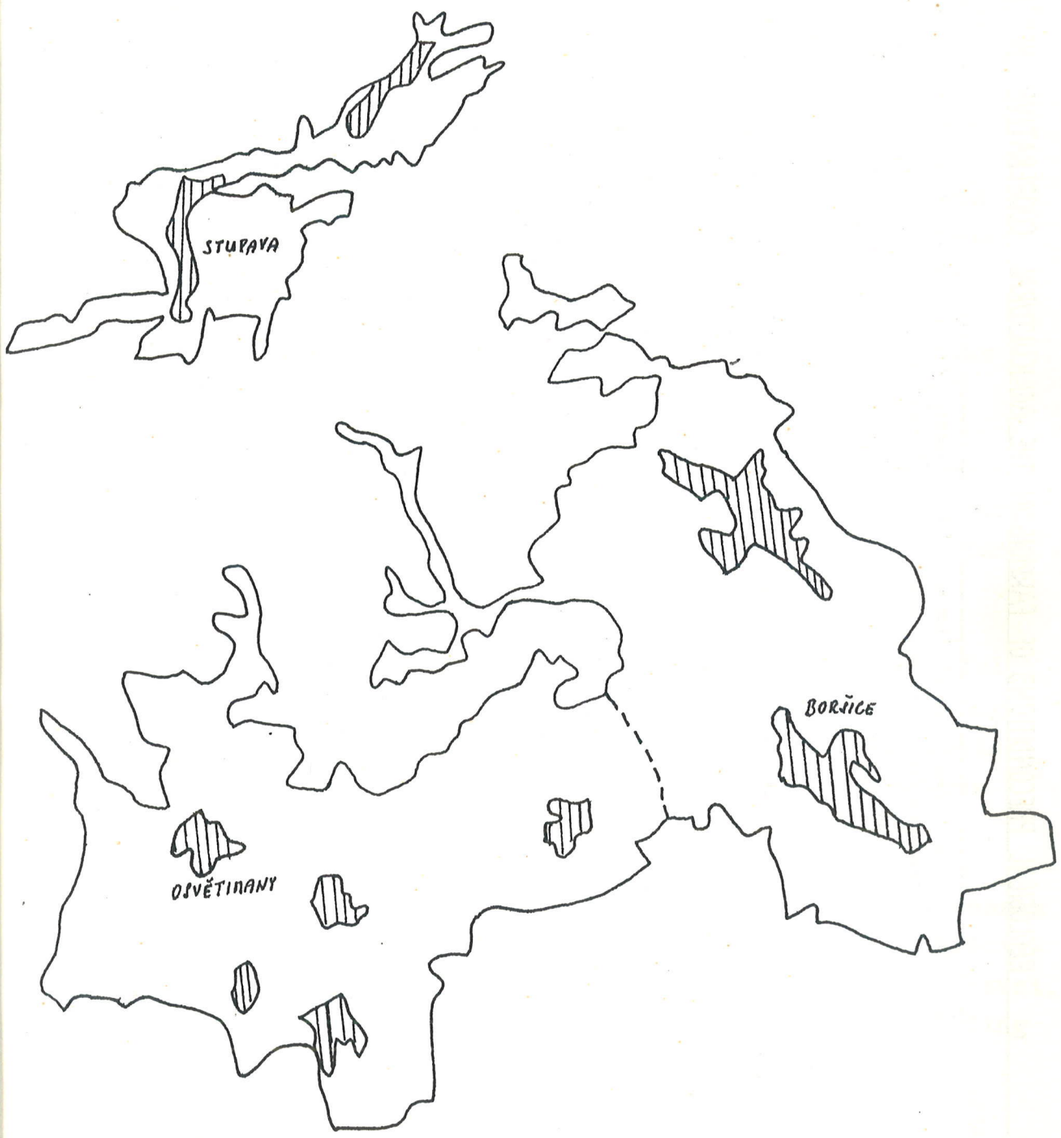
d/ Assesment - we fix in them convenience of every point of the landscape for individual social activities.

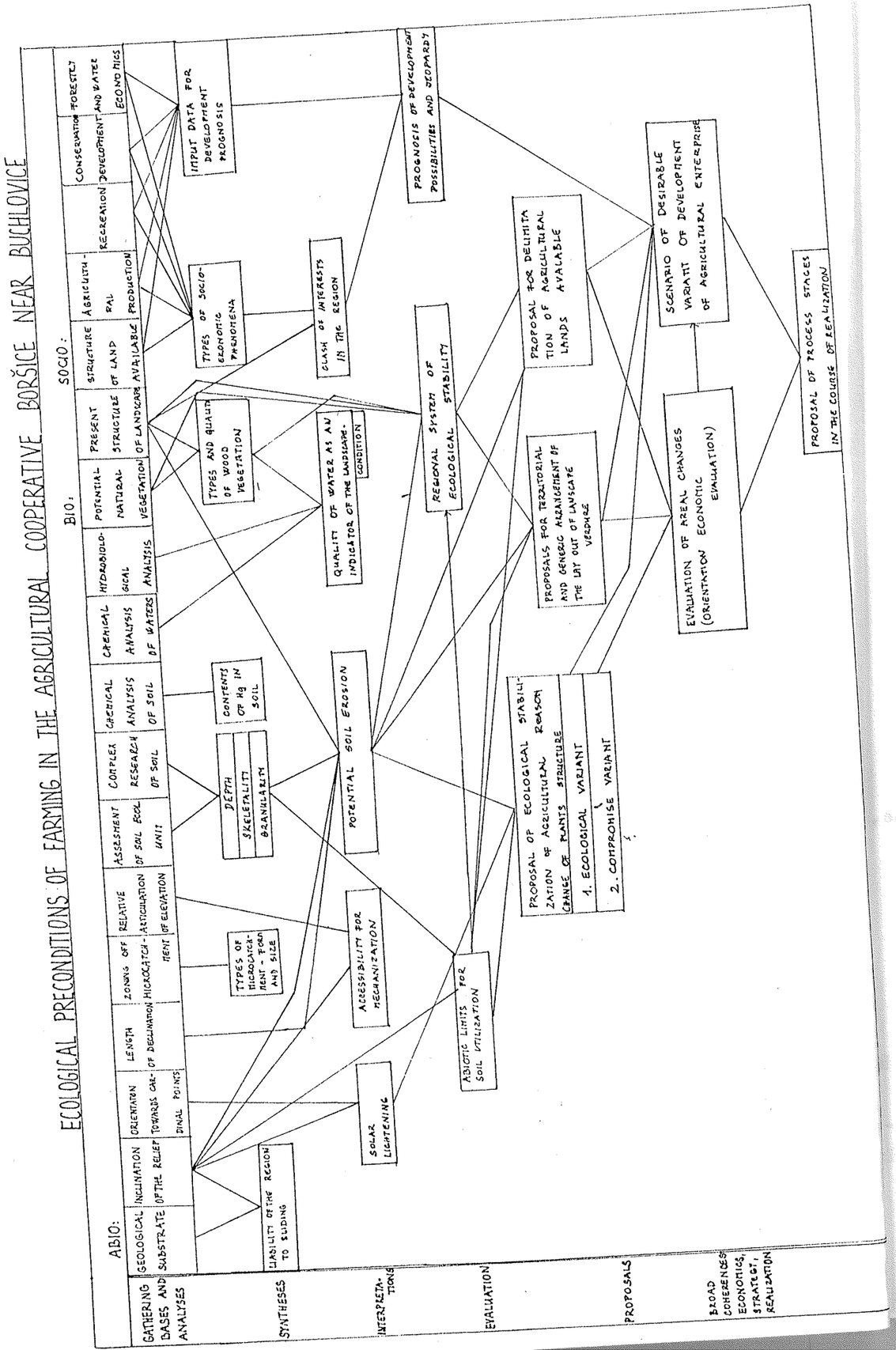
e/ Proposals - are the final goal of LANDEP where in the form of an optimum localisation proposal of social activities in the landscape is presented an ecologically optimum functional division of the landscape.

The work in its analytical phase is divided into three basic "horizontal" blocks: abiotic, biotic and socioeconomic.

The concrete working process is shown in the chart where every frame indicates a worked out thematic map. Most the maps are in the form of papers, or as the case may be, of author's originals. The customer was given seven the most essential maps /appraising and proposal/.

Territory of the Agricultural Cooperative Boršice near Buchlovice





4. Analyses

Abiotic complex

4.1. Properties of geological substrate

As a basis for working out a geological map was used The Registration Geological Map of the Bohemian Republic on the scale 1:50 000 namely the pages 24-44 Bučovice and 25-33 Uherské Hradiště. These maps were compiled of the map bases of different scales, where from results their nonhomogenity from the point of geological explorability.

The most frequent geological phenomenon represented in the area utilized by The Agricultural Cooperative Boršice near Buchlovice are palegenic rocks of the flysh zone of the Western Carpathian Mountains. The local area is a part of the Račany unit of Magura flysh group.

From tertiary rocks are further represented neogenous clays, sands, gravel-sands and gravels, but not in very extensive relicts.

The most widespread quarter sediments are loesses and loess aerth covering a fair part of the demarcated territory. In the south-east corner of the territory of the Agricultural Cooperative can be found pleistoceneous proluvial sand gravels.

At the foot of the slopes are here and there plentiful sand-and-clay up to clay and rock deluvial sediments. Along water streams are deposited sand-and-clay fluvial sediments /aluvium/. On the upstream or in the waterless depressions these sediments pass onto sand-and-clay deluviofluvial sediments.

On the locality in question a lot of geodynamic processes participating in modelling the landscape and forming characteristic morphology of the given area are in progress at present. The most important of them from the point of view of building or agricultural activities are movements of declination.

The rise of movements of declination is contingent on the geological structure of the given territory and many other factors /such as morphology-broken field, ample precipitation, bad outflow conditions etc./ are also contributing. This territory is characteristic by frequent recurences of landslides of local importance /small areal dimensions/, by frontal landslides, but just these territories of the Carphatian flysh are mostly jeopardized by landslides of regional significance and the rescue of thus jeopardized territories are most problematic.

Objective precondition for rise of landslides is given by parallel deposit of flysh layers with the slope inclination, when it comes about to a rise of a predisposed area, along which the layers slide down. Unbalanced state on the slopes of this territory is often brought out above all by human activities, either building /cutting down the slope by cuts or excavations, steep slope inclination by sloping, loading the upper part of the slope/ or by improper agrotechnical activities in the fields /ploughing the field along the lines of maximum slope/.

If the reasons for rise of landslides are known, it is possible to rescue or to temporarily stabilize them. The most effective rescue is, as u rule, drainage of the slope or reduction of its inclination, loading the foot of the slop breaking the slope with a bench, or if need be, combination of more measures.

This mode of rescue is suitable for local landslides, restricted to only a few square metres, occuring isolatedly. Rather complicated is stabilization of sliding territories, where there are many generations of active landslides on extensive areas, thus creating a very broken field, which multiplies the possibility of a growing number of new landsli by forming local depressions without the outflow of fallen precipitation. Farming on these extensive areas is very diffi cult, practically impossible. The only stabilization measure draining, even if it is technologically demanding and complicated.

Legend No.1: Geological substrate - commentary

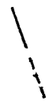
Quarter		
Holocen		
1	T 11	fluvial sediments /aluvium/
2	T 10	deluviofluvial sediments
3	T 4	deluvial sediments
Pleistocen		
4	T 3	proluvial riss sand gravels
5	T 3	proluvial sand gravels of medium and old pleistocen
6	T 3	eolic würm sands
7	T 2	loesses and loess earth /not articulated/
Tercier		
Neogen		
8	T 23	gay clays, sands and pliocen gravels
9	T 18	sands, clays with coal pits - panon
10	T 18	panon porcelainites
11	T 18	sands, gravels, clays - sarmat
Paleogen		
Magura group		
12	T 19	Vsetín layers /upper Zlín layers/
13	T19+T21	Vsetín layers with sands of Luhačovice types

14	T19+T21	Luhačovice layers
15	T 8	Bělovež layers
16	T 21	Upper Soláň layers, here and there with hardpán
17	T 6	gay Soláň layers

landslides

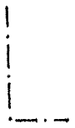
direction and inclination of layers with hyerogliphs

wells



located and presumed breaks

proved transposed lines



boundary of map bases of different degree of geological exploration

4.2. Representative properties of soil cover

1. Gathering and working up the bases

Before carrying out the soil analysis we had at disposal the following documents about the properties of soil on the territory of Agricultural Cooperative Boršice near Buchlovice:

- map "BPEJ" on scale 1:10 000, the map of comparatively homogenous soil-ecological units, which in the form of pentacode contains: the basic climatic region, the main soil unit /expressive of soil subtype, soil type and character of substrate/, declination and exposition of the relief, skeletality and the depth of soil
- map "KPP" /complex research of soil/ on the scale 1:10 000, expressive of soil subtype, granularity, signs of skeletality and wetting - it is the result of a complex research work carried out on the territory of Agricultural Cooperative in 1962

Working up the said materials consisted in making ourselves familiar with the soils of the territory under study on the bases of KPP and BPEJ and in special revaluation of working materials of KPP. We have listed the following data about each probe: soil skeletality, genetic depth of the soil, granularity of arable soil and of the lower layer of arable soil /upper horizon and the second in turn horizon/, character of the substrate, the contents of carbonate, soil subtype.

2. Field study

We have focused the specialized soil research to arable soils with the aim for ascertaining the changes of selected properties of soils. Almost on all arable lands we have made 2 - 3 probes and alltogether we have analyzed 150 probes. Thirty five probes were placed as close as possible to the localities of KPP probes /KPP - complex research of soil/

so as to assess the changes of selected soil parametres in the period after KPP. We have observed the following parametres: genetic depth of the soil and the width of its individual horizons, skeletality of the soil, contents of carbonates, character od the substrate and the subtype of the soil.

In comparative probes we have sampled the earth for agrophysical and agrochemical analyses of the soil.

3. Assessment of documents - synthesis of selected soils properties

The objective of this stage was to form relatively homogeneous territorial soil units. The zoned off soil units are not determined on the basis of the genetic aproach, but they take into consideration the properties of the selected parametres of soil. It is the question of these main parametres: skeletality and the genetic depth of the soil /7 categories/, granularity of arable soil ar of the top soil horizon /6 categories/, granularity of the lower layer of soil or of the second horizon in turn /11 categories/, carbonates content and humus content /4 categories/. The values of these parametres are shown in the chart No. 1.

On the basis of the areal assesment of soil units we have summarized the actual areal spread of individual categories of the depth and skeletality of the soil, granularity of arable soil and of lower layers of soil /in the form of charts/. These areas are expressed in hectares /ha/ and in percents.

The territory of Agricultural Cooperative Boršice near Buchlovice was divided into three basic areas for which the areal assessment is shown separately:

- area Boršice near Buchlovice - region No. 1
- area Osvětimany - region No. 2
- area Stupava - region No. 3

Chart No. 1: Ratings of selected soil parametres

a/ Skeletality and genetic depth of soils

1. not and slightly skeletal - deep
2. not and slightly skeletal - medium deep
3. not and slightly skeletal - shallow
4. medium skeletal - deep
5. medium skeletal - medium deep
6. medium skeletal - shallow
7. very skeletal - shallow

b/ Granularity of arable soil /top horizon of soil/

1. sandy
2. earthy sandy
3. sandy earthy
4. earthy
5. clayey earthy
6. clayey

c/ Granularity of lower layer of soil /horizon second in turn/

1. sandy
2. earthy sandy
3. sandy earthy
4. earthy
5. clayey earthy
6. clayey
7. clay
8. clayey substrate
9. earthy substrate
0. sandy substrate
P. firm substrate

d/ Carbonates content and humus content

1. soils with medium up to high humus content, containing carbonates
2. soils with medium up to high humus content, without any carbonates
3. soils with low up to medium humus content, containing carbonates
4. soils with low up to medium humus content, without any carbonates

Area of individual categories of the soil depth

The depth, skeletality of soil and granularity of the two top horizons of the soil are expressed on the small maps on

the scale 1:50 000.

The actual condition of the soil cover can be expressed on the basis of the spread of individual soil units as follows:

- genetic depth of the soil - on the territory of the Agriculture Cooperative there are only 1/3 of deep soils /35%/, but more than 1/2 of medium deep soils /51%/ and the rest /13%/ are shallow soils
- skeletality of the soil - on the territory of Agricultural Cooperative there are almost 3/4 soils with no or slight skeletality /73%/, more than 1/5 medium skeletal /21%/ and about 5% very skeletal soils
- granularity of the two top horizons of soil - on the territory of Agricultural Cooperative there are significantly more earthy lands /59,3 and 56,6%/ and considerable part form sandy-earthy lands /20,4 and 10,5%/ and clayey-earthy lands /14,4 and 16,3%/. The second horizon in turn is formed by the soil substrate on almost 9% of the area

4.3. Chemical analysis of soil

The Cooperative works 360 hectares of orchards and 200 hectares of vineyards. When selling the fruit they often have problems with an excessive mercury /Hg/ content. So far the source of this element is not known. On the territory of the Cooperative we have sampled and analyzed altogether 18 soil samples. The location of the sampling is on the map. Mercury content in the samples was given in the chart, excess of the standart is pointed up by underlining.

The today's standart for Mercury content in the soil is 0,050 mg Hg/1 kg of earth. Out of 18 cases the standart is exceeded thirteen times. We endorse an opinion that the Hg occurence is natural, probably in the form of mercury sulfide /HgS/. From the geological point of view the territory

is situated in the flysh zone, for which an excessive occurance of mercury sulfid is characteristic. We therefore recommended to eliminate growing fruit on the territories where the mercury content in fruit usually exceeds the standart.

4.4. Inclination of the relief and the length of declination

Inclination and the length of the slopes represent the basic morphometric indicators of the relief and they are at the same time the input data for abiotic interpretation of the properties of the relief of the studied territory.

Maps of inclination are based on numerical-graphic determination of inclination of the relief on the descent curves /Krcho, J., 1973/.

For the sake of this work we have chosen the following range of gradients:
1. up to 1°, 2. 1° - 3°, 3. 3° - 7°, 4. 7° - 12°, 5. 12° - 17°, 6. 17° - 25°, 7. over 25°.

Graphic expression of the length of declination was based on topographic maps and on the mapped structure of the present landscape of the region. We have taken into consideration also the elements which we regard as barriers for moving materials on the slope. It is the question of hardened roads, forestsides, stable green grown lines and edges of village catastres. The basic dividing interval of the length of declination is 100 metres. On the territory we have measured the lengths of slopes from 100 m up to 1000 m.

Combining the inclination and the length of slopes we have gained a partial synthetic map of morphologic properties of the relief which represents a direct input for theoretical calculation and spatial expression of potential soil erosion.

4.5. Orientation of the relief towards cardinal points

Orientation of the relief towards cardinal points belongs to significant analytical bases for making up maps of the relief illumination with sun beams, which contributes to better appraisal of the climatic conditions of the given territory.

The method consists in construction of isotangents /Krcho, J., 1973/ connecting the points on the relief with the same orientation towards cardinal points. Basically the reason is to find tangents to contour lines at the given angle A_N and the points with the same value of tangent gradient to contour lines are connected into isotangents.

Isotangents serve later as the borders of the areas with a definite interval of orientation.

We have designed isotangents with the angle A_N values: $22^{o}30'$, $67^{o}30'$, $120^{o}30'$, $157^{o}30'$, $247^{o}30'$, $292^{o}30'$, $337^{o}30'$. The result was zoning off areas between isotangents and the following range of orientation:

North $337^{o}30'$ - $22^{o}30'$
North East $22^{o}30'$ - $67^{o}30'$
East $67^{o}30'$ - $112^{o}30'$
South East $112^{o}30'$ - $157^{o}30'$
South $157^{o}30'$ - $202^{o}30'$
South West $202^{o}30'$ - $247^{o}30'$
West $247^{o}30'$ - $292^{o}30'$
North West $292^{o}30'$ - $337^{o}30'$

The graphic result is a map of relief orientation towards cardinal points.

4.6. Relative articulation of elevation

With the map of relative articulation of elevation we wanted to put stress on the fact that the relief on the territory of the Cooperative does not correspond to the general conception of the term "South Moravia". As the worked lands partly break into both the Morava river meads and to the central part of the Chřiby highlands, the overall superelevation 332 m is for the Cooperative area /3 534 hectares/ extraordinary big. The highest point on the territory

is 521 m above sea level, the lowest point is 189 m above sea level.

The relative articulation of elevation was divided into 11 categories per 30 metres each, differentiated in colours. We have divided the territory of the Cooperative into three basic regions /the same division was used for appraisal of soils and for proposal of the new structure of agricultural plants/: Boršice near Buchlovice /region No.1/, Osvětimany /region No.2/, Stupava /region No.3/. The area of individual elevation categories is shown on the chart No.2:

Number	Elevation above sea l.	Boršice		Osvětim.		Stupava		Tetal	
	m	ha	%	ha	%	ha	%	ha	%
1.	190-220	264	16,0	-	-	-	-	264	7,5
2.	220-250	388	23,5	15	1,0	-	-	403	11,3
3.	250-280	452	27,3	216	14,7	-	-	688	18,8
4.	280-310	250	15,1	342	23,3	-	-	592	16,7
5.	310-340	131	7,9	348	23,8	35	8,4	514	14,5
6.	340-370	74	4,5	339	23,2	48	11,5	461	13,0
7.	370-400	50	3,0	161	11,0	74	17,9	285	8,0
8.	400-430	11	0,7	44	3,0	76	18,3	131	3,6
9.	430-460	11	0,7	-	-	97	23,3	108	3,1
10.	460-490	22	1,3	-	-	58	13,9	80	2,7
11.	490-520	-	-	-	-	28	6,7	28	0,8
	Total	1653	100	1465	100	416	100	3534	100

The said chart and the map of the relative articulation of elevation should be a conclusive argument for the necessity to implemet the Cooperative with lighter mechanization suitable for cultivating very articulated lands.

4.7. Zoning off the micro-catchment area and directions of water outflows

Micro-catchment are the smallest gravitationally homogenous areas. They are spatial units in which we may expect the same conditions for superficial outflow. From the point of view of planimetric features and inside directions of outflows they are homogenous. On the topographic map of the studied territory the boundaries of the gravity directions according to natural water shed dividing lines and antropogenious forms of the relief /roads, railways/ must be designated. Thus you will gain on the map a network of outflow areas - micro-catchment /Miklós, L., Kozová, M., in: Ružička, 1986/.

These areas could be appraised according to two criteria:

a/ the area of the micro-catchment /the first figure in the code/:
   1. 0 - 5 hectares
   2. 5 - 20 hectares
   3. 20 - 40 hectares
   4. 40 and more hectares

b/ the shape of the micro-catchment /the second figure in the code/:
   1. triangular /outflow in one direction, without concentration, with outflow volume falling down from the centre to the outer ends/
   2. trapezoidal /outflow in one direction on the whole areas/
   3. lenticular /concentrated outflow/
   4. funnel-shaped /substantially concentrated outflow/

According to these two points of view it is possible to work out a chart of the dependance of the micro-catchment character on the area and the shape of the micro-catchment.

We determine five criteria:

The area of micro-catchment:	0-5	5-20	20-40	40 and more
The shape of the micro-catchment:				
triangular	I	I	II	II
trapezoidal	I	II	III	III
lenticular	III	III	IV	IV
funnel-shaped	IV	IV	V	V

Character of micro-catchment /from the point of view of the removal of the material/:

I.- very favourable
II.- favourable
III.- medium favourable
IV.- unfavourable
V.- very unfavourable

On the territory of the Agricultural Cooperative may be found all categories of areas and shapes of micro-catchment. The character of microcatchment together with the details about the inclination of the relief and the granularity of soils are suitable indicators for aapraisal of potential predisposition of lands to water erosion.

The map us utilized for assessment of the expected move of agrochemicals, suitable location of dungheaps, assessment of water erosion etc.

4.8. Climatic conditions

The area of interest is part of relatively warm agroclimatical region. Regarding precipitation the area is part of a predominantly dry or semidry agrochemical subregion. Most of the area has relatively temperate winters, only Stupava and Staré Hutě have moderately cold winters.

The sum of temperatures equal to or exceeding 10°C is in the Southern and Southeastern parts in the interval between 2800 - 3000°C, majority of the area is in the interval between 2600 - 2800°C, only the area of Stupava and Staré Hutě lies below 2600°C. The annual average value of precipitation is 568 mm.

The major precipitation deficit may be observed during the vegetation period. A suitable characteristic for the evaluation of soil humidity is the difference between values of actual and potential evaporation. The difference E_o - E can be used as a measure for the deficit causing suboptimum growth of agricultural crops. It may be expressed in absolute units. In the area if interest the value of E_o - E is up to 240 mm per annum.

The above mentioned water deficit of the area is further worsened by relatively strong and frequent winds. According to the windrose the most frequent winds come from the North, Northeast, Nortwest, Southwest and from the South.

4.9. Surface Waters and the Balance of Precipitation and Outflow

The area of the Agricultural Cooperative Boršice near Buchlovice is drained by three major streems, the Kyjovka, the Dlouhá řeka and the Hruškovice. The region of Stupava and Staré Hutě is part of a special water resources protection area, whire the possibilities for agricultural utilisation are somewhat limited.

Characteristics of the watershed are given in the following tables /example/:

Stream	Stream grade	Area P/km^2/	Valley Length	Char. P/L^2	Percentage of Forest Land
Kyjovka above the creek from Kraví Hory	IV	54,07	20,0	0,14	50

The problems connected with the balance of precipitation and outflow were studied only in a limited way. This was due to lack of data concerning precipitation and waterflow of the respective streams.

4.10. Chemical Analysis of Water in Selected Profiles

Water is thought to be component of the environment, which very explicitely reflects the current status of the landscape. It is thought to constitute a certain system of vessels in the landscape, an ideal invironment for monitoring the status of the respective watershed. This is the reason, why much attention was paid to evaluation of water quality in surface streams.

We were looking for mutual relationship between large-scale agriculture and water stream quality on the basis of evaluation of chemical and hydrobiological analyses of surface water quality together with the assesment of quality and structure of shore vegetation.

The chemical analyses were performed in October 1989 on 19 sites on the cooperative territory. The following parametres were measured: total matter /mg/l/, soluble matter /mg/l/, nonsoluble matter /mg/l/, ammonium /NH_3^+/, nitrates /NO_3^-, mg/l/, nitrites /NO_2^-, mg/l/ and acidity/alkality /pH/ of the water. The results are shown in map /site description/ and table /in Czech version/.

Biotic Complex

4.11. Hydrobiological analyses of the selected profiles

Hydrobiological sampling was performed only once, in November 1989. Samples from 12 sites were evaluated in detail. A systematic survey of all collected organisms /generic composition and quantity of the individual representatives/ was sent to the customer in a separate report. Evaluation

and analyses of 3 sites, which may be useful for a landscape ecological study, are shown here purely as an example.

Locality /site No. 1/:
/stream Dlouhá řeka, below Boršice farm/

Grossly polluted waterflow, the water may be classified as transient between beta-saprobitic and polysaprobitic /practically the maximal observable degree of water pollution/. But the bottom is not overgrown with filamentous bacteria of the species Sphaerotilus natans. Gross pollution is indicated by presence of Chironomus gr. Thummi larvae, which prefer highly polluted waters. On the other hand presence of larvae of the Simulidae family is surprising, because they are observed usually in less polluted waters. They are formed /respectively deformed/ by the surrounding environment and the above mentioned situation is surely only a case of "survival". Another fact of interest may be the presence of high numbers of representatives of Oligochaetous worms of the Naididae family /1[illegible]26x/.

Locality /site No. 13/:
/the creek Boršický potok, outflow out of a forest/

Very good profile with oligosaprobitic water. From the biological viewpoint the water may be used after treatment as a source of drinking water. The majority of the water organisms constituting the biocenosis on the locality are psychrofilic or even kresobiotic /dwelling in springs/. Baetis alpinus is an inhabitant of absolutely clear alpine type waters. But no organism, which could be classified as rare, could be collected.

Locality /site No. 15/:
/the creek Buchlovický potok, below Buchlovice/

Worse quality of surface water can hardly be found/not taking into account radioactive waters/. The whole bottom is covered by dense colonies of filamentous bacteria of the species Sphaerotilus natans. The only organisms found in these clumps were Chironomus gr. Thummi larvae /68x/ and a few representatives of oligochaetius worms. No other representatives of aqueous organisms are to be found in such waters.

4.12. Potential autochtonous vegetation

Data about potential autochtonous vegetation of the region of interest were found in the paper of Mikyška et al. /1968/. In accordance with this report a short characteristic of those charting units, which can be observed in the region, is given:

1. Riverine forests and alder groves

Habitats of decidous forests and their developmental stages colonising quaternary alluvia of creeks and rivers. The systems are permanently or intermittently flooded and influenced by high or intermittently appearing highground water.

2. Oak-hornbeam groves

A representative is to be found in the alliance Carpinion betuli. It is a mixed forest with a majority of decidous trees, disseminated mainly in lowlands and hilly regions, on the average up to a height of 450-500 meters above sea level. Majority of the trees are winter oaks, summer oaks and hornbeam trees are also frequent. This vegetation type covered the majority of the area under study.

3. Floraceous beechgroves

Climax beech groves and spruce groves with a rich herb layer, predominantly of the Fagion alliance. Appears either in the mountaneous or submontaneous belts. Regarding woody plants, the beech /Fagus sylvatica/is in the majority.

4.13. Current Landscape Structure

It is and expression of the spatial distribution of the individual landscape elements, which today fill the surface of the Earth, that means elements of the current landscape structure /Ružičková, H., Ružička, M., 1973/.

The current landscape structure of the region was field cartographed in 1987. The survey was done by students of the Faculty of Architecture of Prague Technical University after istruction by collaborators of the Institute of Landscape Ecology of the Slovak Academy of Sciences in Nitra, who also supplied specialist supervision of the whole process.
The charted elements of current landscape structure are shown in legend 2.

Each element charted into the terrain was designated by a serial number and registered in a table. This table consisted of units 1.1. - 2.9. i.e. elements of landscape vegetation together with their precise spatial characterization /see for and example one page of table 4/. The main types of wood plants contributing to vegetation and its structure were characterized by the following descriptors:

A. Connection of vegetation: connective vegetation, non connective vegetation
B. Growth type: confluent vegetation, lacunated vegetation, scattered vegetation
C. Vertical structure: 3 layers /trees, shrubs, herbs/, 2 layers /trees, ~~shrubs~~ herbs/, 2 layers /shrubs, herbs/
D. Horizontal structure: multicolumnar, monocolumnar
E. Vegetation width: less than 2m, 2 - 6 m, more than 6 m.

The spatial structure of vegetation was numerically evaluated /see table 3/ as a basis for further work /see chapter 5.1. Types and Quality of Wood Vegetation/.

Table No. 3: Types and Quality of Vegetation Spatial Structure

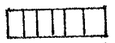
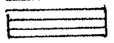
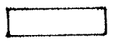
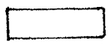
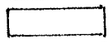
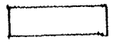
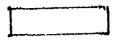
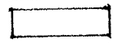
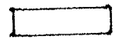
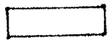
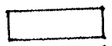
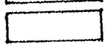
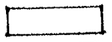
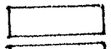
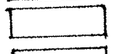
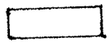
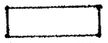
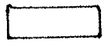
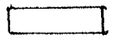
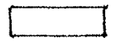
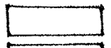
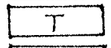
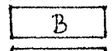
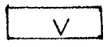
A. Connection /opennes/ of vegetation	1. Close vegetation	3 points
	2. Open vegetation	1 point
B. Growth type	1. Confluent growth	3 points
	2. Lacunar growth	2 points
	3. Scattered growth	1 point
C. Vertical structure	1. 2 elements /trees, shrubs/	3 points
	2. 1 element /trees/	2 points
	3. 1 element /shrubs/	1 point
D. Horizontal structure	1. Monocolumnar	1 point
	2. Multicolumnar	3 points
E. Vegetation width	1. Less than 2 m	1 point
	2. 2 - 6 m	2 points
	3. More than 6 m	3 points

The total structure quality is given by the sum of all points obtained in the evaluated criteria. According to this value 4 grades of vegetation structure quality were constitute:

5 - 6 points	N /unsatisfactory/
7 - 9 points	P /average/
10 - 12 points	D /good/
13 - 15 points	VD /excellent/

Characteristics of all 1 372 charted elements were supplied to the customer in a separate report.

Legend No. 2: Secondary Landscape Structure

Symbol	Serial No.	Designation of charted element
	1.	Forests, Groves
	1.1.	coniferous
	1.2.	decidous
	1.3.	mixed
	2.	Landscape vegetation
	2.1.	herbs, nonruderalised with solitary woody plants
	2.2.	herbs, ruderalised with solitary woody plan
	2.3.	woody, nonruderalised
	2.4.	woody, ruderalised
	2.5.	fruit lanes with nonruderalised undergrowth
	2.6.	fruit lane with ruderalised undergrowth
	2.7.	decorative alley /chestnuts, lime trees, etc./ with nonruderalised undergrowth
	2.8.	decorative alley /chestnuts, lime trees, etc./ with ruderalised undergrowth
	2.9.	solitary trees
	3.	Herb undergrowth
	3.1.	herb communities nonruderalised
	3.2.	herb communities ruderalised
	3.3.	springs and marshy areas
	3.4.	intesively farmed meadows
	3.5.	extensively farmed meadows and pastures
	3.6.	nonexploited /ruderal/ areas
	4.	Orchards and Gardens
	4.1.	intensive orchards on arable land
	4.2.	small scale orchards and gardens /resp. individually farmed plots/
	4.3.	extensive orchards with grass cover
	4.4.	parks and cemeteries outside settlements
	5.	Arable land
	5.1.	large rectangular tracts
	5.2.	narrow tracts, terrace type
	5.3.	narrow tracts, rectangular type
	5.4.	wineyards

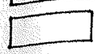
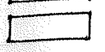
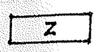
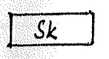
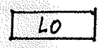
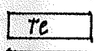
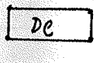
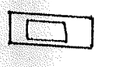
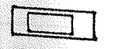
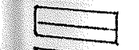
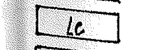
Symbol	Serial No.	Designation of charted element
	6.	Water stretches
	6.1.	natural /pond, lake/
	6.2.	artificial /dams, reservoirs/
	6.3.	swamps
	6.a.	Water streams
	6.4.	natural, nonmeliorated
	6.5.	meliorated
	6.6.	artificial /dikes, channels/
	6.7.	led through tubes /pipes/
	7.	Other landscape elements
	7.1.	rocks and natural formations without vegetation
	7.2.	quarries
	7.3.	terraces /state regulation and utilisation/
	7.4.	devastated areas: by water erosion E mechanisms M cattle, sheep D landslides S
	8.	Technical structures and elements
	8.1.	built-in areas outside of settlements /farms/
	8.2.	built-in areas outside of settlements /highly ruderalised/
	8.3.	roads and other thoroughfares
	8.4.	airports
	8.5.	dung-heaps /artificially built, reinforced/
	8.6.	dung-heaps /natural/
	8.7.	waste disposal sites
	8.8.	other elements /a characteristic has to be added to the respective number/

Table No. 4: List of charted units /example/

Map No	Unit No	Characteristics	Structure A	B	C	D	E	Evaluation	Health	Note
244414	28.	3.4. plum, apple and pear trees								
"	29.	2.3.	1/3	2	1	1	2	9P		
"	30.	2.4. 2balks, height 0,5								
"	31.	2.6. fruit /plum,apple and pear trees/	1	2	2	2	2	9P		old,to renewed
"	32.	2.3. fruit							sick	
"	33.	2.9. ash 6-8 m								
"	34.	8.1. movable sheepstall								
"	35.	4.3. orchard relicts	1	1	3	3	3	11D		
"	36.	3.4. balk levelled			-					
"	37.	3.4.								
"	38.	1.3. along a stream trees	3	3	3	3	3	15VD		
"	39.	3.3. swamp in the vicinity of a forest								
"	40.	3.4. pasture divided by a balk								
"	41.	4.3. orchards								
"	42.	eliminated balks								
"	43.	2.4. along the road	3	3	3	1	2	12D		
"	44.	2.4. on a balk	3	3	3	3	2	14VD		
"	45.	2.3. eliminated balks	2	3	1	-	-	6N		
"	46.	2.4. along a balk,cluster	3	3	3	3	2	14VD		
"	47.	eliminated+renew balk								
"	48.	2.4. new balk	3	3	3	3	3	15VD		
"	49.	3.6.								
"	50.	3.6.+ new growth of trees								
"	51.	3.4.								
"	52.	2.3., creek	2	2	2	2	2	10P		
"	53.	3.4.								
"	54.	3.6. growth of seedlings	1	1	3	3	2	10P		

The Socioeconomical Complex

4.14. Socioeconomical phenomena

Socioeconomical phenomena are considered to be the complex of claims of human society towards the landscape and simultaneously the negative effects of human activity on it /Moyzeová,M., Izakovičová, Z., in Altmanová et. al., 1987/.

Generally socioeconomical phenomena are divided into:

1. realised claims
   a/ of material characters
   b/ of nonmaterial character /circumscribed by legislative normatives/
2. planned claims /expressing future claims of the society towards the landscape

Socioeconomical phenomena were evaluated on the basis of an available questionnaire, personal consultations with representatives of the cooperative managment and a detailed terrain survey. The charted socioeconomical phenomena were divided into 10 groups:

I. Settlements
II. Industry, mining
III. Agriculture
IV. Transport and energy production
V. Recreation
VI. Water resources
VII. Forest resources
VIII. Environmental protection and conservation
IX. Air, pollution, noise, waste
X. Other factors

In legend 3 totally 90 various socioeconomical features /activities/ are represented.

Legend No. 3: Socioeconomic phenomena

Symbol	Designation of the charted unit
	I. Settlements
	- residential areas
	- proposed residential areas
	II. Industry, mining
	- industrial areas
	- proposed industrial areas
	- mining areas
	- land destroyed by mining activities
	- proposed mining areas
	III. Agriculture
ŽF	- animal farms and restricted zones /number of milk cows - D, heifers - J, chicken - K, sheep - O
MS	- agricultural machinery center
PV	- affiliated businesses
	- farming buildings
	- arable land
a	- gardens and private plots
♀	- orchards
∮	- wineyards
"	- meadows
^	- pasture land
⊖	- fallow land
x	- controversial land /discrepancies between classification as agricultural or forest land/
	- protected soil-ecological units with defined bonity
ZTA	- agro-technical park
D	- devastated areas /by erosion - E, machinery - M, cattle - D/

Symbol	Designation of the charted unit
L	- agricultural airfields
Hz	- dung heaps /raised, reinforced/
Hv	- dung heaps /natural/
Si	- ensilage objects
R	- soil recultivation
R	- proposed soil recultivation
Tv	- large terraces
TM	- small terraces
Ø	- irrigation
	- former balks, preserves
sk	- rocks and natural formations without vegetation
	- land with signs of wind erosion with data about prevailing wind direction
	IV. Transport and power industry
	- roads 1st class /national/
	- roads 2nd and 3rd class /regional/
	- electric mains
	- parking lots and garages
	- dirt roads
	- reinforced dirt roads
	- former dirt roads
	V. Recreation
	- sporting and recreational establishments
	- recreational areas
	- recreational buildings
	- proposed recreational establishments
VL	- ski lifts

Symbol	Designation of the charted units
	VI. Water resources
	- streams, purity grade
	- water reservoirs
	- proposed water reservoirs
	- natural streams /unregulated/
	- artificial and modified streams /regulated/
	- streams in artificial piping
	- protected water resources managment region
	- 2nd degree restricted zone, external
	- 2nd degree restricted zone, internal
	- existing irrigated areas
	- proposed irrigates areas
	- existing maliorated areas
	- proposed meliorates areas
ČOV	- existing sewage disposal plant
ČOV	- proposed ~~meliorated~~ sewage disposal plant
	- protective zone of mineral springs
	- important subterrestial water sources /more than 2 litres per second/
P	- drinking water sources, springs
	- pumping station
	- marshes, water spring areas, wet ground
	VII. Forest resources
↑	- economically exploited forests
u o	- protective forests
	- recreational forests
B	- pheasantries
šk	- nursery

Symbol	Designation of the charted units
	VIII. Environmental protection and conservation
	- protected landscape region
	- proposed zone of rest
CHÚ	- small protected regions
NÚ	- proposed protected regions
PK	- protected natural monuments /parks/
SP	- proposed protected study areas
12	- biologically and esthetically valuable areas /with serial number/
+	- cultural monuments /cross, minor religious monument/
	IX. Air pollution, noise, refuse /wastes/
	- areas with polluted air
◇◇	- zone of dangerous noise /over 65 dB/
	- dumps, mud settling ponds
K	- controlled sites of waste deposition
D	- unlicensed sites of waste deposition
S	- naturally exposed substrate
	X. Other elements
⊙	- TV transmitter

4.15. Soil Resources Characteristics

The way of utilisation of soil resources by the agricultural cooperative Boršice near Buchlovice is rather well characterized by the soil structure itself.

Table No. 5: General Overview of Soil Resources of the Cooperative Boršice near Buchlovice

	hectares	% of total area	% of agricult. land
Total Cooperative area	3894,7	100	
Agricultural land	3547,7	91,09	100
Arable land	2110,3	54,18	59,48
Wineyards	221,6	5,69	6,25
Gardens	21,5	0,55	0,61
Orchards	327,5	8,41	9,23
Meadows	366,5	9,41	10,35
Clearings	500,3	12,85	14,10
Forests	9,8	0,25	
Water areas	8,4	0,22	
Built-in land	6,8	0,18	
Other land	321,8	8,26	

From the above table is evident, that arable land represen up to 59,48% of the total agricultural land available. Because this represents also a rather high percentage of arable land, which also shows major effects of erosion, the structure of crops cultivated on this arable land was also ascertained. The individual crops were evaluated according to their protecti antierosive effect.

Table No. 6: Classification of Agricultural Crops According to their Antierosive Effect

Category	Crops according to antierosive effect	ha	%	Antierosive effect
1	grain corn	280	14,3	the least
2	sugar beets	146	7,5	
2	rape seed	140	7,1	
	subtotal	286	14,6	
3	spring cerals	133	6,8	
3	one-year forage crops	216	11,0	
	subtotal	349	17,8	
4	winter wheat	811	41,5	
5	clover	250	11,8	the best

The above table shows, that although the cooperative land is highly affected by erosion, the crop structure is in regard to their antierosive properties unsuitable. Almost a third of its arable land /28,9%/ is overgrown by crops of the first two categories with minimal antierosive effect. On the other hand crops with the best antierosive effect are cultivated only on 11,8% of total arable land area.

This crop classification may be used in evaluation of erosion processes, where the protective factor of vegetation plays an important role.

4.16. Goals of Further Development of Agricultural Production

The agricultural Cooperative is nowadays in a process of personal and organisational changes and it will have to re-evaluate its complete developmental strategy. The decisive role in this change was played by the current social and accompanying legislative changes /mainly the equal position of all types of property/. But from the ecological point of view the problems have been emerging for a long time already.

The most urgent problem today is the incidence of poly-chlorinated biphenyls /PCB substances/ and their inadmissible concentrations in products of cattle farming. They are carci-

nogenic substances originating probably out of protective coatings of silage pits. The coatings have been removed already.

A further urgent problem, this time a longterm one, predominantly water, but also wind erosion. It is the main theme of this study. The cooperative loses through water erosion the equivalent of 5 hectares of land every year. In financial terms this represents 15 million Czechoslovak crowns in loss of crop production.

The cooperative raises 720 dairy /milk/ cows, 1 300 heifers, 150 pigs, 4 0000 chicken and 2 600 sheep. As a result of the sugested changes in crop production and structure /termination of the corn programme, bigger areas of cereals and forage crops, the transition of arable land into permanent grass land/ there will also be changes in animal production. In no case do we suggest a rise of animal production, it will rather be a question of farming changes, possibly export of hay into low lying regions of Southern Slovakia etc.

4.17. Goals of Further Development of Recreation Possibilities

Tourist trade in the region of the Boršice near Buchlovice agricultural cooperative is today nonsignificant, but some parts of the region have a good potential for the development of recreational possibilities. Small centers of cottage recreation exist /below the forest line/ in the Southern part of the Chřiby hills.

A recreational center of regional importance are the Sovín winecellars together with the nearby recreational and irrigational reservoir and a camping they have good prerequisites for harboring oneday or longer recreation. The Buchlov castle and Buchlovice chateau with its park are also important sightseeing points for tourists.

Many possibilities for attractive and unusual forms of recreation /stays for children from polluted regions, holiday courses, tourism-hiking, horseriding,.../ exist in the region Staré Hutě-Stupava. A complex of forests in the Chřiby hills,

vicinity of Buchlov castle and good transport possibilities /highway Brno - Trenčín/ are also further advantages for possible exploitation of this region by tourists. The cooperative has chances of building small catering and accomodation facilities along the above mentioned highway connection Brno--Trenčín. Attractivity of the region would be also enhanced by production and sale of some specific food products, f.e. ovine cheese.

4.18. Goals of Further Environmental Protection

No large area or small area protected sites lie on the lands of the agricultural cooperative. Even so we would like to mention a few sites in this chapter.

The first would be the upper part of the Kyjovka stream down to the point, where it leaves the forest by Staré Hutě. It is very interesting from the hydrobiological point of view. It is an extraordinarily high quality oligosaprobic water with a taxonomically rich water fauna. It consists exclusively of organisms living in cold waters of submountaneous streams: Beatis alpinus, Planaria, Leuctra, Rheopelopia, Parachiona. Because the number of biotopes capable of sustaining the life of these species is in a permanent decline, we suggest some type of protection of this rare alliance.

A further case is the Paseky site /North of Stříbrnice/, which represents a mosaic of meadows, orchards and gardens with varying degree of cultivation, together with noncultivated areas with possible incidence of a wide spectrum of plant and animal species.

4.19. Goals of Future Development of Forestry Management

All forest vegetation neighboring with the lands of the Boršice near Buchlovice agricultural cooperative is managed by the Buchlovice Forest Enterprise. These are economically

exploited forests with the exception of vegetation near the Koryčany reservoir, which belongs into forests with special purpose category. They consist mainly of beech and oak, often with a treak of hornbeam, pines and spruce, but quite often may be seen also forests with a majority of coniferous trees - - either pure spruce forests or spruce together with pine or oak. The vegetation varies in age, there are also growths older then 120 years of age. Due to the fact, that these are economically exploited forests, older growths are generally suggested for felling, there exist practically no restrictions for felling. Even though it would be probably worthwhile to limit lumber production in many cases - either by exclusion of the respective growth from the category of economically exploited forests or by finding more gentle methods of exploitation. This would prevent such cases as the several hectares big landslides, which occured after extensive lumbering in the Paseky site /local area Stříbrnice/.

5. Synthesis and Interpretation

5.1. Type and Quality of Wood Vegetation

Quality of wood growths in the region was evaluated according to two points of view: according to originality and according to vegetation structure. Originality was evaluated by comparing the species composition of the respective growth with potential natural vegetation /Mikyška et al., 1968/ and the vegetation was classified into one of the following categories:

- vegetation consisting of original wood species
- mesofilic shrubs
- artificial decidous trees
- artificial coniferous trees
- combination of the above mentioned categories

Evaluation of vegetation structure was done using data about vegetation types obtained from the table of contemporary landscape structure. Out of 5 characteristics mentioned in the table for line vegetation, three were used in our case: growth width, vertical structure and growth type.

Classification of the spatial structure of growths is shown in table No. 7:

Growth spatial structure quality:	Growth width:	Stratification:	Growth type:
excellent	more than 6m	3 layers	confluent
good	2 - 6 m	3 layers	confluent
	more than 6m	2 layers	confluent
	more than 6m	3 layers	lacunar
average	more than 6m	2 layers	lacunar
	2 - 6 m	3 layers	lacunar
	2 - 6 m	2 layers	confluent
	less than 2m	3 layers	confluent
poor	2 - 6 m	3 layers	lacunar
	less than 2m	3 layers	lacunar
	less than 2m	2 layers	confluent
unsatisfactory	less than 2m	2 layers	lacunar

A graphical output is the map "Vegetation types", where both vegetation structure and its originality are evaluated.

5.2. Exposition of the Relief to the Sun

Solar exposition of the relief is one of those factors, which have a decisive role in the microclimatic conditions according to the respective amount of direct solar radiation descending on the relief. Solar exposition is influenced by analytical morphometric characteristics:

- relief inclination
- geographical orientation of the relief

These two factors define the angle of incidence of solar radiation on the relief surface and so also the amount of solar radiation descending on a unit area.

Tables ennumerating absorbed direct solar radiation during the vegetation period April-September /Matečný, I., 1984/ were used for the interpretation of the above mentioned variables. The calculated values were classified into categories according to the following table/Table No. 8/:

Inclination / Orientation	0-1	1-3	3-7	7-12	12-17	17-25	over 25°
N	3	3	4	4	5	6	7
NE	3	3	3	4	5	5	6
E	3	3	3	3	3	3	4
SE	3	2	2	2	1	1	1
S	3	2	2	1	1	1	1
SW	3	2	2	2	1	1	1
W	3	3	3	3	3	3	4
NW	3	3	3	4	5	5	6

The respective code values in the Table of Incidence of Direct Solar Radiation During a Vegetation Period can be characterized in kiloJoules as follows:

Code:	Radiation receipt /kJ/:
1.	696 - 725
2.	676 - 695
3.	656 - 675
4.	616 - 655
5.	576 - 615
6.	536 - 575
7.	less then 535

The final map depicting the solar exposition of the relief was obtained by orientation of both the inclination map and the relief orientation map according to the North - - South axis.

5.3. Evaluation of the Changes of Selected Properties of Soils on the Basis of Data from Comparative Probes

On the basis of data about selected soil properties /depth, soil skeletality and arable land granularity/ obtained from terrain survey data and materials from the Pedological Institute, Brno, we evaluated changes of these values during the period between the surveys.

Genetic soil depth - changes in genetic soil depth were classified into several categories: minor changes /0-10cm/, medium changes /10-30 cm/ and extensive changes /30-60 cm/. Simultaneously the changes were classified as positive /increase of soil profile depth/ and negative /decrease in soil depth/. The comparative set encompassed 41 probes.

Ascertained changes /number of cases/:	0-10cm	10-30cm	30-60 cm	Total
positive	3	1	4	8 /20%/
negative	7	18	8	33 /80%/

The results show an unequivocal tendency towards a general decrease in soil depth. This is in agreement with other observations.

Soil skeletality - differences in skeleton content could be compared only roughly on the basis of classification of the soils into one of the three major categories of skeletality /soils without or with minor skeletality, soils with medium skeletality, soils with high skeletality/. Soil classification could be the same or could differ by one or two categories. The changes could be positive /decrease of skeletality/ or negative /increase of skeletality/. The comparative set encompassed 44 probes.

Ascertained changes /number of cases/:	without change	change by 1 category	change by 2 categories	Total
positive	-	1	-	1 /2%/
without change	33	-	-	33 /75%/
negative	-	7	3	10 /23%/

The results show, that changes occur also in soil skeletality, once again in the negative direction. This is caused also by specific substrate conditions of the region.

Arable land granularity - differences in granularity were compared on the basis of laboratory analyses of the percentual content of clay particles /particles smaller than 0,01mm/. The changes were divided into three categories: minor /0-5%/, medium /5-10%/ and major /more than 10%/. The clay fraction content could have decreased or increased. The comparative set encompassed 34 probes.

Ascertained changes /number of cases/:	0-5%	5-10%	more than 10%	Total
clay fraction increase	10	3	5	18 /53%/
clay fraction decrease	8	6	2	16 /47%/

In this case no unequivocal tendencies in soil granularity changes could be found. Changes of granularity are a part of the complex erosion process and are influenced by several factors.

Laws Governing Spatial Differentiation of the Soil Layer

On the basis of the performed soil survey, its evaluation and interpretation the following assumptions may be stated: The most important factor determining changes of soil quality in the surveyed area is the anthropogenic factor - utilisation of land and the manner of its farming. On arable land there were observed in many cases total changes of soil properties

- tending towards soil degradation mainly on slopes with high inclinations and bad substrate character /comparatively large areas in Region 2/.
- the microrelief factor /inclination, relief structure and spatial relationships/ seems to be the most important transforming element of anthropogenic influence to the soil in concrete sites on the individual tracts - it influences water outflow velocity and soaking up of water, chances of washing away and soaking up of agricultural chemicals and the intensity of erosive processes. In respect to erosion processes three major parts of slopes were distinguished: erosive /steep, convex slope parts with an ascertained loss of soil during the period of study up to 30-60 cm/, transport /less steep convex or steeper concave slope sections /combined loss of soil together with soil accumulation from higher slope sections/, changes of genetic soil depth are in the interval between -20 cm to +20 cm/ and accumulative /slope foot/ with accumulation often between 50-100 cm, bottoms of slope vales - accumulation up to 50 cm and ridges - - accumulation up to 30 cm/
- the substrate factor is important mainly because of the physical and mechanical changes of soils. These changes interact with processes of soil erosion, because the substrate gets closer to the surface during intensive erosion, it is often ploughed over and so it significantly influences soil quality and fertility

On the whole it may be stated, that changes of soil quality in the region of the Boršice agricultural cooperative have a negative tendency, manifested mainly by:

- soil degradation in certain areas, mainly in region 2. This is manifested by an increase in the incidence of shallow and medium depth soils and an accompanying decrease in deep soils, an increase in the extent of skeletality and content of clay particles and in soils inclined to compaction and marshification

- rise in heterogenity mainly of large soil tracts of arable land due to diferential erosion and accumulation based on the respective microrelief

A solution, leading to stabilisation, should be a new redistribution of lands and their differential utilisation according to soil-ecological conditions and a substantial change in crop structure.

5.4. Potential Soil Erosion

The theoretical calculation of soil erosion was, because of the specifics of this study, oriented towards calculation of quantitive soil erosion per unit of area. This allowed us to identify critical sites and propose suitable antierosive measures.

Basis of the calculation is a well-known theoretical erosion model, published by W.H. Wischmeier and D.D. Smith /1978/. Values of several factors used in the calculation were taken from the paper of Pasák, Janeček and Šabata /1983/.

The universal equation is the following:

G - R.K.S.L.C.P where

G = soil loss in tons.ha^{-1}.year
R = factor of erosive effects of torrential rain
K = factor of susceptibility of soil to erosion
S = factor of slope inclination
C = factor of protective effects of vegetation
P = factor of antierosive measures /in our case P=1/

The value R = 26 was ascertained by analogic comparison of the amount and intensity of precipitation with values, which were found in the methodical studies. Because majority of the cooperative area is being intensively destroyed by erosion, we set the value of factor K = 0,7 for the whole area. This corresponds to eroded soils of a deteriorated type. Values of factor C are modified according to the protec-

tive effects of the respective groups /crops/. Due to representation in the rotation of crop planting corn and sugar beets were chosen as representatives with a low protective effect and winter cereals on the other hand as an example of crops with a high protective effect. Value of factor C by root crops is 0,60 and by winter cereals is 0,25.

Out of the calculated values of soil loss by various combinations of inclination /factor S/ and slope lengths /factor L/ 10 categories of soil loss were established. Simultaneously a separate category was also created for areas without effects of erosion, which are represented by valley bottoms and creek meads.

Category 1 - values of soil loss are usually between 4 - 8 tons, but generally they do not exceed in soils of this category the value of 10 tons/ha/year. These are very stable and high quality lands.

Category 2 - values of soil loss lie by root crop cultivation between 10 - 20 t/ha/year and by winter cereals they do not exceed 10 t/ha/year.

Category 3 - the respective values are by corn cultivation between 20 - 30 t/ha/year, i.e. 1,6 - 2,4 mm/year and by winter cereals cultivation up to 10 t/ha/year, i.e. up to 0,8 mm/year. This category is represented by land with inclination maximum up to 7°, but with considerable slope lenghts.

Category 4 - is represented by areas with values of soil loss, when cultivating corn and sugar beets, between 20 - 30 t/ha/year, i.e. 1,6 - 2,4 mm/year and by winter cereals cultivation 10 - 20 tons/ha/year, i.e. 0,8 - 1,6 mm/year.

Category 5 - encompasses the largest area of all the categories. By root crops cultivation potential soil loss lies between 30 - 50 t/ha/year, i.e. 2,4 - 4,0 mm/year and when cultivating densely drilled cereals is the respective value only 10 - 20 t/ha/year, i.e. 0,8 - 1,6 mm/year.

Category 6 - values of potential erosion reach by rootcrop cultivation up to 50-70 t/ha/year, i.e. 4,0 - 5,6 mm/year and 20 - 30 t/ha/year, i.e. 1,6 - 2,4 mm/year when cultivating densely drilled cereals.

Category 7 - represented by lands with potential erosion between 70 - 100 t/ha/year, i.e. 5,6 - 8,0 mm/year by root-crop cultivation and between 30 - 50 t/ha/year, i.e. 2,4 - 4,0 mm/year respectively. These values hold for slopes with inclinations between 7° - 12° and partially also for 12° - 17° slopes.

Category 8 - is characterised by potential soil loss when cultivating root crops between 100 - 130 t/ha/year, i.e. 8,0 - 10 mm/year, by winter cereal cultivation 30 - 50 t/ha/year, i.e. 2,4 - 4,0 mm/year. Results of the theoretical calculation and field surveys suggest, that this category is the last, where intensive agriculture may be considered.

Category 9 - encompasses areas with a potential soil loss by root crop cultivation between 130 - 170 t/ha/year, i.e. 10,4 - 13,6 mm/year and by winter cereals cultivation between 50 - 70 t/ha/year, i.e. 4,0 - 5,6 mm/year. Incidence of these highly endangered areas corresponds to slopes with inclinations between 12° - 17°, partially also 17° - 25°.

Category 10 - its values of potential soil loss are by root crop cultivation 170 - 200 t/ha/year, i.e. 13,6 - 16,0 mm/year and by winter cereals 70 - 100 t/ha/year, i.e. 5,6 - 8,0 mm/year.

Proposed Antierosive Measures

In proposing these antierosive measures, we used the theoretical model values and further calculations for establishing optimum crops and slope lengths for each category. The final proposal for antierosive measures, resulting from a complex evaluation of biotic and abiotic factors, are mentioned in the concluding chapters of this study.

Under antierosive measures we understand those inevitable changes and interventions into the agricultural landscape, which could with a certain degree of security enable the conservation of an equilibrated balanced landscape system, conservation and preservation of the soil profile and improvement of the physico-chemical properties of the uppermost part of the soil - the humus horizon.

The respective antierosive proposals are correlated with the erosion categories and on their basis a new division of lands and a rotation of crop planting are proposed.

Category 1 - together with those areas which were marked on the map as land with no erosion danger and with a surplus of accumulated material /creek meads, valley floors/. These areas pose no problem and are suitable for cultivation of all agricultural crops. In the 4 year crop rotation cycle we suggest 75% of root crops /corn, sugar beets/ and 25% densely drilled cereals /mainly winter varieties/, respectively 25% of alfalfa and forageplants. We propose planting of shrubs and trees on the borders of these plots. They will improve soil water balance.

Category 2 - all agricultural crops may be cultivated, but tract lenght in the drop direction has to be regulated. Optimum lengkth by root crops would be 150 - 200 m, maximum 400 m. By cereals a maximum length of 900 m is proposed. After taking into account the slope length we propose in the crop rotation cycle 50% of root crops, 25% of cereals and 25% of forage crops. We suggest planting shrubs and trees on the tract borders.

Category 3 - is suitable mainly for densely drilled cereals, with maximum tract length 860 m. Root crops would be acceptable only if block length in the drop direction would not exceed 100 m. Optimum length is approximately 50 m. After suitable tract length regulation we propose 25% of root crops, 25% of cereals and 50% of forage crops /alfalfa/. Tract borders and division areas should be stabilised by bush and tree vegetation 5 m wide.

Category 4 - proposed antierosive measures forbid the cultivation of root crops in this category. Densely drilled cereals are suitable only if tract lengths are limited to 100 - 200 m, maximum 400 - 500 m. Optimum crop are winter cereals.

Category 5 - is forbidden for root crops and winter cereals cultivation is suggested only after regulation of tract length maximally to 100 m. We stress the character of tract borders and division strips, where tree growths with a minimum width of 5 m should be dominant.

Category 6 - does not allow the block system of cultivation and enables only struip cultivation with the width of cultivated strips between 30 - 50 m. Optimum crops are even without using antierosive steps forage plants, with a higher degree of intensification. Locally in good sites we suggest arable land with a 25% rate od densely drilled cereals. The sites are also rather suitable for wineyards and orchards.

Category 7 - is according to theoretical conclusions unsuitable for arable land. According to our opinion optimum is cultivation of forage crops with a medium degree of intensification and even possible sites for wineyards and orchards are not excluded.

Category 8 - forces the exclusion of arable land, optimum is medium to low intensity permanent grassland.

Category 9 - we think it to be unsuitable for agriculture, we propose permanent grassland /pastures/ with a low degree of intensification. Locally are some of these lands suggested for reforestation.

Category 10 - the areas should be from the theoretical point of view excluded from agriculture and be gradually reforested. Forest planting is especially important in the upper regions of valleys and in the vicinity of wash-outs. Non intensive grass land would also be suitable.

5.5. Quality of Water as an Indicator of Landscape Condition

Water quality in surface streams was also evaluated on the cooperative lands using hydrobiological surveys /see Chap. 4.11./. The individual profiles, from which samples were taken, can be classified into 5 groups.

1. High quality, oligosaprobic water - sites 13, 17
2. Good quality, beta mesosaprobic water - profiles 9, 10
3. Transition between beta and alpha mesosaprobic water-sites - profiles 7, 11, 18
4. Polluted, alpha mesosaprobic water - sites 3, 5, 8
5. Highly polluted, alpha mesosaprobic-polysaprobic water - profiles 1, 15

The best water quality was observed in profile 17 on the Kyjovka stream /we propose environmental protection of this stream/, most polluted water was found in profile 15. Results of hydrobiological surveys suggest, that water pollution is caused by both agricultural and other activities. Determination of their relative influence on water pollution would be only possible if more analyses were available.

In the Staré Hutě - Stupava region analysis was performed in two sites on the Kyjovka stream - at the outflow from a forest above Staré Hutě and below the village Stupava. The difference in water quality is highly significant: at the outflow from the forest the water is high quality, oligosaprobic grade, after flowing through both villages the water is medium polluted - transition between beta and alpha mesosaprobity. Most polluted water was found in profiles 1 and 15. These two sites have in common the fact, that they lie below large villages /Buchlovice, respectively Boršice/ and are in close proximity to agricultural centers of the cooperative. Interesting is the change in water quality in the Buchlovice creek between profiles 15 and 9. The distance between these two sites is not quite 2 km and while profile 15, lying above profile 9, is a site with most

polluted water, water in profile 9 is already beta-mesosaprobic, i.e. good quality water. The change in water quality is striking. The reason lies most probably in the presence of big stones on the creek bottom, which cause good oxidation /by high water drop rate/, which in turn supports water self-purification. We could also prove the positive influence of the Smraďavka reservoir on water quality - out of the dam flows good quality beta mesosaprobic water, cleaner then the one, which flows into the reservoir. The first impression would be, that the high degree of water pollution /alpha mesosaprobic/ in a short stream, originating in the village Hostějov, is surprising. But here has to be ataken into accou besides possible pollution from the village as such also the fact, that the stream serves as an outflow of two watersheds without permanent water flow but with a highly exposed relief and a high probability of washing down of agrochemicals.
A similar alpha-mesosaprobic water may be observed at samplin site 3 in the Medlovice creek, which flows through two villages /Medlovice, Stříbrnice/ and an intensively farmed landscape and has a very poor shore vegetation.

5.6. Ecological Problems Originating in the Clash of Interests in the Region

Each socioeconomical phenomenon has its place in the landscape. Out of the characteristics of socioeconomical phenomena is evident, that two or more phenomena may appear in one location. Mutual relations of these phenomena cause conflicts of interest /Moyzeová, Izakovičová, in: Altmanová et al., 1987/.

From the ecological point of view socioeconomical phenomena are divided into three groups:

- endangered features - positive landscape phenomena

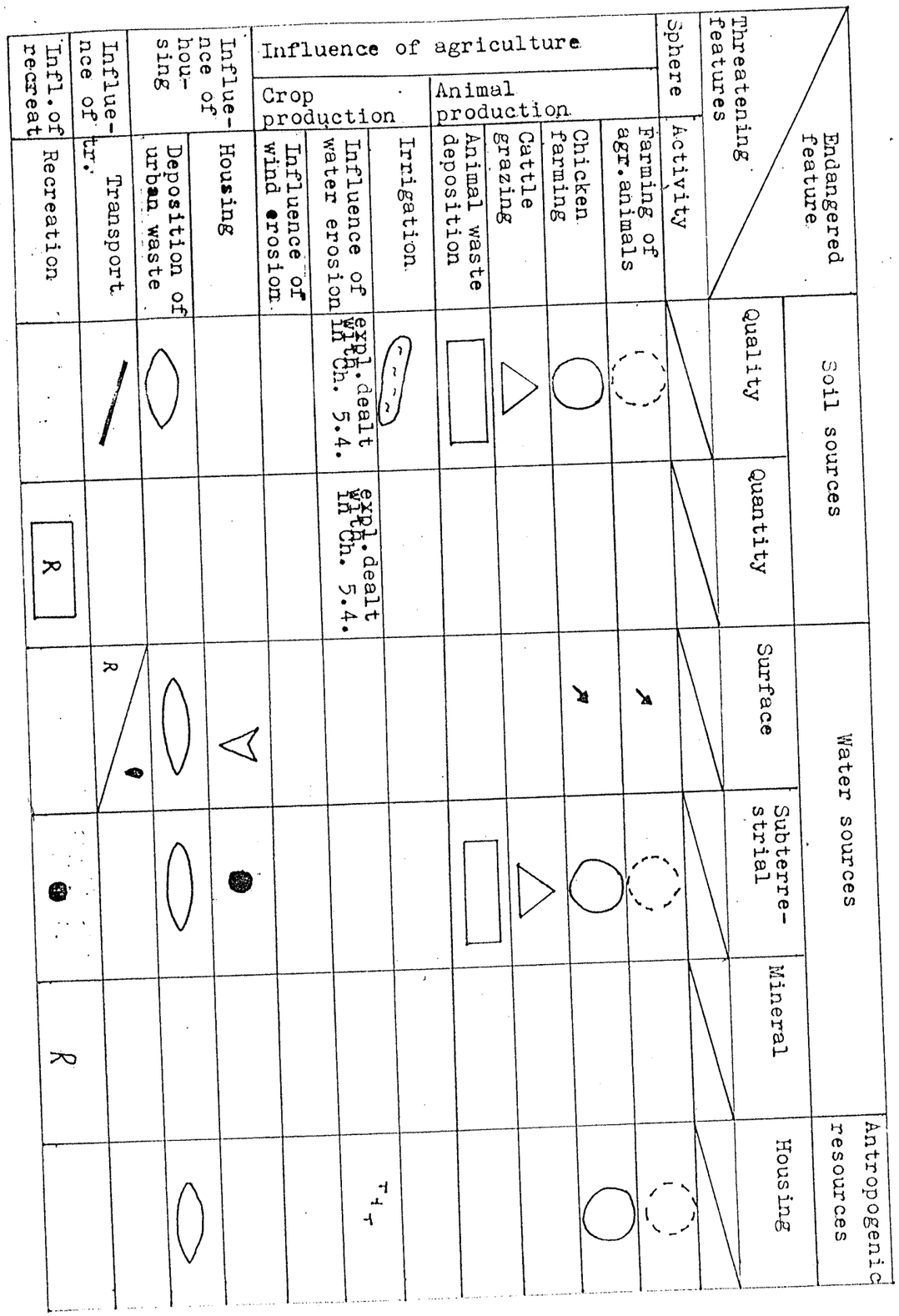
a/ socioeconomical phenomena expressing the interest of nature conservation, biologically and ecologically valuable areas

b/ socioeconomical phenomena expressing the interests of natural resources protection /arable land, forests, air, water/

- threatening features - these are features influencing the landscape negatively. These phenomena accompany the development of agriculture, urbanisation and transport
- features simultaneously endangered and threatening - these are phenomena expressing interests of urbanisation and recreation /urban areas, land used for sports and recreation

Spatial conflicts of interests of these three groups lead to the rise of ecological problems.

The problem with absolute priority on the lands of the agricultural cooperative Boršice near Buchlovice is water erosion. Its extent is shown on a separate map. Further significant clashes of interest between socioeconomical activities in the area are the influence of agriculture /and to a lesser extent also of transport on soil and water resources, housing and recreation /see Legend No. 4/.



Legend No. 4: Conflicts of Interests in a Landscape

6. Evaluation and Proposals

The Landep method describes evaluation as a process of determining the suitability of an area for localisation of selected social activities according to the interpreted properties of the respective landscape.

6.1. Determination of the Utilisation of an Agricultural Landscape according to Abiotic Limits

The following criteria were taken into account in the evaluation:

Relief inclination:

1. 0 - 1°
2. 1 - 3°
3. 3 - 7°
4. 7 - 12°
5. 12 - 17°
6. 17 - 25°
7. 25° and more

Soil depth and skeletality

1. Deep, without or with minor extent of skeletality
2. Medium depth, without or with a minor extent of skeletality
3. Shallow, without or with a minor extent of skeletality
4. Deep, with a medium degree of skeletality
5. Shallow, with a high degree of skeletality

Soil granularity

1. Soils without very heavy horizons
2. Soils with a very heavy surface of subsurface horizon
3. Soils with a very heavy surface and subsurface horizon
4. Soils with a from heavy to very heavy substrate under the surface horizon
5. Soils with a from heavy to very heavy and solid substrate under the surface horizon

The result is a set of spatial units depicted in the map, characterized by a ternary code of suitability for agricultural exploitation, as shown in Table No. 9.

Individual units of the set were classified into groups according to proposed agricultural exploitation.

0 - areas suitable for arable land without limitations /according to abiotic limits/
4 - areas suitable for biannual forage crops on arable land
5 - areas suitable for permanent grass land and for biannual forage crops
6 - areas suitable for permanent grass land of varying intensities
7 - areas suitable for reforestation and transition into forest land

Abiotic limits are one of the data necessary for the final proposals for ecological stabilisation of the respective landscape and for a novel redistribution of agricultural land.

Table No. 9: Abiotic Limits for Utilisation of Agricultural Land

Suitability for: / Evaluated parameter:	Arable land /0/	Arable land with for.crops /4/	Grassland and bian. for.crops /5/	Grassland /6/	Forest (7)
Inclination	1-3	4	-	5,6	7
Soil depth and skeletality	1	2,4	3,5	6	-
Soil granularity	1 /2/	2	3,4	5	-

6.2. Proposed Changes in Spatial Localisation and Structure of Wood Vegetation

When preparing planting and supplementing vegetation the following basic rules have to be adhered to:

a/ use original wood species /see points 1-4 below/
b/ do not plant monocultures, but use several species of autochtonous wood plants in such a way, that their choice would correspond to the characteristics of the respective site
c/ the seedlings should be from local sources, as close to the place of plantning as possible
d/ suitable vertical structure of the vegetation has to be taken care of, i.e. suitable representation of trees and shrubs. From the point of view of vegetation function, it would be profitable to plant older individuals with soil around the roots

The proposal for spatial localisation of wood vegetation can be divided into 4 groups:

1. Proposed planting and supplementing of wood vegetation with the aim of either stopping or at least diminishing the effects of water erosion. We propose the planting of antierosion strips with a minimum width of at least 5 - 10 m, formed by several rows of trees and shrubs. Attention has to be paid to sufficient confluency mainly of the brush layer. Almost the same species may be used for planting as in paragraph No. 2. It is suitable to plant resistant shrubs on the outskirts of vegetation, in the zone of direct contact with agricultural production /and field alliences/.

2. Proposed changes in the spatial localisation of permanent vegetation in a landscape with the goal of supplementing the system of ecologically stable elements of an agricultural landscape. These proposals are partially based on the theory of regional system of ecological stability /Löw, 1984/. Existing vegetation in the landscape was in these proposals exploited to the

maximum, new biocenters were proposed only in inadvertant cases. The vegetation, proposed in paragraphs 2 and 3 also serves as biocorridors. Very important in especially the vegetation around water streams. Spatial parametres are the following: minimum width of biocorridor 5-10 m, minimum area of a biocenter 3 hectares /Löw, 1984/.

In the map of proposed vegetation changes are shown besides the proposed vegetation growths also the current basis of ecological stability: existing vegetation capable of acting like biocenters and biocorridors and there are also emphasized the major directions of the biocorridors. We propose the use of the following trees and shrubs:
Quercus petraea, Quercus robur, Carpins betulus, Tilia cordata, Acer campestre, Acer platanoides, Acer pseudoplatanus, Fraxinus excelsior, Lonicera xylosteum, Corylus avellana, Ligustrum vulgare, Prunus spinosa, Crataegus monogyna, Viburnum opulus, Euonymus verrucosus, Euonymus europaeus, Swida sanguinea, Rosa canina, Rhamnus catharticus.

3. Planting and supplementing shore vegetation with the goal of improving water ecosystem quality, support of the selfpurification abilities of streaming water and diminishing the degree of water stream pollution by washed down chemicals from fields. We propose supplementing or planting of stream shore vegetation in such a way, that width of the respective outgrowth would be minimally 5 m on each shore and that both a tree and a shrub layer would be formed. We propose the use of the following species:
Alnus glutinosa, Salix fragilis, Salix purpurea, Salix caprea, Fraxinus excelsior, Acer platanoides, Acer campestre, Corylus avellana, Euonymus europaeus, Euonymus verrucosus, Ligustrum vulgare, Swida sanguinea, Lonicera xylosteum, Rhamnus catharticus, Crataegus monogyna, Sambucus nigra.

4. Planting of protective strips of wood plants in the contact zones of roads with fruit orchard with the goal

of diminishing the pollution of orchards by vehicle exhausts. Sufficient data are to be found in literature /f.e. Burkhart, 1972, Keller, 1970, 1974, Vlčková, 1978, Curzydlo, 1979/ about contamination of vegetation along highly used roads and the protective effect of wood vegetation. We propose the planting of protective strips of woody vegetation along the state highway No. 50 in the area, where it gets into contact with a fruit orchard in the vicinity of the village Buchlovice.
A similar situation is also by an orchard between the villages Stříbrnice and Medlovice, which neighbours with an adjacent road. The protective strips should be with well confluent trees and shrub layers, to keep the filtration effect at its maximum. The prevailing wind direction should also be taken into account, which means, that vegetation on the Southern and Eastern sides of the road will be more afflicted. The relief also has to be taken account for. Well confluent vegetation may in some cases not only stop pollutants, but may also influence airflow and so protect the vegetation on the land behind it also in this manner. Wood plants with wide leaves are most suitable for protective strips: a good filtration capacity was observed by the following species:
Quercus robur, Quercus petraea, Acer campestre, Betula pendula, Carpinus betulus, Ulmus minor, Ulmus laevis, Ligustrum vulgare, Lonicera xylosteum, Prunus spinosa, Rosa canina, Corylus avellana, Viburnum opulus, Swida sanguinea, Eunonymus europeus, Rhamnus catharticus.

Legend No. 5: Modification of Spatial Distribution and Structure of Wood Vegetation

Proposed planting:

with a main antierosive function

along roads with a main filtration function

other

Supplementing existing vegetation:

improvement of vegetation vertical structure

widening of growths and improvement of vertical structure

Elements of a local regional system of landscape ecological stability:

existing biocenters

proposed biocenters

main directions of biocorridors

existing biocorridors

6.3. Proposed Ecological Stabilisation of an Agricultural Landscape

The unsuitable system of crop production in the coperative Boršice has become in the past few years unwarrantable. This was also the reason for the ordering of an ecological study, the final and decisive parts of which are proposals for ecological landscape stabilisation and restructuring of the lands available.

We decided for two variants of landscape ecological stabilisation:

1. ecological /optimum/ - is currently hardly feasible for the cooperative because of its finacial problems. But it shows, how extensive changes have to be done to enable sanitation of the landscape and also its permanent exploitation and utilisation
2. compromise variant - this variant was elaborated together with cooperative agronomists. It is a compromise, still ecologically acceptable and from the economical point of view /as discussed with cooperative management/ feasible. The biggest advantages of this variant lie in the possibility of immediate launch and realisation.

The following analytical and interpretation data were taken into account:

1. map of current land tract borders
2. map of secondary landscape structure
3. map of socioeconomical phenomena
4. map of water erosion
5. map of provisions for landscape utilisation according to abiotic limits
6. map of the local regional system of landscape ecological stability

The ecological variant

The map includes numeric codes, where the first number shows water erosion intensity, the second number

shows abiotic limits for land utilisation. The final proposal for crop structure is shown in colors.
Brown lines - proposed planting of vegetation /trees and shrubs with undergrowth/ with an antierosive function. Their other function lies in the incorporation into the local regional system of landscape ecological stability.
Green lines - proposed planting of vegetation /trees and shrubs with herb undergrowth/ with a purely antierosive function.

Legend No. 6: Proposed Ecological Stabilisation of the Agricultural Landscape /Ecological Variant/

1st code: Erosion /during corn cultivation/

1. soil loss /0 - 10 t/ha/year/
2. soil loss /10 - 20 t/ha/year/
3. soil loss /20 - 30 t/ha/year/
4. soil loss /30 - 70 t/ha/year/
5. soil loss /70 - 100 t/ha/year/
6. soil loss /100 - 170 t/ha/year/
7. soil loss 170 and more tons/ha/year

2nd code: Abiotic limits for soil utilisation /evaluation of inclination and soil depth, skeletality and granularity/

0. arable land
4. arable land with prevalence of forage crops
5. biannual forage crops to permanent grassland
6. permanent grassland
7. suitable for transition into forestland

Final proposal:

land suitable for arable land

land suitable for arable land with a prevalence of forage crops

land suitable for from biannual forage crops to permanent grassland

land suitable for permanent grassland of varying intensity

land suitable for transition into forest land

line vegetation /trees and shrubs with herb undergrowth/, antierosive function and simultaneously a part of the regional system of landscape ecological stability

line vegetation /trees and shrubs with herb undergrowth/, antierosive function

The Compromise Variant

The map has only graphical description without codes and shows the proposed and according to the cooperative management also feasible crop structure. Precise planting procedures should be elaborated.

Legend No. 7: Proposed Ecological Stabilisation of the Agricultural Landscape /Compromise Variant/

land suitable for cultivation of sugar beets and corn /binary codes 10,20 in the ecological variant/ /16% sugar beets, 28% corn, 28% cereals, 18% fodder crops/

land suitable for corn cultivation /binary codes 30,04,14,24,05,15 in the ecological variant/ /50% corn, 25% cereals, 25% forage crops/

land suitable for forage crops and cereals /binary codes 34,40,44,25,35,45,50,16,26,36,46,56 in the ecological variant/ /50% cereals, 50% forage crops/

land suitable predominantly for forage crops /binary codes 54,55,60,64 in the ecological variant/ /75% forage crops, 25% cereals/

land suitable for permanent grass cultures or wineyards /areas with an expedient S, SW and SE orientation/ /binary codes 65,66 in the ecol. variant/

land suitable for transition into forest land /areas with extreme water erosion above 170 t/ha/ year during cultivation of crops with extreme erosion/

line vegetation /trees and shrubs with herb undergrowth/ with an antierosive function and simultaneously a part of the regional system of landscape ecological stability

line vegetation /trees and shrubs with herbaceous undergrowth/, antierosive function only

The above mentioned proposals are directed towards the notion, that the agricultural landscape should start to fulfill its basic functions, mainly the antierosive and soil protection, biologically stabilising and aesthetical functions.

6.4. Evaluation of Areal Changes of Crop Structure and Landscape Vegetation

If there should be introduced in crop production a way of farming, which would be permanently sustainable /and limit above all water erosion to a sustainable level/ there has to take place a rather broadminded supplementing of the landscape, above all of line vegetation and what is more important, there has to take place a substantial change in crop structure.

Until now the cooperative planted in the past years approximately:

130 hectares of sugar beets
200 hectares of grain corn
200 hectares of fodder corn
1 000 hectares of densely drilled cereals /800 hectares winter cereals, 200 hectares spring cereals/
300 hectares lucerne /alfalfa/ and spring fodder mixtures

This will not be possible anymore in the future. Production areas of corn and sugar beets will have to be reduced /by sugar beets perhaps eliminated at all/, to the contrary the percentage of densely drilled cereals, forage crops and permanent grass cultures should rise. Even new species of technical /energetic/ crops could be tried.

Landscape vegetation should be restored, supplemented and newly planted according to the proposals, which are shown in the map "Changes in Spatial Localisation and Structure of Wood Vegetation". This means above all the planting of line vegetation, which has not only an antierosive role, but also has a stabilising function /in the framework of the local regional system of landscape ecological stabilisation/see Chapter 6.2./. By the ecological variant this means proposed planting of 122,9 km of line vegetation /at least 5 m wide/, by the compromise variant this would be 77,5 km. The compromise variant is in accord with a condition of the cooperative management, that newly planted vegetation should not occupy more than 1% of agricultural land. But there has to be mentioned here the necessity not only to plant the vegetation but also to maintain it with high expenses. Otherwise undesirable consequences can follow /spread of weeds etc./.

Total evaluation of areal changes is shown in the following tables. Graphical description is shown in Chapter 6.3. The following chapter 6.5. is the conclusion of the whole proposal part of the study. It is based on all the above mentioned data and proposes a precise distribution of the individual land tracts, restoration and supplementing of field roads and a suitable crop structure. But it has to be mentioned, that some of the tracts may be in reality united, because they are divided f.e. only by an unconsolidated field road. But the condition, that the block width should be at least 45 m, has been respected in all cases.

Table No. 10: Evaluation of Areal Changes of Crop Structure - the ecological variant /in hectares/

	□	□	□	□	□	Total
Boršice	538,7	449,5	103,9	390,7	52,4	1535,2
Osvětimany	273,9	480,1	166,3	534,3	57,1	1511,7
Stupava	44,5	72,8	68,3	286,3	0	471,9
Total	857,1	1002,4	338,5	1211,3	109,5	3518,8

Line Landscape Vegetation - the ecological variant /in kilometres/

	□	□	Total
Boršice	36,9	29,0	65,9
Osvětimany	21,1	35,9	57,0
Stupava	0	0	0
Total	58,0	64,9	122,9

Table No. 11: Evaluation of Areal Changes of Crop Structure - the compromise variant /in hectares/

	□	□	□	□	□	□	Total
Boršice	380,1	235,2	318,2	187,5	426,0	3,6	1550,6
Osvětimany	196,2	143,2	548,5	229,9	390,7	7,1	1515,6
Stupava	9,6	8,5	84,8	2,9	377,6	0	483,6
Total	585,9	386,9	951,5	420,3	1194,3	10,7	3647,8

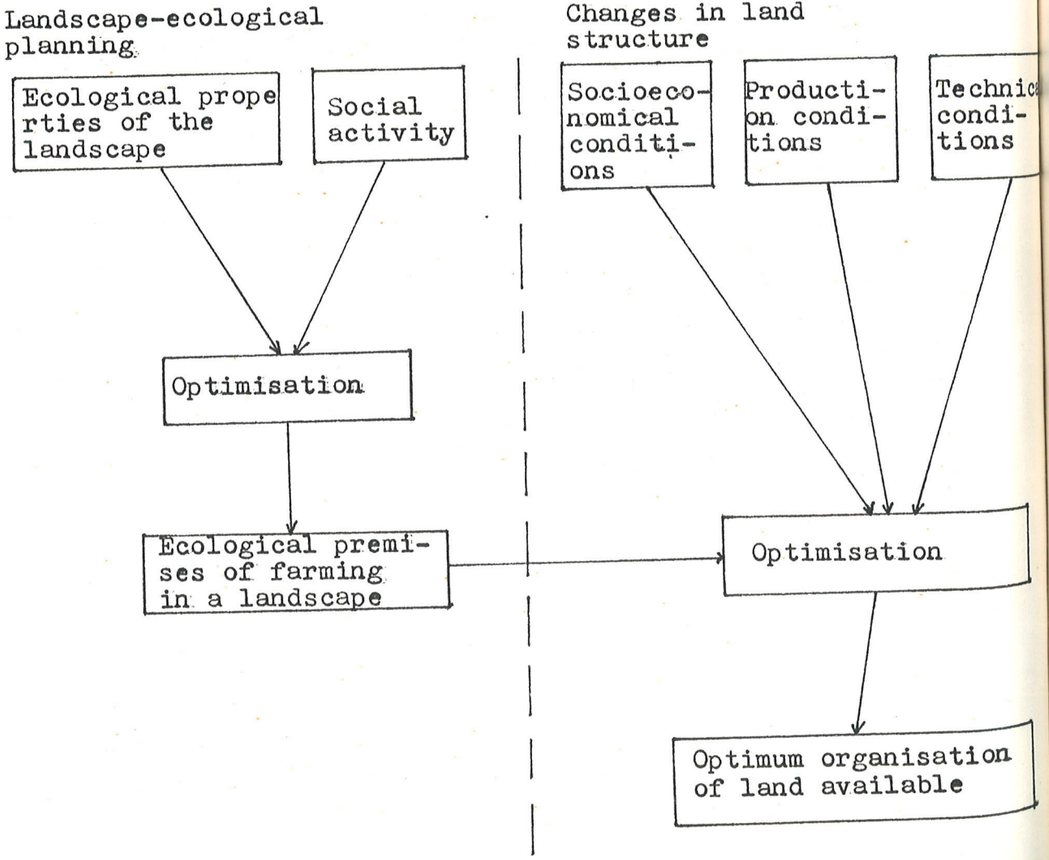
Line Landscape Vegetation - the compromise variant /in kilometres/

	□	□	Total
Boršice	25,6	13,2	38,8
Osvětimany	16,5	22,2	38,7
Stupava	0	0	0
Total	42,1	35,4	77,5

6.5. Proposed Optimum Organisation of Land Available /abridged/

Under organisation of land available we understand the classification of agricultural land according to its ease of cultivation, inclusion of the tracts into land units, setting up of borders between arable land, permanent grassland and other cultures and the implementation of delimitation between agricultural and nonagricultural land. The new land organisation is realised through proposed modification of tract distribution /proposal of new tracts/. It is influenced by agricultural buildings, antierosive measures and in the final outcome it concerns the whole landscape. The process of optimisation of land organisation is shown in Figure:

Process of Optimisation of Land Organisation



This concise method was applied in the farming area of the agricultural cooperative Boršice.

6.5.1. Proposed Land Delimitation

The goal of land delimitation is to determine according to local conditions and the plan of agricultural production suitable areas for the individual cultures /arable land, permanent grasslands, orchards, wineyards etc./ and through this enable rational utilisation of agricultural land.

6.5.2. New Arrangement of Land Units

Division of agricultural land into land units is one of the most important tasks, when proposing a new organisation of land. Many factors have to be taken into account in the proposal, such as:

- optimum size and unity of the tracts
- as high as possible homogenity of the tracts
- practical tract shapes, above all suitable length and width of the tract
- proper positioning in the terrain - according to inclination and morphological conditions
- localisation of the tracts according to agricultural production sites /centres/

Novel division of permanent grassland

The compromise proposal was taken as the basis for division of permanent grassland, evisioning the inclusion into one tract of such grassland, that is farmed with approximately similar intensities. Some land suitable for arable land was included into permanent grassland mainly in the Stupava region due to the existence of a protective zone of the Koryčany water reservoir. We tried to divide the tracts mainly through natural obstacles.

Novel division of orchards and wineyards

The basis for a novel distribution of these permanent cultures was also the compromise ecological proposal. Simultaneously we tried to conserve the existing status to a large extent. In positioning of new tracts into the terrain various factors were taken into account, such as slope exposition, extent of potential exposition to solar radiation and the existence of frost basins.

6.5.3. Proposed Road Network

Modern agriculture has high demands on agricultural transport, mainly on the state of field roads and their width. In designing a network of field roads, we tried to reach the state, when they would, besides their basic function of opening up the tracts and accelerating transport, also save energy, eliminate or limit agricultural transport on public roads and through settlements and also serve as anti-erosive protection.

In the area of interest three levels of field roads are proposed:

Connecting roads - reinforced, 6 m wide on the crown. Three connecting roads with a total length of 5,2 km were proposed.

Main roads - reinforced, 5 m wide on the crown. Seventeen main roads with a total length of 29 km were proposed.

Primary, side roads - according to importance reinforced or natural, 4 m wide on the crown.

The total of 78 reinforced roads with a total length of 68,4 km and 116 nonreinforced roads with a total length of 76,6 km were proposed. Reinforced primary field roads were proposed for transport from sites with a higher transport frequency. Nonreinforced field roads were proposed only for seasonal opening of the respective tracts.

6.5.4. Proposed Landscape Architecture /Landscape Proposals/

When preparing landscape architecture the regional system of ecological stability and the compromise ecological proposal were taken as a basis. Actually we concentrated on the precise localisation of already proposed vegetation on the basis of new land organisation of land available.

Vegetation was proposed in 5 groups with emphasis given mainly on the antierosive function:

- in the form of lines along tract borders
- in the form of lines along field roads /on one side or both sides/
- in the form of lines along water streams
- in the form of lines along farming centers of the cooperative
- in the form of preserves or small groups of trees and shrubs

7. Prognosis of Development of the Agricultural Cooperative

On the above pages an ecological study was presented, which should help the agricultural cooperative Boršice near Buchlovice above all answer the following two questions:

a/ what is the current status of the landscape, what potential does it have for current and future utilisation

b/ what is the desirable distribution of socioeconomical activities in the landscape /not only agricultural ones/ to allow maximum possible mutual respecting of spatial requirements of the individual sectors at the smallest possible costs.

The study was based on the landscape ecological methodic LANDEP, which systematically progresses during problem solving from collection of data and analysis over synthesis, interpretation and evaluation to the final proposals.

In the concluding chapter we shall try to assess the wider context and point out the major factors, which will influence development of the landscape in the future. The ecological study thus becomes the basis for a prognosis of future developmental possibilities and risks, which should be the prerequisite for elaboration of a satisfactory long term strategy of desirable development both of the agricultural enterprise and the rural area.

7.1. External Trends

There appear on the republic and broader scales tendencies, which will influence the cooperative in the future and which will have to be responded to. The development of rural agricultural areas /enterprises/ will be influenced by the following trends:

1. The importance of natural resources, mainly nonrenewable, will raise.
2. The price of energy will raise, the importance of local alternative sources will raise.

3. The price of mineral fertilizers, mainly of nitrogen containing ones, will rise due to their high energy content. Simultaneously their quality will decrease as a consequence of limited import from the Soviet Union and increased import of fertilizers from African countries with a high content of heavy metals.
4. There will take place a radical change of economical conditions, characterized by three basic principles:
   - widespread privatisation
   - price liberalisation
   - strugle for convertibility of Czech crown
5. The number of private farms will rise significantly, to the contrary the number of state owned farms will rapidly decline.
6. Private landowners will unite their strength and technical means in the form of loose groups or they will collaborate with agricultural cooperatives, which will mediate some activities for them /sales and purchase, foreign contacts and trade etc./.
7. Gradually the market will get saturated in quantitative terms with resulting retail problems.
8. A rise in the interest of people in the quality of agricultural products and healthier nutrition will take place.
9. Agricultural production will differentiate. The role of biologically more valuable /"cleaner"/ foodstuffs, used mainly for sucklings and children, will rise.
10. In accordance with world trends towards healthier nutrition the degree of animal proteins in food will decrease. As a consequence animal production will be restricted.
11. Production surpluses /mainly in animal farming/ will gradually diminish the pressure towards utilisation of agricultural land, at least in certain areas /crisis regions, protected landscape regions, protective zones etc./.
12. Unemployment /if not absolute, then at least regional/ will become a reality, people will have to migrate in search of employment and undergo requlification.

The cooperative will be forced either to limit the number of its members or be active in other fields, above all in services and tourist trade.

13. Ecological consciousness will increase not only by experts and managers, but also in the general public, whose interest in the state of the environment will rise. This will lead to increasing ecological pressure "from the ranks".
14. All enterprises /not excluding agricultural ones/ will increase their outlays for environmental questions but even so the ecological crisis will simultaneously become more acute because of inertia, mutual synergetic effect of negative factors and a large number of unsolved problems.
15. Pressure towards recreational utilisation of nondevastated areas will rise.
16. Large areas of our country will be subjected to negative influences. This will be above all atmospheric pollution. Emissions will affect our landscape not only locally and regionally, the total level of pollution in the republic will increase.
17. Tendencies towards decentralisation of power and responsibility, towards selfrule not only on the scale of the whole republic, but also in individual enterprises will be strenghtened.
18. The role of decentralised small /resp. middle size/ enterprises and productions, which are able to react fast to market requirements, will increase. In rural areas this will apply especially to production and sale of foodstufs, services and tourist trade.
19. The enterprises will try to increase the technological niveau of their products, this will lead to opening up towards foreign investments and influences.
20. In the future people will gradually drift away from cities, first into satellite villages and then into more faraway areas.

21. The role of clubs, groups and citizen iniciatives and their number will rise, people will be interested in taking part in the development and management of their village or region.
22. The role of education or ability to requalify will rise.
23. After strenghening of selfgovernment and the role of communities there will take place also a strengthening of the role of companies active in the respective region. They will play an important role in the development of the region, this can be assisted by tax reductions, if the company invests into preferred areas, such as education, services, environment etc.
24. Independent regions and enterprises will be forced to change the form and content of their activities from administratively bureaucratic to an attitude concentrated on research and development /founding of research and developmental units by national commitees/ or other newly founded administrative organs /or in enterprises/. Money will flow not for institutions, but towards positive projects and programmes.

The agricultural cooperative Boršice near Buchlovice will have to be able to react to all these anticipated changes. This means, that one of the basic prerequisites of its further development is the change of the administrative center of the cooperative into a concept center, which, not counting other functions, also elaborates /or plans orders for such documents/ alternative scenarios of further development. On the basis of such variants of prognostical scenarios of future development will be elaborated longterm and middle term strategies, which will be decisive for cooperative tactics in the respective years.

On the basis of republic and European trends it can be foreseen, that after a period of extensive development and consequent intensification and "industrialisation" of agriculture, there will take place its ecologisation.

On the following pages we shall try to show a way, which would support balanced economical, ecological and social development. Our aim is to initiate discussions and reasoning in the sense, that ecological farming could be economical and effective already under current conditions and that its importance will surely increase in the future. Experience from Western countries shows, that ecologically suitable technologies do not retard economical development, they accelerate it.

7.2. Transition to New Conditions

The agricultural cooperative is today in a pressing economical situation /especially due to problems with polychlorinated biphenyls/ and a critical ecological situation.

And this all in a period, when external conditions change, above all state subsidies are being cut, prices are yet free and all forms of property are not equal.

Although there will appear a number of private farmers, according to our opinion the cooperative should survive due to at least two good reasons:

- cooperatives are more stable and resistant towards adverse influences /climatic, economic/, which could economically endanger the private landowner
- family members /especially children/ are not economically bound to the family farm and can more easily choose a nonagricultural profession

There is also a cultural reason. If Czechoslovakia is on the border between Western culture with its preference of individual property and Eastern culture, where the role of collective property is more accepted, then there could probably coexist in our conditions both forms of property, none of which is distant to mentality of our people. In a hilly region, there will be a majority of private owners /at least in the beginning/, in more fertile and flat regions there will be rather a prevalence of cooperatives /although of a smaller size than today/.

Even private owners will have to found or use the services of certain special purpose groups, may it be for the purchase of mechanisation, application of chemical compounds or for the sale of their own products. The Boršice agricultural cooperative could provide these services to private landowners in its area.

It is important, that the cooperative management will start early enough with internal decentralisation and get rid of superfluous workers in the administration, management and also in certain affiliated businesses. It also has to regionalise the cooperative /creation of three relatively independent land regions proposed in the study may also serve as an alternative for the division of the cooperative into smaller units/ and above all change its organisational disposition to much more loose forms /such as assistance in the founding of family farms, services and businesses, sale of its stock etc./.

The basic prerequisite for survival is to gain confidence of its members to such an extent, that they will be willing to and also will have the chance to invest their savings into perspective parts of the enterprise /f.e. the above mentioned family farms/.

7.3. The Past Way of Farming and a Warning Prognosis

On the basis of the results of the ecological study the past way of farming may be unequivocally designated as a warning variant for further development.

If we should extrapolate the past trends into the future, we would get a scenario leading in the near future to an ecological and a subsequent economical crisis. This may be documented on the development of soil horizons during the last 30 years. On land endangered by erosion disappeared 30 - 60 cm of soil and soil depth varied according to individual sites between 60 - 120 cm. If soil depth on certain tracts was

80 cm thirty years ago and today is 20 cm /as verified by a series of 150 dug out probes/, then it can be rather exactly calculated, when the cooperative will get to the substrate using unchanged methods of farming.

It is more complicated to calculate this tendency for the cooperative on the whole, because soil depth and speed of erosion processes vary in individual localities according to the microrelief. But development of soil depth on the individual tracts may be predicted on the basis of data shown in this study.

In some cases the cooperative reached the substrate already by now, in other words soil has vanished. This leads to a significant decrease in production, nutrition must be applied in the form of high doses of mineral fertilizers, which are tolerated only by certain crops. Crop quality decreases, the situation leads to increased contamination with heavy metals, which in turn negativelly influences sale prices etc. Under market mechanism, cutting of state subsidies and increasing pressure towards products quality in this development synonymous for the cooperative with a catastrophe. We estimate, that if no changes in farming style take place, this would lead to devastation of about 30% of lands of the agricultural cooperative during the next 10 years.

This prognosis should be the warning variant, which by showing future consequences will lead to a change in the farming method and so will not become reality /it will destroy itself, the so called "selfdestructive" prognosis/.

7.4. The Desirable Variant of Development

Besides the warning variant, it is possible to prepare two other classical scenarios: the compromise one and the ecological, optimum /better expressed - desirable/ scenario of development.

According to our opinion the cooperative is heading towards the compromise variant. It clearly wants to change its way of farming and settle past debts, even if it has to pay the price of commercial losses.

It is hampered in its struggle by at least three negative influences:

a/ The ecological situation is today so disastrous, that total damage remedy would require according to an estimate of the cooperative approximately 90 million Czechoslovak crowns, which is at least ten times as much, as the cooperative can in reality afford.

b/ The problem of polychlorinated biphenyls in animal products. According to the data given to us, the origin of these compounds lies in coatings of fodder pits. These paints were allowed at the time of application.
They have been removed now, but increased concentrations in products may continue for several years. If the government will not take over the economical losses caused by the resulting inability to sell animal products, the enterprise will be in economical jeopardy.

c/ Longterm existence of only vague economical rules. Hardly anyone is able to understand the current jungle of subsidies, sale prices, taxes, deliveries etc. and what is even more important knows the future state of economic legislation. The obscurity of property relations is also an important factor in this context.
The cooperative has to calculate, especially in ecological matters, with an inertia of influences, with their cumulative effects and gradual discovery of effects, which were hidden in the past but now, even after elimination of the original cause, will still be effective for a period of time.

According to our opinion one more reason for the compromise variant is the traditional rural mentality, where radical changes both in way of thinking and farming are rare.

The proposals formulate the so called compromise variant of proposed changes in crop structure. They were prepared together with the cooperative management. It is necessary to put them into life very quickly, if the cooperative is to have a chance to get rid of the most pressing ecological problems during the next 10 - 15 years. We will strive to succeed in achieving the gradual transition of this compromise variant of crop production development /which subsequentially also influences animal production/ into the more radical ecological variant.

The cooperative is in no case in the position to push through the "ecological" desirable variant. Because both the cooperative /because of its unsuitable production type and unsensitive relation to the landscape/ and the state /because of its administrative-bureaucratic system of management/ are responsible for the past system of farming, they should both share the burdens of rectification. But taking into account the fact, that the majority of cooperatives in the Czech republic are in a similar situation and the capabilities of the state are limited, we see for the agricultural cooperative in Boršice a solution, which is contingent on time:

Due to the fact, that there has been elaborated an ecological study here for the past two years and there has been amassed a number of analytical and synthetical data, the cooperative could become an experiment in new ways of farming and further development of agricultural cooperatives in the Czech republic. This experiment will be characterised by three principles:

- ecologisation of farming
- internal management decentralisation
- an experiment in symbiotic relations between cooperative and individual forms of property and farming

The Boršice agricultural cooperative has at least a two year advantage because of the existence of an ecological study. If the cooperative will order in the next step a prognostic-economical study of further development and if it is going to be willing to go over to the desirable farming variant, which is for crop production synonymous with the ecological variant of the changes in the crops structure map, we shall try to get the Ministry of Agriculture of the Czech Republic to subsidize this unique experiment. From the scientific and professional points of view, this would also represent a splendid chance for a number of scientific teams to verify in the future in practical conditions and to a large extent the practical application of their methods and mothodical instructions.

7.5. Special Proposals Concerning the Desirable Variant of Development - Plant production

Both in the ecological and in the compromise variants of crop structure we propose extensive transition of arable land into permanent grassland /especially in the Osvětimany region/, by arable land a substantial decrease in the intensity of its utilisation. This means termination of sugar beet production, decrease in the current production area of corn by half, an increase in the extent of forage crops cultivation. Further we propose wineyards on selected sites /in the Map of Proposed Ecological Stabilisation of the Agricultural Landscape/. According to our opinion it would be suitable to try the cultivation of technical energetic crops, such as rape, which can serve as a source of fuel. Experience has been gained already in Austria and Poland and there are farms, which satisfy their complete energetic consumption from their own resources. Taking into account the foreseen rise in costs of energy and the problems to find crops with a good antierosive effect, when there exists already a surplus of forage crops, these could be perspective crop species.

Energy

Cost of energy will because of well known reasons increase for a longer period of time /global price development, our dependence on the Soviet Union, problems with purchase for hard currencies, high energy consumption of the whole national economy including agriculture/. This will lead to a concentration of attention /also out of ecological reasons/ on alternative, renewable sources of energy. Agriculture has some very good prerequisites in this respect. Besides the already mentioned cultivation of energetic crops, there is a clear choice of biogas utilisation in sites of animal production. These could be animal farms Boršice, Osvětimany and Medlovice. But we propose the closing or relocation of the Medlovice farm due to public health reasons and problems with water resources pollution. The utilisation of solar energy will also be very suitable for agriculture on the whole and especially for animal farms. Especially due to the fact, that even warming of water /and not quite change of state to steam and production of electrical energy/ is useful.

Animal Production

According to our opinion it should not be extended, perhaps even limited to a small extent /above all the Medlovice farm/. Two inverse tendencies can be observed here. On one hand it is desirable to cultivate forage crops and permanent grassland on a large area /protection against water erosion/, on the other hand meat consumption will surely decrease in the Czech republic in the future, at least by 30%. Another solution could perhaps be the sale of hay to lowland regions /i.e. Southwestern Slovakia/, the problem lies in transport costs. From the longterm point of view, there will appear overproduction both in the animal and crop sectors. This will ead to a decrease of pressure towards intensification of agricultural production and so will enable landscape rectification /rectification of its aesthetic looks/. A permanent trend will be a rising hunger

for recreational areas. This gives the Boršice Agricultural Cooperative a big chance for polyfunctional utilisation of the landscape with an emphasis on tourist trade /especially its modern forms/. We do not suggest the reduction of animal production in the Stupava-Staré Hutě region, but finalisation /processing/ of here produced goods would be desirable.

Affiliated businesses

These have a good perspective for the cooperative, their structure should be heterogenous, but generally directed towards production, processing and sale of agricultural products. In the moment, when industry will start to function properly /and this will probably be soon/, it is not going to be prospective to substitute its role, although this was precisely what some cooperatives did in the past /and often with big profits/. We propose a consequent orientation on the processing of own agricultural products, may it be fruit, wine or products of animal farming. Fruit storagehouses, freezers etc. should be built, which would give the cooperative a chance to sell for profitable prices during offseason months. We recommend the creation of a net of shops and small selfservice bars and restaurants, first of all in the Uherské Hradiště district, especially in the Stupava region near the highway connection Brno - Trenčín and second in more remote centers /Brno/. Satisfaction of the population /and so a good relation to the enterprise/ may be also supported by production and sale of bread, milk and milk products.

This may also eliminate to a large extent the foreseen future unemployment, which will hit the cooperative.

Another field may be the filling of "gaps" in the production and sale of certain specific highly desired crops. Market extent for these plants may vary significantly from year to year. This could be f.e. cultivation of medicinal herbs /sold well even to the West/, strawberries, garlic etc. The cooperative could lease its members problematic land /f.e. terrace areas/ which could be to the contrary well fit for these crops. At the same time it bears the risk of failure.

A bad harvest /climatic influences/ or a change in market requirements will not endanger its existence /which could freely happen by an individual/ and in the case of a successful harvest and sale both the cooperative and the leaseholder will profit.

Possible and suitable would also be orientation towards areas closely connected to agriculture - lumber processing etc. All the time gaining in perspective will be recreation and tourist trade.

Provision of certain small agricultural services, such as repair shops /or help to citizens in setting up of such facilities/ does not have to be economically sound, but again it partially solves the unemployment problem and the question of happiness and good relations of the local population to the cooperative.

International Collaboration

The cooperative needs only for rectification of ecological damage according to its own estimates 90 million Czechoslovak crowns. On the above pages was written, that better than a cautious, slow, compromise variant of transition to rectification is a fast radical variant. Not mentioning other problems, such as polychlorinated biphenyls, it is not to be expected, that the cooperative will be able to get the necessary finances for it from its own sources or from the state.

We recommend, that the cooperative management should order the elaboration of a project of a partial "sellout" to Western investors. Joint companies with stock emission /even with the share of the Western partner more than 50%/ do not have to mean a loss /if the partner has been chosen correctly/, to the contrary necessary investments, technologies and an import of know-how, necessary for a fast take-off. This is especially true for processing technologies, sales and services. If this is going to be understood as a "defeatist" attitude, we would like to remark, purely as an example,

that even the company Adidas after a few years of losses did not hesitate to sell 80% of its shares to a French businessman. And precisely the German pride and state of economy would suggest, that the company would rather try to hold its stock in its own country.

Further international activities could be directed to the East /to th Soviet Union, especially to the Ukraine/ and certain developing countries. Our agriculture is in comparison with these partners at an excellent state concerning knowledge, experience and technologies. And at the same time these countries often have, due to cultural reasons, a rather profound tendency towards collective property and way of farming.

So it is possible to start joint cultivation of cereals, corn and other crops with a Soviet partner and cultivation of citruses and tropical crops with a chosen partner from a developing country. If large investments should be necessary, participation of a third partner from Western Europe would be suitable. In the sphere of developing countries, there exists a probable possibility for support from the state and international foundations, because this could represent a suitable form of longterm and complex developmental aid. Input of knowhow would be mutually profitable and it would have a better impact than government aid in the form of foodstuffs and other gifts.

Alternative Agriculture and novel crops

Alternative /ecological, biological/ agriculture starts to play a role also in our country. In Western countries an average 1% of cultivated soil is farmed using this way of agriculture. It can be expected, taht by us this percentage will be even higher, because foodstuff quality is considerably worse and interest in noncontaminated foodstuffs is higher. After price liberalisation cultivation of these crops can be profitable and people may be willing to pay for these products

relatively high sums of money. This applies especially to products for children - fruit, vegetables, milk products. In the Boršice agricultural cooperative could be suitable for cultivation of these crops especially problematic tracts - - small and large terraces, parts of orchards and wineyards, by animal production above all the whole Stupava region. An important point is that the products should be also processed by the cooperative, thus the chance for a profitable sale perhaps even abroad is higher /f.e. wine not treated with chemicals/. As has been mentioned in the paragraph about affiliated businesses suitable would be also leasing of problematic land, where interest of individuals in the cultivation of crops with market shortages in individual years could be expected - such as garlic, medicinal herbs, strawberries etc.

Even taking into account the current inexpedient levies on wages, we would like to advocate the production of vegetables without or with minimum chemical treatment on at least 1% of the cooperative lands. These vegetables should be offered primarily to schools and hospitals in the region.

Development of rural areas

In a short time an extensive decentralisation of administrative power to the individual communities and cities will take place. It is not only a political phenomenon, decentralisation is nowadays a general world phenomenon /f.e. multinational corporations also undergo a process of internal decentralisation/. The agricultural cooperative should become a trusted partner of selfgoverning communities in its region and at the same time a center of employment and services for the people. If the enterprise will invest money into regional development, it is highly probable, that this will be in the future reflected in massive tax reductions.

The cooperative should get ready for significant future trends:

- decentralisation of settlement, increased migration of people /especially young and educated ones/ from cities to the countryside. This tendency, if the countryside will be ready for it, can be extremely important both for settlements and local enterprises.
- the ever increasing thirst for recreational utilisation of the landscape. In the near future even less attractive regions of the Czechoslovak Federal Republic, such as the Chřiby region, will be opened up

The region /and the cooperative/ should support these tendencies especially in three spheres:

- building of transport connections to regional and district cities
- good and modern telecommunications
- concentration on the advancement of education and hiring of university and college graduates

Information, abilities and knowledge will be the best articles in the market of the future.

Polyfunctional landscape utilisation

In the moment, when the foodstuff market gets saturated in the future, requirements for product quality will rise and intensity of land utilisation will diminish. This will enable farmers to leave certain tracts fallow from time to time and seed other plots with grass and the aesthetical appearance of the landscape will improve considerably /by planting of landscape vegetation and diversified utilisation of the landscape/.

The cooperative will earn money not only from production, processing and sale of agricultural products, but also from tourist trade and recreation. Tourist trade is today the third or fourth most important sphere of world economy and according to some prognoses, it has a chance to become number one in the future. Tourist trade in our country will also be supported by opening of borders, our geographical location in the center of Europe and lots of natural sights.

Already today we propose, that the cooperative should develop especially novel forms of recreation in the Stupava region. These could be summer camps for childrem, family recreation /coupled perhaps with payment by help with seasonal farmwork/, lease of weekend houses, horseriding lessons, tourism etc. This region is especially suitable for polyfunctional utilisation - because of good transport connections /highway Brno - Trenčín/ and because of good chances of building stylish, low capacity accomodation, because of the vicinity of Buchlov castle and the chateau with park in Buchlovice, because of the beautiful forest complexes of the recreational area in Chřiby hills, because of vicinity of the Sovín wine cellars and the recreational water reservoir by Sovín and the pilgrimage site on Velehrad.

7.6. Conclusing Proposals

We recommend after the ecological study the subsequent ordering of a study concerning the future organisation of the cooperative /regionalisation, decentralisation, forms of property, role of center and its conceptual work, ways of sales management, development of nonagricultural activities, international contacts and collaboration etc./. A study of economical prospects after transition to an ecologically more acceptable way of farming is also necessary. An independent expert opinion of a foreign partner would also be suitable, especially in the sphere of privatisation.

Crucial has to be renewal of trust in the sense and legitimacy of the existence of the cooperative, clear explanation of future possibilities and risks to the members. If the cooperative members are willing to invest into their own enterprise /f.e. through purchase of stock/, this means, that they are capable of a certain sacrifice, that they believe in the future of their enterprise.

We suggest, that the cooperative should profit from the fact, that it has a certain advantage in comparison to other agricultural cooperatives in respect to the assesment of future prospects. Namely the cooperative should try to establish itself as an experiment in the sphere of complex development of an agricultural enterprise and the respective region under conditions of equality of all forms of property.

We recommend, that the Ministery of Agriculture of the Czech Republic should formulate a project, which would handle these problems in the Boršice by Buchlovice agricultural cooperative as a model enterprise and which would be practically realised in a stepwise manner using united financial means of the cooperative and of the Czech Republic.

8. Conclusions

The study "Ecological preconditions of farming in the Agricultural Cooperative Boršice near Buchlovice" was elaborated in the years 1988 - 1990. The study used the LANDEP methodic- - it is concerned with the abiotic, biotic and socioeconomical elements of a landscape and is based on a collection of data and analyses and further continues over syntheses and interpretations /reevaluation of entry data/ to concluding evaluations and proposals. The output is above all in the form of seven resulting maps, supplemented by a number of other charts /in the 1:10 000 scale/. Due to the fact, that the area is relatively small /3 500 ha/ we were able to verify in detail a number of the data /f.e. the actual charting of the secondary landscape structure/ and modernise them /f.e. by digging 150 pedological verification probes/.

And also it can be said, that the maps of proposals were elaborated on the basis of high quality and reliable data. But even so this whole effort would hardly have any sense

/perhaps except perfectioning of some methods of landscape-ecological planning/ if it was not accepted by the praxis. And so variant proposals - the ecological /desirable/ one and the compromise /real/ one had to be elaborated.

For those interested and professionals, who want to help the Boršice agricultural cooperative in the ecologisation of its farming, we state those main topics, which should still be further perfected: Above all it is the problem of professional economic evaluation of the proposed changes, a proposal /accurate regarding time/ of the individual steps in the realisation of the changes, accurate data about the necessary number and species of trees and shrubs for the planting of landscape /especially line/ vegetation in the form of an obliging project.

In the evaluating, seventh, chapter, prognostical approaches had to be applied to landscape-ecological planning. As the authors of the study we are interested in monitoring its future realisation and we believe, that we can be useful as consultants from time to time.

Important is, and we try to achieve this goal by adding the chapter "Prognosis of Development of the Agricultural Cooperative", to get the members of the cooperative and its management to start to formulate their own future by dreaming and thinking about it and have the necessary resolve to change the negative trends.

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10. List of maps

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FC - field /working/ concept
AO - author´s original
RM - resulting map /print, final map/