

### 2.7.3 SELECTION OF APPROPRIATE CROPS TO AVOID CROP DAMAGE

#### (1) Necessity of Avoiding Crop Damage to Make Full Use of Land Resources

The farm land in the Zahorska area is divided into two major categories: “loamy” soil and “sandy” soil. The loamy soil is mainly spread along the Morava river, and the sandy soil widely develops from the inside of the river dyke to the foot of the Male Karpaci. The loamy soil has a high capacity to hold water and crop nutrients. The sandy soil is suitable for root growth of crops, although the capacity is poor. In addition the soil water content is affected by the difference in elevation. Difference as small as 30 - 50 cm in elevation of the surface of arable lands will have large effects on plant growth. These two factors are closely related to the crop growth and yields on fields. To avoid crop damage by water conditions and make better use of farm lands the following 3 points are considered:

- a. Dry mounds -- Zone II
- b. Drainage problem areas -- Zone II
- c. Drainage problem areas -- Zone III

From the field data obtained from STOMFA s.r.o. the decrease in crop yields in the 2001 and 2002 years were calculated by differences from the average yield of each crop as shown in Figure 3.6 and 3.7. In the dry spot in Zone II the difference was -10% on average, varying from -1 to -22%. For the drainage problem area in Zone III, the difference was -22% on average, ranging from -5 to -46%. In these problem areas winter wheat and rye had larger decreases. The location of the problem areas are shown in Figure 3.8: a. dry spot - hilly area in the northern and eastern parts of Verke Levare, b. wet areas - in the river basin of the Porec as major fields and c. drainage problem areas - lower parts of the Malolevsky canal.

## (2) Location, Soil Conditions and Crop Growth in the Problem Areas

### 1) Soil Conditions in the Problem Areas

Farmers have enough knowledge of the soil characteristics: difference between sandy soil and loamy soil. The 3 points above seem to accord with the field observation and farmers experiences obtained by interview survey. In this observation the elevation of the farm land is not decided by the absolute elevation, but the relative height/difference in height of a slope between hills and bottoms. The following are rough characteristics of the points:

1 0 1 2 Kilometers

**Red Number** : Filed Number of Stomfa  
**Black Number** : Difference from Average Yield(%)

- C/S Site A
- Road and Railways
- Highway
- Main Roads
- Railways
- Wheat
- Rye
- Spring Barley
- Maize
- Sunflower
- Winter Barley

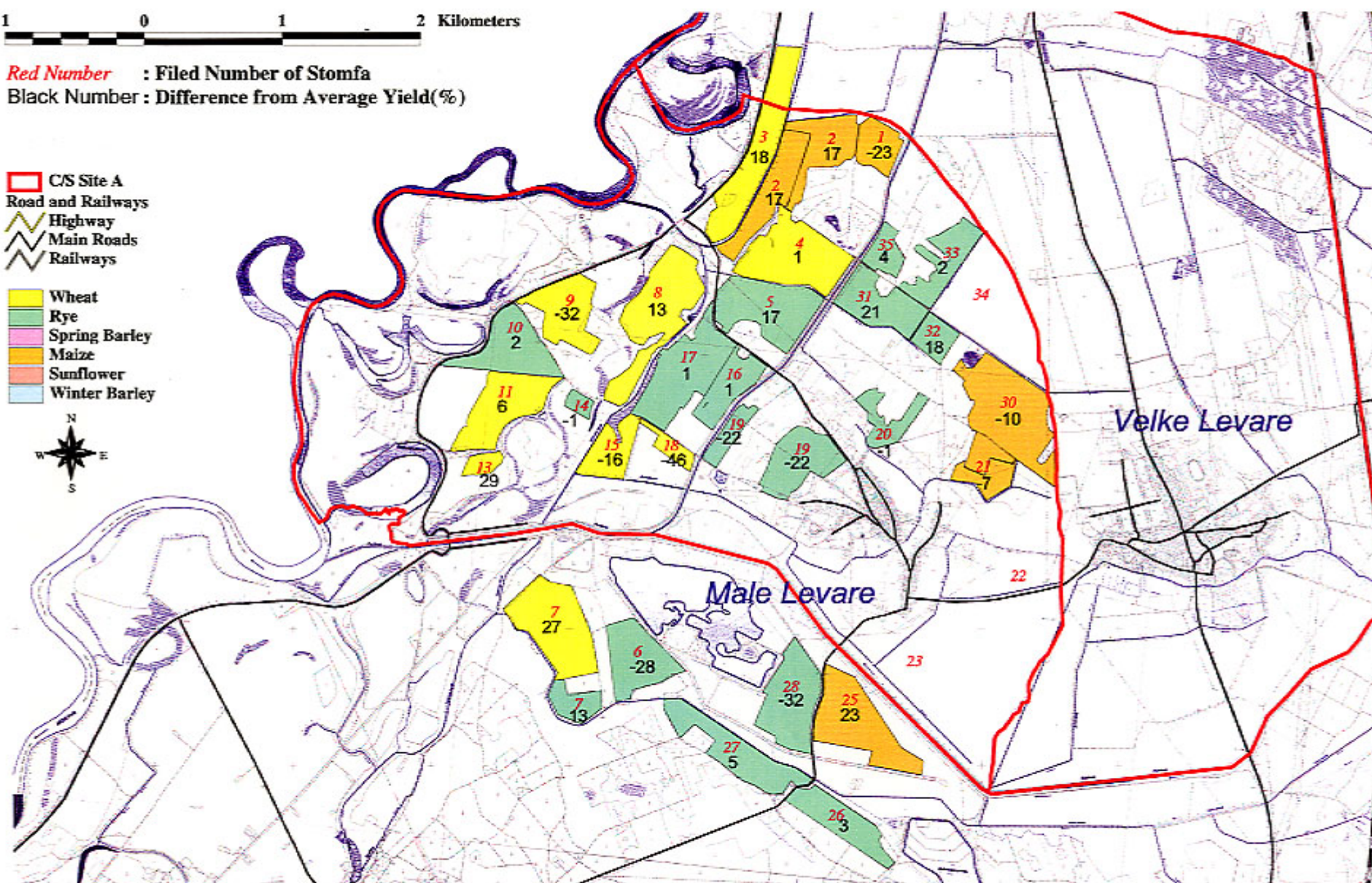


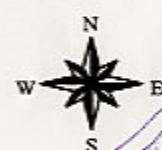
Figure 3.6 Evaluation of Crop Production by Field - Year 2001



1 0 1 2 Kilometers

**Red Number** : Filed Number of Stomfa  
**Black Number** : Difference from Average Yield(%)

- C/S Site A
- Road and Railways
- Highway
- Main Roads
- Railways
- Wheat
- Rye
- Spring Barley
- Maize
- Sunflower
- Winter Barley



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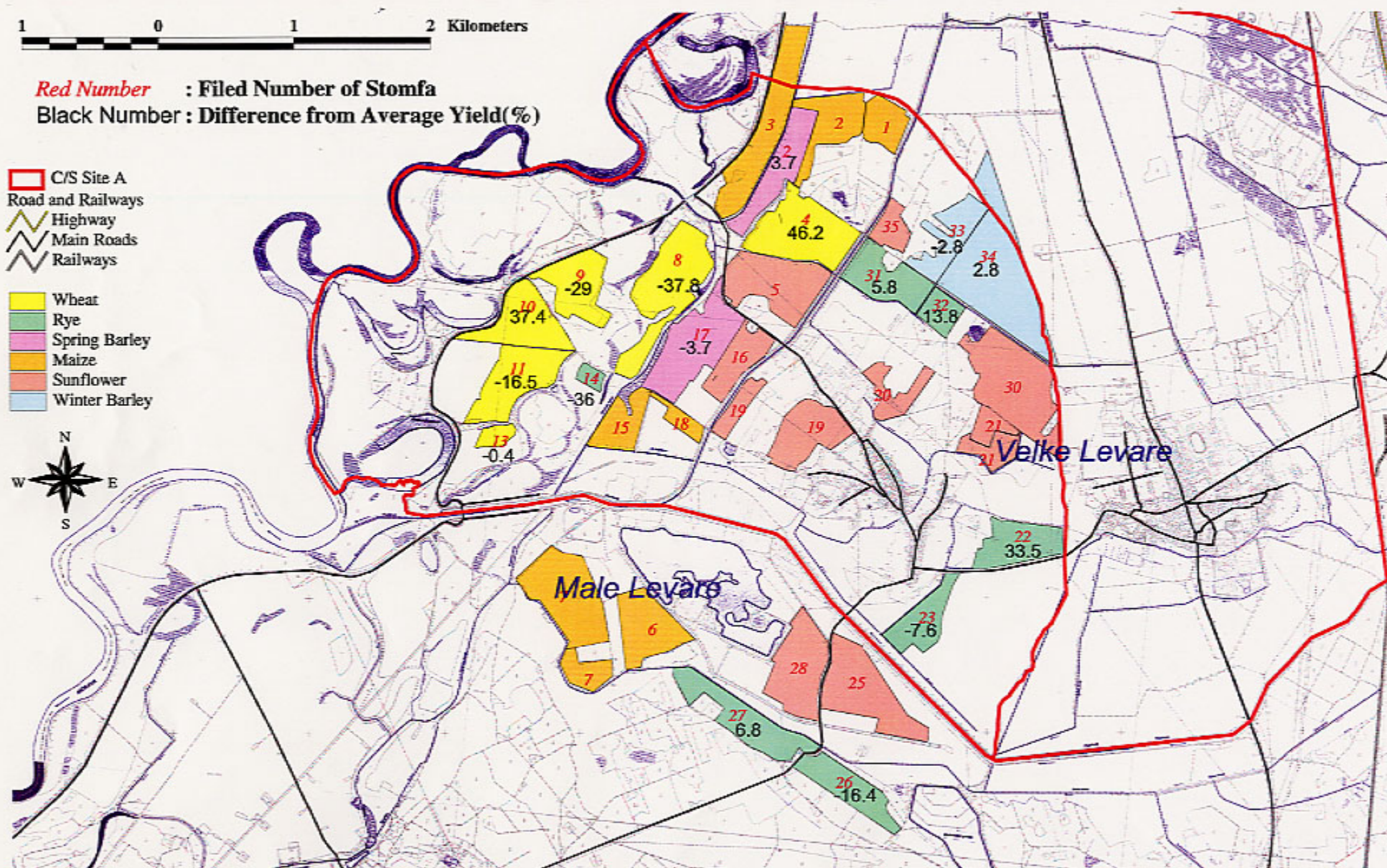


Figure 3.7 Evaluation of Crop Production by Fiels - Year 2002

- a. Dry mounds -- Zone II
- Surrounding areas of residential and forest areas in the Levare district in the Zone II.
  - Poor crop growth due to low holding capacity of nutrients and water.
  - Necessary to irrigate, increase fertilizers and protect lands from wind erosion.
  - Necessary to convert arable lands to natural meadows and forests in some cases.
  - Possibility of decreasing damages of crops by cultivating winter crops with resistance to environmental stresses.
- b. Drainage problem areas -- Zone II
- Located along rivers and drainage canals, generally flat but containing different type of soil and uneven elevation of field level.
  - No severe deficiency of water and nutrients due to the topography and characteristics of lands.
  - Suitable to cereals and oil crops due to high fertility for sandy soil, but not to vegetables because of water logging and high ground water.
  - Water-logging in early spring and at heavy rain, partly flooding in areas close to roads and canals, but usually limited damage in area (several % by observation in 2002 summer).
  - Heavy damage by weeds.
- c. Drainage problem areas -- Zone III
- Water-logging on field surface in early spring and after heavy rain due to low elevation.
  - Large damage by hygrophytic weeds,
  - Necessary to select appropriate crops due to frequent water logging.
  - Necessary to break sub-soil to remedy water-logging.



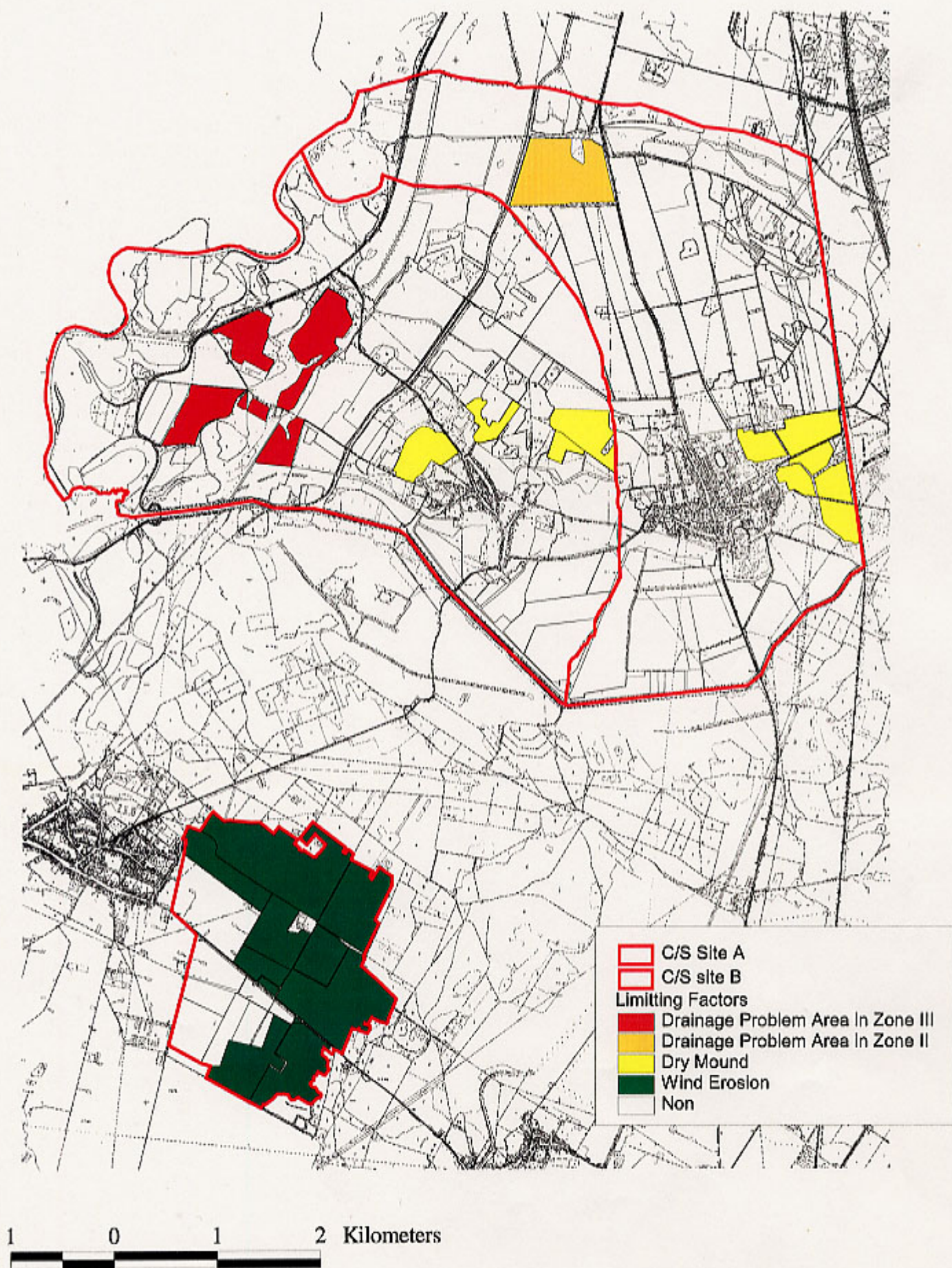


Figure 3.8 Limiting Factors of Crop Production by Field

## 2) Yield Decrease in the Problem Areas

### a. Decrease in Yield of Sunflower by Elevation of Field

The decrease in yield of sunflowers by elevation was measured as a trial in No. 21 field (Kruh) of the STOMFA farm. The field is located in the dry area close to Velke Lezare (158 m from the sea level). The elevation was measured by a 20 m water hose which was filled with water. The difference of elevation of fields was measured by the difference of the height of the surface of water at the two ends of the hose. The surface of the soil at the hill looked eroded by wind as there were a lot of pebbles and plant residues left on the surface of the land. On the other hand, the plow soil of the lower area was deep and looked fertile. The weight of a single flower was measured for an indicator of yield. As the elevation of the sunflower field increased, the weight of the flower decreased in a field of the same soil type. It indicates that the difference in elevation of fields has strong effects on the crop yield in mild slopes.

### b. Changes of Crop Yield by the Elevation of Fields

The cereal yields were also affected by the elevation of fields. In Zone II the yield of hilly areas was lower than the medium areas (the lower areas) in all the crops compared. In Zone III, the yields in the medium areas, where the water logging seldom happens, were higher than the lower area for winter wheat, rye and spring barley. The maize had higher yield in the low areas, indicating the maize is resistant to wet conditions. The yield of spring barley was rather high due to the fact that an appropriate seeding date can be selected.

## (3) Selection of Appropriate Crops and Counter Measures to the Problem Areas

To achieve high crop yields, it is important to analyze crop damages and identify the reasons for the damage in addition to the adaptability of crops to soil type and water supply. It was often observed that inappropriate soil water conditions often cause the retarding of crop growth, and aggravate the damage by weeds in the case study area.

### 1) Dry Mounds in Zone II

The dry spots were observed in the sandy soil areas with relatively higher elevation areas. Wind erosion is often observed by the loss of surface soil. Crop damages are observed in various types, but the major problem is the decrease of crop yields, especially in summer crops due to dry conditions and poor nutrient supply. Lodging of crops and damages by weeds were also observed. These damages will cause poor grain quality.

Several counter measures can be recommended. The primary measures will be the selection of appropriate crops. The appropriate crops should be drought resistant, and winter crops such as rye, winter wheat for feed and triticale are eligible. These crops can be cultivated in a crop rotation which fulfills the needs of markets and self-supplied feeds. Split and increased dose of fertilizers will also be useful for crop production. Irrigation will be useful, but it will not be profitable due to the low efficiency of crop production. The areas in severe conditions will need to be left to return to the natural vegetation and forests. Vegetables and summer crops will not be appropriate. In addition to these effects the cultivation of winter crops will diminish the damage by soil erosion by covering farm lands with crop leaves in early spring and water deficiency in summer time.

### 2) Drainage Problem Areas in Zone II

Generally the drainage problem areas are fertile and abundant in water supply. Therefore, these areas are suitable for most of the crops, and the productivity is high, being ranked as A-1 in the classification of the soil survey. In these fields crop damage will happen, but these damages are caused in limited areas and are negligibly small compared to the production of the entire field. However, unstable soil water content, especially in early spring, causes damage to vegetables and crops of small architecture. The vegetables are usually cultivated in a small area. Therefore, the crops such as vegetables in the water logging area will have serious damage, and the damage will not be compensated by the higher productivity of other parts of the field.



There are several promising countermeasures because of high productivity. However, from an economic point of view, the selection of appropriate crops and the avoidance of susceptible crops to excess water will be the most practical method. Highly profitable crops such as winter wheat for food, sunflower, maize and spring barley will be suitable to this area. The crop rotation: IR 1< sunflower, spring barley, maize, food wheat> can be recommended.

No. 14-1 field is located at the lower part of the drainage canal. To protect crops from flood damage in spring and weed damage, tall summer crops have advantages: e.g. maize, sunflower and grasses. For feed crops, red clovers and gramineous crops will be suitable to these areas, while lower water areas will be used for alfalfa.

### 3) Drainage Problem Areas in Zone III

Wide areas of fields are flooded by high ground water level in early spring and at high rain fall periods. The damaged areas are characterized by lower elevation of fields <high ground water level> and low permeability of soil. The majority of the soil type of Zone III is loamy soil, and the crop productivity is high. However, due to crop damage, the potential of the soil can not be realized in many of the fields in Zone III. Major phenomena of damage in the wet areas are death of seedlings/crops by water logging and the spread of weed damage along with retarded crop growth.

Possible counter measures are limited because Zone III is specified as natural protection areas, and various land development works are prohibited in this area. Therefore, the most appropriate approach is to select suitable crops. The character of crops are as follows:

- Crops highly resistant to water damage: e.g. maize.
- Crops susceptible to water damage: e.g.. vegetables (onions, carrots, potatoes, etc.), barley, wheat, rapeseeds, other winter crops.

- Spring barley—not resistant to excess soil water content, but possible to select appropriate seeding time to avoid damage by water logging,
- Sunflower—not resistant to excess soil water content, but possible to select appropriate seeding time. It has same advantage to resistant to excess soil water and weed damage due to large architecture of plants and allelopathy effect.
- These crops can be organized in a highly profitable crop rotation: sunflower - spring barley – maize - maize It is also important to avoid inappropriate winter crops such as winter wheat, rye and rapeseeds.

#### (4) Other Crop Damage

The crop damage by drought and water logging were discussed in detail in the previous section in relation to agriculture in the problem areas. Weed damage and pest and diseases are also serious problems in the Zahorska areas.

##### 1) Weed Control

Weed control is more serious in relatively fertile farmlands. Water conditions and nutrient supply are also appropriate to weeds as well as to the cultivated crops. Therefore, if the crop growth under cultivation is inhibited for some reason, weeds grow more vigorously than the crops, the weed damage will be more serious. In the Zahorska area the water logging can often be a trigger for the weed damage. The possible counter measures are as follows:

##### a. Application of Herbicides

The application of herbicides is crucially important to control weeds. In the interview survey with the STOMFA s.r.o. more than one third of the total production cost was shared by crop protection. About 20 kinds of herbicides were used on crops depending on the crop – weeds relationship. The herbicides will also be used in the future, but it is important to reduce the dependence on herbicides by developing the other application methods such as concentrated use to high density areas and other methods such as plowing.

#### b. Concentrated Application of Herbicides

The weed damage usually happens in much wider areas than the water logging, but the damaged areas are still limited in location in fields. The damage is much larger than in other parts of the field. Therefore, herbicides should be used intensively and be concentrated on the areas with high density of weeds. The concentrated use of the herbicides has various advantages:

- Weeds are controlled intensively,
- Overall amount of herbicides can be decreased by the limited use to certain parts of fields,

#### c. Plowing

Up-rooting is effective for weed control by suppressing the growth of weeds. Stripes of weeds in fields and large contrasts of weed growth in cultivated fields to non-cultivated fields are clear evidences of the effects of uprooting on weed control.

#### d. Selection of Appropriate Crops

Crops of large architecture have advantages over weeds. Rapid growth and high coverage of lands/weeds by sunflower and maize enable these crops to be resistant to weed damage. Several crops such as sunflower have allelopathy, and are effective in weed control. When the crop rotation is decided, the resistance to weeds should be considered as well as the crop production and crop profitability.

### 2) Pests and Diseases

Due to low temperature in winter the damage by pests and diseases are not very high in the Zahorska area, no insects were found in wheat grains in storage during summer, and soybeans can be cultivated without a high dose of pesticides. However, the pesticides and fungicides for disinfection were often used by farmers for cash crops such as sunflowers. The diversification of crops and the climatic change may cause severer damage in the future.



#### 2.7.4 IMPROVEMENT OF MIXED FARMING: RECYCLING OF ANIMAL WASTES

In the present situation of world agriculture, especially in the EU region, harmony with environmental protection is one of the most important requirements. Without environment-friendliness agriculture will not be supported by governments or citizens in urban areas. Bio-farming is widely extended and the regulations to fertilizers and agricultural chemicals are enacted in major countries in EU. Facing the accession to EU, the establishment of the environment-friendly agriculture is an inevitable hurdle to be cleared by SR. For the Zahorska area, the majority of the farmland is sandy, and a large part of the farmlands and meadows are located in natural reservation areas. Therefore, it is quite important to protect farm lands, ground water and the natural environment from excessive amounts of animal waste and artificial fertilizers.

The Zahorska area has some advantages for this type of advanced farming with its flat and wide areas of farmlands, the traditional cereal-animal mixed farming close to large consuming areas, etc.

#### 2.7.5 CROP BUDGET

The crop budget for major crops in the case study area were assessed based on the survey results. The effects of the plan were evaluated mainly by the estimation of yield increase, production cost and net income. These individual data were collected, analyzed and compiled from the various sources: interview survey (2001 and 2002), the data of MOA, the statistical data of SR and Malacky, etc. in order to cover a wide range of items.

##### (1) Estimation Procedures of Production Cost

The production cost in the survey area was analyzed by the item of work of crop production.

The parameters of the crop production cost are usually categorized by input as follows:

- materials <agricultural machines, fertilizers and rental>
- labor cost
- interests and land rent

However, in the survey, analysis by working steps was important to evaluate the share of individual technical practice. It can be an indicator whether the said techniques will be practical and applicable from an economic point of view. The items of production cost were categorized as:

- land rent,
- plowing,
- organic manure application <application of solid and liquid manures> ,
- fertilization <fertilizer cost and application cost> ,
- seeding <seed cost and seeding cost> ,
- weeding <herbicide cost and application cost> ,
- plant protection <fungicide, insecticide cost and application cost>
- harvesting,
- irrigation <Zone-II>, and
- management cost: 10% of the direct production cost.

The application costs are costs by contract; therefore, fuel cost, labor cost and related management cost for operation are included. The cost of materials such as fertilizers, seeds and chemicals were obtained from the information of suppliers. The data of the current cost were collected from the statistical data and the results of the interview survey.

The increased rates of inputs (Irrigation, fertilizers and agricultural chemicals) were estimated by the results of interview to the farming units and field experimental data. The major evaluation items to increase production/profit in the plan were as follows:

- irrigation cost (water cost, electricity cost and maintenance cost)
- fertilizers

- agricultural chemicals to protect crops from weeds and pests/diseases
- harvesting: transportation cost
- subsidies

The yield and selling price were mainly cited from the 2001 crops.

The input level [yield target] was targeted to overtake those of the front runners in the case study area: actually the levels of JAKOS a.o. and STOMFA s.r.o. ∴

## (2) Results of the Production Cost

Major remarks of each crop are as follows:

### 1) Winter Wheat

- The production of winter wheat is composed of two parts: animal feeds and human consumption.
- The winter wheat for feeds is not irrigated, and the cost is low as compared with the food wheat. The net income of the feed wheat was narrowly positive with the subsidies.
- With irrigation and increase of N dose in Zone II, mainly for the production of the food wheat, the net income was increased.
- In Zone III the increase of N fertilizers increased the yield and brought about substantial increase in net income.

### 2) Maize

- Although the production cost was slightly higher than cereals, the current net income was also positive with the subsidies.
- As observed in the winter wheat, the irrigation and increase of fertilizers produced the higher net income. The amount of increase was smaller than the case in winter wheat.

### 3) Spring Barley

- The yield was lower than winter wheat and maize, the net income was good due to a high selling price.



- The irrigation and increase of fertilizer in Zone II increased the grain yield and provided the highest net income.
- 4) Sunflower
- The production cost was the highest of all the crops examined due to the high cost of agricultural chemicals.
  - However, the net income was positive with subsidies and a high selling price.
  - The increase of net income produced by the irrigation and fertilizer dose was not high for the major crops.
- 5) Soybean
- This is not a major crop in the Zahorska area or SR. However, the production of soybean was developed by the government with special subsidies
  - The net income of the current situation was positive, and the irrigation and fertilizers increased the net income. However, the net income in Zone III was quite high: almost twice as high as the irrigated crops in Zone II. It indicate that the soil characteristics are of dominant importance.
- 6) Rye
- Rye is one of the most resistant crops to the environmental stresses. Therefore, the production cost was the lowest among all the crops.
  - Since rye has low fertilizer response, the effects of fertilizer dose on net income was also low.
- 7) Rapeseeds
- Rapeseeds are one of the well adapted crops to the Zahorska area. The current net income was high, and the response to fertilizer dose was the highest with the plan.
  - In Zone III the current situation was high, and the production with plan was even higher in net income. Both values were the highest among all the crops.

8) Carrot

- Carrot was the only crop grown by intensive agriculture among the crops.
- The irrigation and fertilization were already performed.
- The fluctuation of selling price varies greatly, and it influences the net income with a wider range than the other crops.

9) Alfalfa

- Alfalfa is usually cultivated for 3-4 years in succession. The values in the table were calculated by the results for 3 years and adjusted to the yearly basis.
- The current net income was not low as compared with other crops. However, the increase by the plan was not large. The profit can be increased by using it for roughage and obtaining profits from animal products.

(3) Contribution by Particular Items to the Production Cost

The contribution by particular items to the production cost varies by zone and by crops, however, it could find some common trend. The feature of production cost of cereals and oil crops by zone is as follows:

- a. Land rent: The level was as low as 3 to 4%. It was not a large burden to farmers, and, hence, a large land rent can be incurred.
- b. Plowing: The share of costs was not very large; about 10%. In addition to the land preparation for seeding, the method is expected to suppress weed density in fields. From the low cost of the method, plowing can be used for a supplementary method for weed control.
- c. Organic manure: The application cost of the manure <solid manure> was 5 to 6% for sunflowers. In this survey the application of manure was made only to crops with high profit such as vegetables and sunflower because the manure application is laborious and needs high cost for distribution.

- d. Fertilization: The share of cost was about 10%, not very high. The fertilizer application was reported to be one of the worst examples of the disproportion in price between the inputs and outputs. However, from the data on the table the disproportion was less serious than expected in the actual agricultural production. Therefore, it is expected that an appropriate amount of fertilizer dose will produce an economic increase of crop products.
- e. Seeding: The share of costs was about 20%, the second highest share next to agricultural chemicals. Most of the seeds used by farmers are purchased from traders, being renewed every year. Therefore, the seed cost is quite high. There are several constraints to reduce the cost of seeds and seeding from the facts that the seeds of several crops such as maize are hybrids and that the multiplication of seeds is often protected by patents.
- f. Weeding and plant protection: The share of combined chemicals for weed control and plant protection including application costs amounts to more than 30%, the highest of the items. The share of the herbicides was about 20%. From a view to protecting environments, the application of the agricultural chemicals should be reduced. From the field observation on the weed growth, the damages were found in limited areas but with high density. Therefore, a remedy can be recommended to make concentrated herbicide application and other management practices such as plowing for the areas with high weed density.
- g. Harvesting: The harvesting was about 10% of costs. The major components are fuel cost, labor cost and depreciation of machines, which are basic needs in farming.
- h. Irrigation: In the case study site, irrigation is provided to profitable crops such as vegetables, asparagus and alfalfa at present. The irrigation cost is expected to occupy 18.2% of total farming cost in Zone II at plan with irrigation.

#### (4) Factors to Profitability

The cost increment rate in the improvement of farming method without irrigation is 8 to 12% besides that with irrigation for cereals and oil crops is 37%, which is 4,728 SKK/ha. The irrigation of alfalfa has almost same situation to cereals and oil crops.



The share for cost of each item will be not changed significantly in cereals and oil crops. While the share of seed and fertilizer goes down, the amount of cost for agricultural chemicals increases and it occupies the largest share in the cost. The second largest share is occupied by irrigation cost when irrigation can be applied.

In accordance with the assessment of crop budget in the Case Study, irrigation and improvement of fertilizing contribute significantly to increase of production and increase of profit consequently.

Because the change of crop yield has a strong influence on the profitability, the sensitivity of crop yield to profitability was analyzed by crops. In the case that crop yield becomes 120%, the profit of cereals and oil crops becomes 2,000 to 4,000 SKK/ha, 3,280 SKK/ha in average, which is equivalent to almost 3 times as high as the profit of original case, 943 SKK/ha. On the contrary, the profit will significantly fall and all crops including vegetables have a deficit balance which are -1,394 SKK/ha for cereals and oil crops and -47 SKK/ha for vegetables, when the yield is 80%,.

Table 3.1 Production Cost and Net Income of Crops (1/6)

Crop: Wheat	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars																
I Costs																
1 Land Rental	ha		500	500		500	500		500	500		500	500		500	500
2 Ploughing	ha		1,300	1,300		1,500	1,500		1,500	1,500		1,500	1,500		1,650	1,650
3 Chemical Fertilizers	kg	80	13	1,040	100	13	1,300	135	13	1,755	80	13	1,040	100	13	1,300
4 Fertilizer Application			500	500		500	500		500	500		500	500		500	500
5 Seeds	kg	150	7.5	1,125	150	7.5	1,125	150	7.5	1,125	150	7.5	1,125	150	7.5	1,125
6 Seeding			1,450	1,450		1,450	1,450		1,450	1,450		1,450	1,450		1,450	1,450
7 Agricultural Chemicals (Herbicides)		3	600	1,800	4	600	2,400	4	600	2,400	4	600	2,400	5	600	3,000
8 Chemicals Application (Herbicide)				500			500			500			500			500
9 Agricultural Chemicals (Plant protection)				700			700			700		1,000	1,000		1,200	1,200
10 Chemicals Application (Plant protection)				500			500			500			500			500
11 Harvesting			1,700	1,700		1,870	1,870		1,870	1,870		1,870	1,870		1,870	1,870
12 Water Charge										2,744						
Total				11,115			12,345			15,544			12,385			13,595
13 Management Cost (10% of the cost above)				1,112			1,235			1,554			1,239			1,360
14 Other miscellaneous Cost				-			-			-			-			-
Total Cost				12,227			13,580			17,099			13,624			14,955
II Yield ton/ha				3.20			3.80			4.70			3.70			4.40
III Price SKK/ton				3,300			3,300			4,200			4,200			4,200
IV Total Amount (II*III)				10,560			12,540			19,740			15,540			18,480
V Subsidies SKK/ha: Basic and Disadvantage				1,700			1,700			1,700			1,700			1,700
Subsidies SKK/ha: Irrigation (incl. In item I-12)				-			-			-			-			-
VI Gross Income (IV+V)				12,260			14,240			21,440			17,240			20,180
VII Net Income (VI-I)				34			661			4,341			3,617			5,226

Crop: Maize	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars																
I Costs																
1 Land Rental	ha		500	500		500	500		500	500		500	500		500	500
2 Ploughing	ha		1,300	1,300		1,500	1,500		1,500	1,500		1,500	1,500		1,650	1,650
3 Manure		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Chemical Fertilizers	kg	75	13	975	100	13	1,300	100	13	1,300	75	13	975	100	13	1,300
5 Fertilizer Application			500	500		500	500		500	500		500	500		500	500
6 Seeds	kg	80	36.0	2,880	80	36.0	2,880	80	36.0	2,880	80	36.0	2,880	80	36.0	2,880
7 Seeding			850	850		850	850		850	850		850	850		850	850
8 Agricultural Chemicals (Herbicides)		4	600	2,400	4	600	2,400	4	600	2,400	4	600	2,400	5	600	3,000
9 Chemicals Application (Herbicide)				500			500			500			500			500
10 Agricultural Chemicals (Plant protection)			700	700		700	700		700	700		1,000	1,000		1,500	1,500
11 Chemicals Application (Plant protection)				500			500			500			500			500
12 Harvesting			1,380	1,380		1,518	1,518		1,518	1,518		1,518	1,518		1,518	1,518
13 Water Charge										4,382						
Total				12,485			13,148			17,530			13,123			14,698
14 Management Cost (10% of the cost above)				1,249			1,315			1,753			1,312			1,470
15 Other miscellaneous Cost																
Total Cost				13,734			14,463			19,283			14,435			16,168
II Yield ton/ha				3.50			3.80			5.90			4.00			4.70
III Price SKK/ton				3,900			3,900			3,900			3,900			3,900
IV Total Amount (II*III)				13,650			14,820			23,010			15,600			18,330
V Subsidies SKK/ha: Basic and Disadv.				1,700			1,700			1,700			1,700			1,700
Subsidies SKK/ha: Irrigation (incl. In item I-13)				-			-			8,207			-			-
VI Gross Income (IV+V)				15,350			16,520			24,710			17,300			20,030
VII Net Income (VI-I)				1,617			2,057			5,427			2,865			3,862

Table 3.1 Production Cost and Net Income of Crops (2/6)

Crop: Spring Barley	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars	Unit															
<b>I Costs</b>																
1 Land Rental	ha		500	500		500	500		500	500		500	500		500	500
2 Ploughing	ha		1,300	1,300		1,500	1,500		1,500	1,500		1,500	1,500		1,650	1,650
3 Manure	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Chemical Fertilizers	kg	70	13	910	91	13	1,183	91	13	1,183	70	13	910	91	13	1,183
5 Fertilizer Application			500	500		500	500		500	500		500	500		500	500
6 Seeds	kg	150	9.8	1,470	150	9.8	1,470	150	9.8	1,470	150	9.8	1,470	150	9.8	1,470
7 Seeding			1,450	1,450		1,450	1,450		1,450	1,450		1,450	1,450		1,450	1,450
8 Agricultural Chemicals (Herbicides)		1	2,012	2,012	1	2,012	2,012	1	2,012	2,012	1	2,012	2,012	1	2,415	2,415
9 Chemicals Application (Herbicide)				500			500			500			500			500
10 Agricultural Chemicals (Plant protection)			700	700		700	700		700	700		1,000	1,000		1,200	1,200
11 Chemicals Application (Plant protection)				500			500			500			500			500
12 Harvesting			1,500	1,500		1,700	1,700		1,700	1,700		1,700	1,700		1,700	1,700
13 Water Charge										3,056						
Total				11,342			12,015			15,071			12,042			13,068
14 Management Cost (10% of the cost above)				1,134			1,202			1,507			1,204			1,307
15 Other miscellaneous Cost																
<b>Total Cost</b>				<b>12,476</b>			<b>13,217</b>			<b>16,578</b>			<b>13,246</b>			<b>14,375</b>
II Yield ton/ha				2.80			3.10			4.60			3.30			3.80
III Price SKK/ton				4,400			4,400			4,400			4,400			4,400
IV Total Amount (II*III)				<b>12,320</b>			<b>13,640</b>			<b>20,240</b>			<b>14,520</b>			<b>16,720</b>
V Subsidies SKK/ha: Basic and Disadv.				1,700			1,700			1,700			1,700			1,700
Subsidies SKK/ha: Irrigation (incl. In item I-13)				-			-			5,114			-			-
VI Gross Income (IV+V)				14,020			15,340			21,940			16,220			18,420
VII Net Income (VI-I)				<b>1,544</b>			<b>2,124</b>			<b>5,362</b>			<b>2,974</b>			<b>4,045</b>

Crop: Sunflower	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars	Unit															
<b>I Costs</b>																
1 Land Rental	ha		500	500		500	500		500	500		500	500		500	500
2 Ploughing	ha		1,300	1,300		1,500	1,500		1,500	1,500		1,500	1,500		1,650	1,650
3 Manure	t	30	30	900	30	30	900	30	30	900	30	30	900	30	30	900
4 Chemical Fertilizers	kg	90	13	1,170	135	13	1,755	135	13	1,755	90	13	1,170	135	13	1,755
5 Fertilizer Application			500	500		500	500		500	500		500	500		500	500
6 Seeds	kg	25	83.0	2,075	25	83.0	2,075	25	83.0	2,075	25	83.0	2,075	25	83.0	2,075
7 Seeding			850	850		850	850		850	850		850	850		850	850
8 Agricultural Chemicals (Herbicides)	lit.	2	600	1,200	2	600	1,200	2	600	1,200	3	600	1,800	4	600	2,400
9 Chemicals Application (Herbicide)		1	500	500	1	500	500	1	500	500	1	500	500	1	500	500
10 Agricultural Chemicals (Plant protection)		2	945	1,900	2	945	1,900	2	945	1,900	2	945	1,900	2	1,134	2,268
11 Chemicals Application (Plant protection)		2	500	1,000	2	500	1,000	2	500	1,000	2	500	1,000	2	500	1,000
12 Harvesting			1,190	1,190		1,190	1,190		1,190	1,190		1,190	1,190		1,190	1,190
13 Water Charge										3,424						
Total				13,085			13,870			17,294			13,885			15,588
14 Management Cost (10% of the cost above)				1,309			1,387			1,729			1,389			1,559
15 Other miscellaneous Cost																
<b>Total Cost</b>				<b>14,394</b>			<b>15,257</b>			<b>19,024</b>			<b>15,274</b>			<b>17,147</b>
II Yield ton/ha				1.70			1.90			2.60			2.00			2.40
III Price SKK/ton				8,000			8,000			8,000			8,000			8,000
IV Total Amount (II*III)				<b>13,600</b>			<b>15,200</b>			<b>20,800</b>			<b>16,000</b>			<b>19,200</b>
V Subsidies Skk/ha: Basic and Disadv.				1,710			1,800			1,920			1,800			1,920
Subsidies SKK/ha: Irrigation (incl. In item I-13)				-			-			5,973			-			-
VI Gross Income (IV+V)				15,310			17,000			22,720			17,800			21,120
VII Net Income (VI-I)				<b>917</b>			<b>1,743</b>			<b>3,696</b>			<b>2,527</b>			<b>3,973</b>

Table 3.1 Production Cost and Net Income of Crops (3/6)

Crop: Soybean	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars	Unit															
<b>I Costs</b>																
1 Land Rental	ha		500	500		500	500		500	500		500	500		500	500
2 Ploughing	ha		1,300	1,300		1,500	1,500		1,500	1,500		1,500	1,500		1,650	1,650
3 Manure	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Chemical Fertilizers	kg	30	13	390	30	13	390	30	13	390	30	13	390	40	13	520
5 Fertilizer Application	ha		500	500		500	500		500	500		500	500		500	500
6 Seeds	kg	80	24.0	1,920	80	24.0	1,920	80	24.0	1,920	80	24.0	1,920	80	24.0	1,920
7 Seeding			500	500		500	500		500	500		500	500		500	500
8 Agricultural Chemicals (Herbicides)	lit	3	600	1,800	3	600	1,800	3	600	1,800	4	600	2,400	5	600	3,000
9 Chemicals Application (Herbicide)			500	500		500	500		500	500		500	500		500	500
10 Agricultural Chemicals (Plant protection)	time	2	700	1,400	3	700	2,100	3	700	2,100	2	700	1,400	3	700	2,100
11 Chemicals Application (Plant protection)	time	2	500	1,000	3	500	1,500	3	500	1,500	2	500	1,000	3	500	1,500
12 Harvesting			1,700	1,700		1,700	1,700		1,700	1,700		1,700	1,700		1,700	1,700
13 Water Charge										2,679						
Total				11,510			12,910			15,589			12,310			14,390
14 Management Cost (10% of the cost above)				1,151			1,291			1,559			1,231			1,439
15 Other miscellaneous Cost																
<b>Total Cost</b>				<b>12,661</b>			<b>14,201</b>			<b>17,148</b>			<b>13,541</b>			<b>15,829</b>
II Yield ton/ha				1.30			1.50			2.00			1.70			2.00
III Price SKK/ton				7,800			7,800			7,800			7,800			7,800
IV Total Amount (II*III)				<b>10,140</b>			<b>11,700</b>			<b>15,600</b>			<b>13,260</b>			<b>15,600</b>
V Subsidies SKK/ha: Basic and Disadv.				3,150			3,450			4,200			3,750			4,050
Subsidies SKK/ha: Irrigation (incl. in item I-13)				-			-			4,233			-			-
VI Gross Income (IV+V)				13,290			15,150			19,800			17,010			19,650
VII Net Income (VI-I)				<b>629</b>			<b>949</b>			<b>2,652</b>			<b>3,469</b>			<b>3,821</b>

Crop: Rye	Unit	Zone II (Sandy Soil)					
		Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars	Unit						
<b>I Costs</b>							
1 Land Rental	ha		500	500		500	500
2 Ploughing	ha		1,300	1,300		1,500	1,500
3 Manure	t	-	-	-	-	-	-
4 Chemical Fertilizers	kg	80	13	1,040	100	13	1,300
5 Fertilizer Application			500	500		500	500
6 Seeds	kg	150	7.0	1,050	150	7.0	1,050
7 Seeding			1,450	1,450		1,450	1,450
8 Agricultural Chemicals (Herbicides)	lit		2,012	2,012		2,012	2,012
9 Chemicals Application (Herbicide)				500			500
10 Agricultural Chemicals (Plant protection)				-			-
11 Chemicals Application (Plant protection)				-			-
12 Harvesting			1,500	1,500		1,700	1,700
Total				9,852			10,512
13 Management Cost (10% of the cost above)				985			1,051
14 Other miscellaneous Cost							
<b>Total Cost</b>				<b>10,837</b>			<b>11,563</b>
II Yield ton/ha				2.40			2.80
III Price SKK/ton				3,900			3,900
IV Total Amount (II*III)				<b>9,360</b>			<b>10,920</b>
V Subsidies SKK/ha :Basic and Disadv.				1,700			1,700
Subsidies SKK/ha: Irrigation (incl. in item I-13)				-			-
VI Gross Income (IV+V)				11,060			12,620
VII Net Income (VI-I)				<b>223</b>			<b>1,057</b>

Table 3.1 Production Cost and Net Income of Crops (4/6)

Crop: Rapeseed	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars	Unit															
<b>I Costs</b>																
1 Land Rental			500	500		500	500					500	500		500	500
2 Ploughing			1,300	1,300		1,500	1,500					1,500	1,500		1,650	1,650
3 Manure	t	-	-	-	-	-	-				-	-	-	-	-	-
4 Chemical Fertilizers	kg	90	13	1,170	135	13	1,755				90	13	1,170	120	13	1,560
5 Fertilizer Application			500	500		500	500					500	500		500	500
6 Seeds	kg	6	440.0	2,640	6	440.0	2,640				6	440.0	2,640	6	440.0	2,640
7 Seeding			830	830		830	830					830	830		830	830
8 Agricultural Chemicals (Herbicides)	lit	3	600	1,800	3	600	1,800				4	600	2,400	5	600	3,000
9 Chemicals Application (Herbicide)			500	500		500	500					500	500		500	500
10 Agricultural Chemicals (Plant protection)			-	-		-	-					-	-		-	-
11 Chemicals Application (Plant protection)			-	-		-	-					-	-		-	-
12 Harvesting			1,815	1,815		1,815	1,815					1,815	1,815		1,815	1,815
13 Water Charge																
Total				11,055			11,840						11,855			12,995
14 Management Cost (10% of the cost above)				1,106			1,184						1,186			1,300
15 Other miscellaneous Cost																
<b>Total Cost</b>				<b>12,161</b>			<b>13,024</b>						<b>13,041</b>			<b>14,295</b>
II Yield ton/ha				1.50			1.80						2.00			2.40
III Price SKK/ton				8,100			8,100						8,100			8,100
IV Total Amount (II*III)				<b>12,150</b>			<b>14,580</b>						<b>16,200</b>			<b>19,440</b>
V Subsidies SKK/ha: Basic and Disadv.				1,650			1,740						1,800			1,920
Subsidies SKK/ha: Irrigation (incl. in item I-12)				-			-						-			-
VI Gross Income (IV+V)				13,800			16,320						18,000			21,360
VII Net Income (VI-I)				<b>1,640</b>			<b>3,296</b>						<b>4,960</b>			<b>7,066</b>

Crop: Carrot	Unit	Zone II (Sandy Soil)									Zone III (Loamy Soil)					
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated			Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars	Unit															
<b>I Costs</b>																
1 Land Rental									1,300	1,300						
2 Ploughing									1,800	1,800						
<Ridging>									4,000	4,000						
3 Manure (Green)	ha								650	650						
4 Chemical Fertilizers	kg							125	13	1,625						
5 Fertilizer Application									500	500						
6 Seeds	kg									5,000						
7 Seeding									1,800	1,800						
8 Agricultural Chemicals (Herbicides)									x							
9 Chemicals Application (Herbicide)									x	7,100						
10 Agricultural Chemicals (Plant protection)									x							
11 Chemicals Application (Plant protection)									x							
12 Harvesting									9,000	9,000						
13 washing	kg							30,000	1.8	54,000						
14 Water Charges										6,195						
Total										92,970						
15 Management Cost (10% of the cost above)										9,297						
16 Other miscellaneous Cost																
<b>Total Cost</b>										<b>102,267</b>						
II Yield ton/ha										36.00						
III Price SKK/ton										3,400						
IV Total Amount (II*III)										<b>122,400</b>						
V Subsidies SKK/ha :Basic and Disadv.										4,200						
Subsidies SKK/ha: Irrigation (incl. in item I-14)				-			-			8,541			-			-
VI Gross Income (IV+V)										<b>126,600</b>						
VII Net Income (VI-I)										<b>24,333</b>						



Table 3.1 Production Cost and Net Income of Crops (5/6)

Crop: Asparagus	Unit	Zone II (Sandy Soil)											
		Without Plan				With Plan - Non-Irrigated (groundwater control)				With Plan - Irrigated			
		Per ha Amount	Times (10-year)	Price (SKK/Unit)	Total (10-year)	Per ha Amount	Times (10-year)	Price (SKK/Unit)	Total (10-year)	Per ha Amount	Times (10-year)	Price (SKK/Unit)	Total (10-year)
Particulars													
I Cost													
1 Land Rental							10	2,650	26,500		10	2,650	26,500
2 Ploughing (Including subsoil breakage) <Ridging>								6,500	6,500			6,500	6,500
							10	2,000	20,000		10	2,000	20,000
3 Manure (Green manure: plowing-in)	t					60	10	30	18,000	60	10	30	18,000
4 Chemical Fertilizers	kg					430	10	13	55,900	430	10	13	55,900
5 Fertilizer Application							10	500	5,000		10	500	5,000
6 Seeds	kg					10		1,000	10,000	10		1,000	10,000
7 Seeding								500	500			500	500
8 Agricultural Chemicals (Herbicides)	lit					4	10	600	24,000	4	10	600	24,000
9 Chemicals Application (Herbicide)	lit						10	500	5,000		10	500	5,000
10 Agricultural Chemicals (Plant protection)													
11 Chemicals Application (Plant protection)									0				0
12 Shading							10	5,000	50,000		10	5,000	50,000
13 Harvesting							10	160,000	1,600,000		10	160,000	1,600,000
14 Cutting							10	1,000	10,000		10	1,000	10,000
15 Washing and grading							10	1,000	10,000		10	1,000	10,000
16 Water Charges							10	3,743	37,435		10	3,743	37,435
Total									1,852,335				1,852,335
17 Management Cost (15% of the cost above)									277,850				277,850
18 Other miscellaneous Cost													
Total Cost (10 years)									2,130,185				2,130,185
Total Cost									213,019				213,019
II Yield ton/ha									4.00				4.00
III Price SKK/ton									60,000				60,000
IV Total Amount (II*III)									240,000				240,000
V Subsidies SKK/ha :Basic and Disadv.									4,200				4,200
Subsidies SKK/ha: Irrigation (incl. In item I-14)									6,718				6,718
VI Gross Income (IV+V)									244,200				244,200
VII Net Income (VI-I)									31,181				31,181

Table 3.1 Production Cost and Net Income of Crops (6/6)

Crop: Alfalfa	Unit	Zone II (Sandy Soil)								
		Without Plan			With Plan - Non-Irrigated			With Plan - Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars										
<b>I Costs</b>										
1 Land Rental		3	500	1,500	3	500	1,500	3	500	1,500
2 Ploughing			1,300	1,300		1,300	1,300		1,300	1,300
3 Manure	t	60	30	1,800	60	30	1,800	60	30	1,800
4 Liquid manure		3	500	4,500	3	500	4,500	3	500	4,500
4 Chemical Fertilizers	kg	20	13	780	20	13	780	30	13	1,170
5 Fertilizer Application		3	500	1,500	3	500	1,500	3	500	1,500
6 Seeds	kg	20	75	1,500	20	75	1,500	20	75	1,500
7 Seeding			500	500		500	500		500	500
8 Agricultural Chemicals (Herbicides)	lit	2	600	1,200	2	600	1,200	2	600	1,200
9 Chemicals Application (Herbicide)			500	500		500	500		500	500
10 Agricultural Chemicals (Plant protection)				-			-			-
11 Chemicals Application (Plant protection)				-			-			-
12 Harvesting (cutting)		4 times	500	6,000	4 times	500	6,000	4 times	500	6,000
Harvesting (collecting)		4 times	500	6,000	4 times	500	6,000	4 times	500	6,000
13 Water Charge				-			-			11,104
Total				27,080			27,080			38,574
14 Management Cost (10% of the cost above)				2,708			2,708			3,857
15 Other miscellaneous Cost										
Total Cost for 3 years				29,788			29,788			42,431
Total Cost for 1 years				9,929			9,929			14,144
II Yield ton/ha <1 year>				8.40			8.40			12.60
III Price SKK/ton				1,200			1,200			1,200
IV Total Amount (II*III)				10,080			10,080			15,120
V Subsidies SKK/ha : Basic and Disadv.				1,700			1,700			1,700
Subsidies SKK/ha: Irrigation (incl. In item I-13)				-			-			6,619
VI Gross Income (IV+V)				11,780			11,780			16,820
VII Net Income (VI-I)				1,851			1,851			2,676

Crop: Artif. Meadow	Unit	Zone II (Sandy Soil)			Zone II (Sandy Soil)		
		Without Plan			With Plan - Non-Irrigated		
		Per ha Amount	Price (SKK/Unit)	Total (SKK)	Per ha Amount	Price (SKK/Unit)	Total (SKK)
Particulars							
<b>I Costs</b>							
1 Land Rental		10 years	500	5,000	10 years	500	5,000
2 Ploughing			1,300	1,300		1,300	1,300
3 Manure							
4 Liquid manure							
4 Chemical Fertilizers							
5 Fertilizer Application							
6 Seeds	kg	20	75	1,500	20	75	1,500
7 Seeding			500	500		500	500
8 Agricultural Chemicals (Herbicides)							
9 Chemicals Application (Herbicide)							
10 Agricultural Chemicals (Plant protection)							
11 Chemicals Application (Plant protection)							
12 Harvesting (cutting)		2 times	300	6,000	2 times	300	6,000
Harvesting (collecting)		2 times	300	6,000	2 times	300	6,000
13 Water Charge				-			-
Total				20,300			20,300
14 Management Cost (10% of the cost above)				2,030			2,030
15 Other miscellaneous Cost							
Total Cost for 10 years				22,330			22,330
Total Cost for 1 years				2,233			2,233
II Yield ton/ha <1 year>				3.00			3.00
III Gross value SKK/ha				1,667			1,667
IV Total Amount (II*III)				1,667			1,667
V Subsidies SKK/ha : Basic and Disadv.		10 years	6,000	600	10 years	6,000	600
Subsidies SKK/ha: Irrigation (incl. In item I-13)				-			-
VI Gross Income (IV+V)				2,267			2,267
VII Net Income (VI-I)				34			34

## 2.8 FEED CROP AND LIVESTOCK

The livestock sector will be influenced when the proposed technical measures in the Guideline are carried out and structure of products is changed. And some technical measures have a strong relationship with the livestock sector. To grasp this influence and relationship, ensuring the existing condition of livestock, an examination of the balance between crop production and feed demand is carried out.

### (1) Number of Livestock in the Study Area

The number of livestock in Malacky district and its structure of growing stages were assumed to follow the structure of animals of the Bratislava region (date at end of October, 2001 from agricultural census 2001).

Structure of Livestock animals in Malacky

Beef Cattle Breeding		Assumed Head in Malacky
1	Grow, up to 1 year, Male	1,864
2	Female	1,213
3	Fattening, 1 to 2y. Male	1,062
4	Female	527
5	Fattening, over 2y, Male	158
6	Female	0
7	Cows, beef calf reprod	310
8	Cows, calf repr. unmated	59
Total		5,191

Pig Breeding		Assumed Head in Malacky
1	Growing , up to 20 kg	2,040
2	Fattening, 21 to 50kg	2,889
3	51 to 80kg	2,040
4	81 to 110kg	1,808
5	over 110kg	162
6	Breeding, 21 to 50kg	162
7	Breeding boars, over 50kg	30
8	Breeding sows, over 50kg, mated	141
9	ibid, unmated	111
10	Sows, mated	495
11	ibid, unmated	222
Total		10,100

Milking		Assumed Head in Malacky
1	Grow, Male, Breeding	83
2	Female	599
3	Breeding heifers, mated	433
4	unmated	327
5	Breeding, Dairy, mated	184
6	unmated	40
7	Cows, Milking, mated	1420
8	unmated	572
Total		3,658

### (2) Nutrients Requirement of Livestock Animals in the Study Area

The nutrients requirement of livestock animals is estimated in Malacky district based on the above structure. At the beginning, the nutrient requirements are calculated as the energy requirement of body maintaining and fattening or milking. Then, it is converted to Total Digestible Nutrients (hereafter TDN), it is used among livestock farmer universally. By animal types, annual requirement per head is 2,176 kgTDN in cattle, and 532 kgTDN in pig breeding and total requirements in Malacky become about 24,629 tonTDN.

### (3) TDN Conversion

The percentage of TDN, which is contained in feed crop, is called TDN rate. This TDN rate is specified by the type of crops and its water contents. Based on the standard of feed composition in Japan, TDN rates among the major crops are estimated as shown in following table under the usual feeding condition in the area.

TDN rate of Major crops in the Study Area under usual feeding condition

Feed Type	Crop	For Cattle	For Pig	Feed Type	Crop	for Cattle
Concentrated Feed	Wheat	78.7%	79.7%	Roughage	Alfalfa	39.7%
	Barley	74.1%	70.4%		Grass	18.4%
	Maize	79.9%	81.0%		(Reed Canary Grass)	
	Rye	75.9%	78.0%		Silage Maize	15.5%
	Soybean	91.0%	85.9%			

\* TDN rate is shown in fed basis

### (4) Regional Feed Balance in Expected Cropping Pattern and Cultivation Area

To verify the applicability of the proposed farming type and cultivation, the balance between the feed demand and the expected product amount is examined. The assumed annual demand of feed in Malacky district is 14,206 ton in concentrated feed and 77,949 ton in roughage when it is based on the actual feeding. The cultivated areas shown in the following table are the average of four actual years between 1997 and 2000 and the cultivation areas are according to the draft land evaluation (in Part 2 Chapter 3.2) of expected farming type and cropping pattern. The production amount is calculated with these areas and average yield. In the calculation results with average cultivation area, the amount of concentrated feed is 24% more than its demand and also roughage can fill the demand.

On the other hand, in the calculation with expected area, the production of roughage is at the same level as the result of average area and production of concentrated feed is more than that of average area. Finally, the feed crop production in expected cropping is more than the average production. So that, it is safe to assume that the same level of production of feed as it exists will be maintained, even if the cropping pattern is improved to the expected cropping pattern according to land evaluation.

### Cultivation Area in Expected Farming Type and Cropping Pattern

(ha, %)

Crops	Actual Record Average 1997-2000 <sup>(1)</sup>	Expected Cultivation Area <sup>(2)</sup>	(2)/(1)
Sunflower	869 (4%)	1,312 (6%)	151%
Rapeseed	2,108 (10%)	2,138 (10%)	101%
Spring Barley	2,169 (10%)	2,041 (9%)	94%
Food Wheat	3,987 (3%)	1,941 (9%)	114%
Wheat for Feed		2,598 (12%)	
Grain Maize	2,016 (9%)	3,737 (3%)	74%
Silage Maize	3,034 (14%)		
Soybean	-	762 (3%)	-
Alfalfa	1,390 (6%)	2,731 (12%)	197%
Rye	4,137 (19%)	3,360 (15%)	81%
Vegetables	900 (4%)	1,767 (8%)	196%
Others	1,283 (6%)		-
Total of Arable Land	21,891 (100%)	22,387 (100%)	102%
Grassland	5,969	7,105	119%
Total	27,860	29,492	

<sup>(3)</sup> : Increment ratio of sunflower from the average of 1999 to 2000 that was 1,160ha is 113%.

### The Relation Ship between Demand and Products in Feed Crop in Malacky

	Total Amount Ton	Concentrated Ton	Rouage Ton	Total TDN ton-TDN
Estimated Demand	92,155	14,206	77,949	31,102
Production Actual Average	95,713	17,586	78,127	34,141
Expedcted	99,749	21,491	78,258	38,630

### (5) Regional Supply Capacity of Manure

The use of animal waste as manure has an important impact not only on soil fertility management but also on environmental conservation. Total annual products of manure in Malacky district become 185,616 ton, of which 168,406 ton from cattle and 17,210 ton from pig. This amount of manure can supply to 6,187 ha of field, with precondition of 30 ton/ha of manure application in the field.

### (6) Values of Feed Crops

The change of feed crop values though the livestock sector is examined. The amount of TDN requirement to produce the unit livestock products as 1kg of meat or 1 lit. of milk is 5.81 TDN-kg in Beef, 2.40 TDN-kg in Pork and 1.18 TDN-kg in



Milk. The product cost of them is 48.49 SKK, 42.64 SKK and 13.93SKK and selling unit price is 78.06 SKK, 59.67 SKK and 8.54 SKK respectively. The influence of a shift of unit yield to each livestock sector is examined considering the balance between the concentrated feed and roughage, it is assumed that the stated production cost is promoted based on the average yield.

In case of wheat, the balanced yield defined that the profit is 0 at about 3.0 ton per hectare in Milking and Pig Breeding, and about 3.2 ton per hectare in beef cattle breeding which is the same yield when it is sold as feed. Because of that, it can be said roughly that it is difficult to secure profit from selling of wheat when the yield is less than 3.2 ton/ha, but it can be profitable when it is used as feed for livestock.

Calculation Condition				Cattle Breeding		Pig Breeding		Milking	
Demand of TDN per Unit product (1kg or 1lit.)			kg	5.81		2.40		1.18	
Of which	Purchased Feed	Concentrated	kg	0.48	8.3%	0.50	20.8%	0.17	14.0%
	Self-supplied Feed	Concentrated	kg	1.53	26.4%	1.9	79.2%	0.20	16.8%
		Roughage	kg	3.79	65.2%			0.82	69.2%
Production Cost per Unit Production (SKK/kg or lit.)			SK K	48.49		42.64		13.93	
Of which	Purchased Feed		SK K	4.86	15.5%	8.47	19.9%	1.07	7.7%
	Self-supplied Feed	Total	SK K	21.04		12.38		4.27	
		Concentrated	SK K	6.97	14.4%	12.38	29.0%	1.12	8.0%
		Roughage	SK K	14.07	29.0%			3.15	22.6%
	Other direct cost		SK K	14.21	29.3%	14.88	34.9%	6.36	45.7%
	Administration expense		SK K	8.38	17.3%	6.91	16.2%	2.23	16.0%
Selling Price per Unit Production (in live weight kg or lit.)*1			SK K	78.06		59.67		8.54	
Carcass Ratio (%)			%	60%		65%			
Subsidy per Unit Production (SKK) *2			SK K	1.42		0.17		1.16	
Other Income			SK K					4.05	

Source: JICA Estimation

\*1 Average Purchase price in 2001 in Bratislava region (Source: ATIS)

\*2 modified with 2002 subsidy condition

### Balanced Yield in Wheat

Wheat	Yield (ton/ha)	Livestock Product (kg/ha)	Income			Cost			Profit
			Selling amount (SKK)	Subsidy (SKK)	Sub-total (SKK)	Cost (SKK)	Other (SKK)	Sub-total (SKK)	Amount (SKK)
	1	2=1*A/C	3=2*I*H	4=2*J	5=3+4	6	7	8=6+7	9=8-5
Meat Cattle Breeding	3.22	1,650	77,279	2,343	79,622	11,115	68,505	79,620	3
Pig Breeding	3.04	1,278	49,577	217	49,795	11,115	38,680	49,795	0
Milking	3.00	11,824	148,870	13,716	162,586	11,115	151,471	162,586	0
Feed Selling	3.19		10,526.5	1,700	12,227	11,115	1,112	12,227	0

#### (7) Values of Artificial Meadows

There is no market price for feed Grass, which forms the basis to evaluate its value. Due to this, its value is assumed from the price corresponding to TDN in Alfalfa.

The marketing price of alfalfa can be converted to 3.02 SKK/TDN-kg with its TDN contents. The gross value of one hectare of grass can be estimated at 1,878 SKK with this alfalfa's value. The total production cost in one hectare is 2,255 SKK, its balance becomes loss over one year. However the subsidy for grassing is obtained at this time and the annual gross value becomes 2,267 SKK. Due to this, the value is slightly higher than the cost, and the profitability, even if it means only that it is not a loss, is secured by subsidy.