

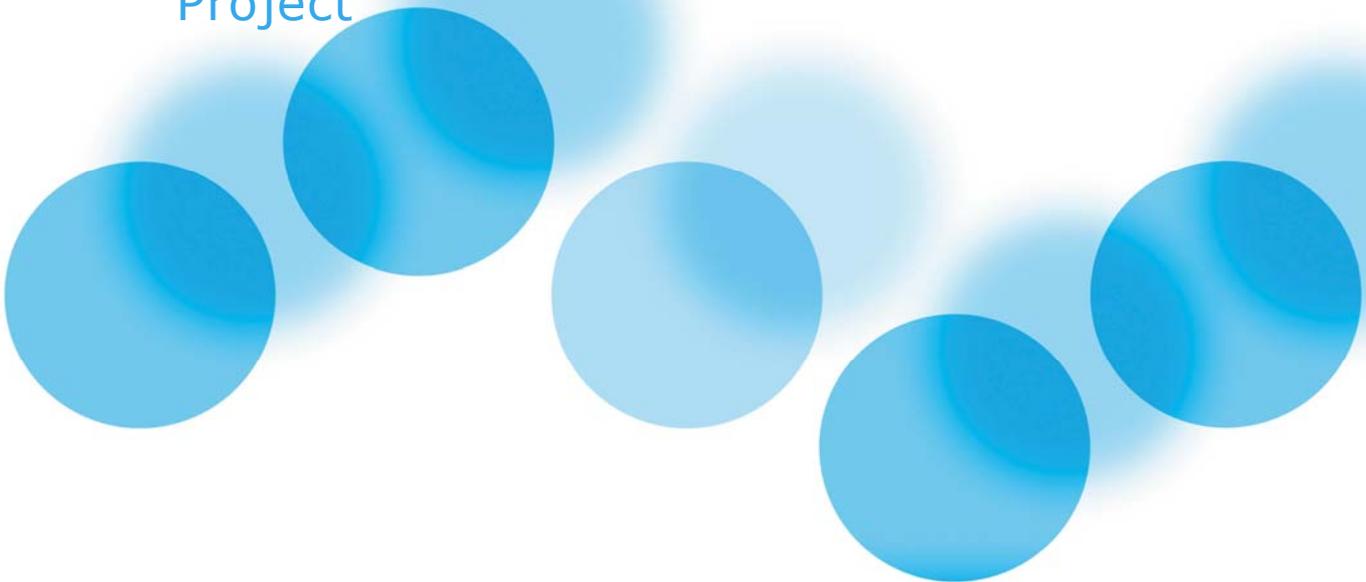


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DANUBE
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PROJECT

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REDUCTION OF POLLUTION RELEASES THROUGH AGRICULTURAL POLICY CHANGE AND DEMONSTRATIONS BY PILOT PROJECTS

Detailed work programme for the Pilot Project



WORKING FOR THE DANUBE AND ITS PEOPLE

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PREFACE

The overall objective of this Project is to the reduction of pollution from agriculture.

Within this Project there are two key specific objectives:

- > Agricultural Policy: Reduction of nutrients and other harmful substances from agricultural point and non-point sources through agricultural policy changes (referred to Output 1.2 in DRP's documentation); and,
- > Pilot Project(s): Development and implementation of pilot projects on reduction of nutrients and other harmful substances from agricultural point and non-point sources (referred to as Output 1.3).

The work will build on earlier studies and will improve the linkages between key EU policy instruments including, Water Framework Directive, Nitrates Directive and the Common Agricultural Policy etc., within the basin.

This Project is a continuation of work began in Phase 1 of the DRP, and the outputs and outcomes from this initial phase will be utilized and further developed in the project.

The Project will assist the DRB countries (especially in the lower Danube basin) with the development of pilot programmes for agricultural pollution reduction and low-input agriculture, in line with existing and emerging (driven by EU Accession) national environmental legislation.

The project addresses two DRP Outputs:

- > Agricultural Policy (DRP Output 1.2) and
- > Pilot Projects (DRP Output 1.3)

The purpose of this report is to describe Task 5: Preparing detailed work programme for Pilot Projects.

Preliminary agreements about participation in pilot projects have been signed with 8 farms. As participation in the Project implies substantial investments for first of all storage capacity and secondly equipment for distribution of manure, some of these farms may later on give up participating in the Project.

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ABBREVIATIONS

BAP	Best Agricultural Practice
daNUbs	Nutrient Management in the Danube Basin and its Impact on the Black Sea
DRB	Danube River Basin
DRP	Danube Regional Project
DRPC	Danube River Protection Convention
EG	Expert Group
EMIS EG	Expert Group on Emissions
EU	European Union
EU WFD	EU Water Framework Directive
GEF	Global Environment Facility
GIS ESG	Expert Sub-group on Cartography and GIS
GIS	Geographical Information System
GAP	Good Agricultural Practice
ICPDR	International Commission for the Protection of the Danube River
IPPC	Integrated Pollution Prevention and Control
MAFWM	Ministry of Agriculture, Forestry and Water Management
MLIM EG	Expert Group on Monitoring, Laboratory and Information Management
MONERIS	Modelling Nutrient Emissions into River Systems
PoM	Programme of Measures
PPP	Plant Protection Products
RBM EG	Expert Group on River Basin Management
UNDP	United Nations Development Programme
RBMP	River Basin Management Plan
RR	Roof Report
TNMN Trans	National Monitoring Network
WFD	Water Framework Directive
WB	World Bank

1. BACKGROUND

Vojvodina selected for the pilot project for the following reasons:

1. it was one out of 6 locations identified for pilot projects (No 6: Good Agricultural Practice in the Intensive Agricultural Region of Vojvodina) in the list of Consolidated Pilot Project Proposals from the DRP phase 1 report: Pilot Projects for Promoting Best Agricultural Practice (BAP) in the Central and Lower Danube River Basin Countries: Concept and Project Proposals.
2. It is in convenient distance from the project office in Belgrade.
3. The area and the agricultural practices is representative for intensive agriculture in the 7 lower Danube countries.

The project considers 15 BAPs:

General

1. There should on all farms above 5 ha and/or 5 livestock be calculated resource economy every year, latest 1 April for the preceding year, and covering at least the resource economy for N, P and PPP.

Crop production systems

2. Every farm with at least 1 ha of arable crops should ensure soil sampling at least each 5 years.
3. Crop rotation and fertilising plans should be prepared for all farms above 5 ha every year latest 31 March, for winter crops latest 1 August. Fertilising plans shall be based on the expected yield level, the needs of the crops, and include both livestock manure and mineral fertiliser.

Livestock production systems

4. Livestock should be fed with rations that are correct balanced with energy, protein and minerals in relation to the productivity.
5. Cleaning of stables with water should be avoided or reduced to a minimum.
6. Watering of the livestock should happen in a way that hinders spill of water.

Livestock density

7. There should maximally be livestock corresponding to a nitrogen content in the manure of 170 kg N per ha. Manure should be sold to other farms or distributed to fields of other farms in case of a higher livestock density.

Livestock manure management

8. There should be storage capacity for at least 6 months production of livestock manure at the farm. Production systems with use of bedding material needs storage capacity for both liquid and solid manure. Production systems with deep bedding can store the manure on the field for up to 6 months if the manure has a dry matter content of minimum 30%.
9. It must be hindered that rain water can dilute the livestock manure.
10. Spreading of manure in the period from 15 October till 1 March should not take place, and in any case not on to frozen land or land with a slope of more than 7°.
11. Proper technology should be used for spreading of livestock manure. Liquid manure and slurry should be spread with band laying system or be injected into the soil.
12. Livestock manure should be incorporated into the soil within 6 hours.

Use of chemicals

13. Spraying should be done according to the needs, and the doses take into consideration the spraying time, the development stage of the crop, the climatic conditions.
14. The spraying equipment should function properly, and it shall be ensured that the nozzles are functioning well to ensure an even spraying.
15. Plant Protection Products shall be kept in a locked store, where books are kept on the purchase and use of PPP.

For more information see the Technical Report made by this Project: BEST AGRICULTURAL PRACTICES – WHAT IT IS AND HOW IT CAN BE IMPLEMENTED IN PRACTICE.

Examples of present nutrient balances, showing the nutrient surplus resulting from the loss of the nutrients in the manure, on two of the pilot farms is shown in Annex G: Outlines for nutrient balance calculations for 2 farms.

2. SHORT DESCRIPTION ON THE AGRICULTURAL SITUATION IN VOJVODINA

The Republic of Serbia covers 88,361 km², and of this area 57,000 km² is agricultural land, and out of the agricultural area 49,000 km² is arable land. Serbia is an important producer of maize, wheat, fruits, wine, barley, oats, sugar beet, potatoes, sunflowers, soy beans, tobacco, fodder crops, and also has a considerable production of livestock based on a national herd of 1.2mill cattle, 3.6mill pigs, 1.4mill sheep, and 19mill poultry. The most important agriculture region of Serbia is Voivodina. It is a representative part of the country where agriculture has a long tradition and hold rural economy almost in whole.

So far in Serbia little practical consideration has been given to the question of the environment versus agriculture. The situation is however the same throughout the region. The potential for introduction of improved agricultural practices and application of better technology is therefore great. The Pilot Project will hence be designed in order to advice on and demonstrate the Best Agricultural Practices for the farming communities and their advisers within the given frames of nature, policy, and project means. As far as possible it will be based on experience collected in other countries, but it will be adapted to local conditions, and if possible break new ground.

2.1. Geography and climate

Voivodina covers 21,506 km² and is situated around 45 latitude north. 17,940 km² are agricultural area, hereof 16,510 km² cultivated, only 2,940 km² is forest. The province is criss-crossed by water courses, first of all the mighty rivers: Danube and Tisa, both navigable in full length in Voivodina, but also canals of which 518 km are navigable for ships or barges. In total there are 17,027 km of canals, and also 363 pumping stations. 1,331 km of embankments protects against water, 15,930 km² are drained.

The climate is characterised with average temperature of 12 °C, with hot summers and cool winters. As an example is given the average figures in °C for temperatures in the central town Zrenjanin for the two years 2002 and 2003:

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug	Sep.	Oct.	Nov.	Dec.
2003	-2.0	-4.3	5.6	11.2	21.0	24.4	22.8	24.8	17.0	9.5	7.8	2.0
2002	0.5	6.8	8.7	11.4	20.0	22.3	24.2	22.0	16.5	12.0	9.6	0.3

The precipitation is low, normally around 500 mm per year. Below is given the precipitation in mm for the town Zrenjanin for all months in 2002 and 2003, plus some months of 2005, where the month of August was with unusually high precipitation:

	Annual	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2003	497	55.5	13.5	9.6	19.1	19.0	32.3	74.1	4.2	117.8	97.0	33.0	21.5
2002	410	5.4	16.9	3.7	14.5	42.2	37.3	34.3	70.9	44.6	67.8	16.6	56.0
2005	(710)	34.5	30.3	55.7	70.4	39.1	71.8	82.6	181.9	85.5	22.0	?	

Because of the hot summers, the evaporation is considerable, see below figures of potential evaporation of humidity in mm for one year at Zrenjanin:

Annual	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
861	15.2	24.1	53.3	80.1	113.4	127.9	139.5	125.9	85.2	53.9	25.4	15.4

It is clear that most months the evaporation exceeds the precipitation, reducing the risk of run-offs caused by rain. In this situation an extensive use of irrigation would be predicted, but although the use of it is expanding there was in the year 2003 still only 33,000 ha with irrigation systems.

2.2. Agriculture

The area is suitable for arable crops as the soils are rich, non-acidic; the main part is either clay soils or black, humus-rich clay soils of chernozem type. In 2003 the following crops were sown: 623,000 ha maize, 316,000 ha wheat, 186,000 ha sunflower, 124,000 ha soy beans, 61,000 ha sugar beets, and 57,000 ha alfalfa.

200,000 private family farms are cultivating 2/3 of the land, 480 former collectives are holding the rest of the available land. In 2003 17 enterprises in Voivodina each had more than 5,000 ha, but most of farms are very small, the average farm in Voivodina has 3.6 ha arable land. The main part of the maize is grown by the holdings, the most of the wheat and sugar beets by the big farms. The biggest threat to the crops is too little rain, especially in the summer.

By the end of 2003 there were in Voivodina: 217,000 cattle, 1,337,000 pigs, 198,000 sheep, and 5,737,000 poultry. Compared to the agricultural area the load of livestock and the resulting organic manure is moderate, there ought actually to be a demand for the manure. The milk yield is about 3.3 ton per year per cow. This is a low figure, and it is worth remembering that efficient use of resources results in lower total pollution per unit produced. It must be concluded that the area is an excellent choice for the project, also because of the transformation of farms going on these years.

The agricultural situation in Voivodina is representative for the 7 lower Danube countries. In the region of Voivodina one can find all types of farms which are present in all 7 lower Danube countries, and all realities concerning natural and human potentials, traditional and modern farming practices. All this is present on a small space in Banat region, where modern large farms are close to small mixed-farms of traditional kind, with high productive chernozem soils, salty and sandy soils, heavy clay, dry or those with high water plot, often flooded.

There are a range of environmental problems related to the agricultural practices in Voivodina. Many of these problems can only be solved via investments on the farms. Examples are: bad stables with liquid manure leaking all around, silage trenches without collectors, manure storages without concrete base, slurry tanks with no proper equipment for regular emptying, chemical storages without protection, loading and distribution of manure and slurry with inefficient machinery and equipment and even manually, sprayers worn-out etc.

3. LINK TO PHASE 1 DRP ACTIVITIES

This report builds on the achievements of Phase 1 of the Danube Regional Project, especially the reports:

- Recommendations for Policy Reforms and for the Introduction of Best Agricultural Practice (BAP) in the Central and Lower Danube River Basin Countries.
- Final Report for Danube Regional Project Outputs 1.2 & 1.3

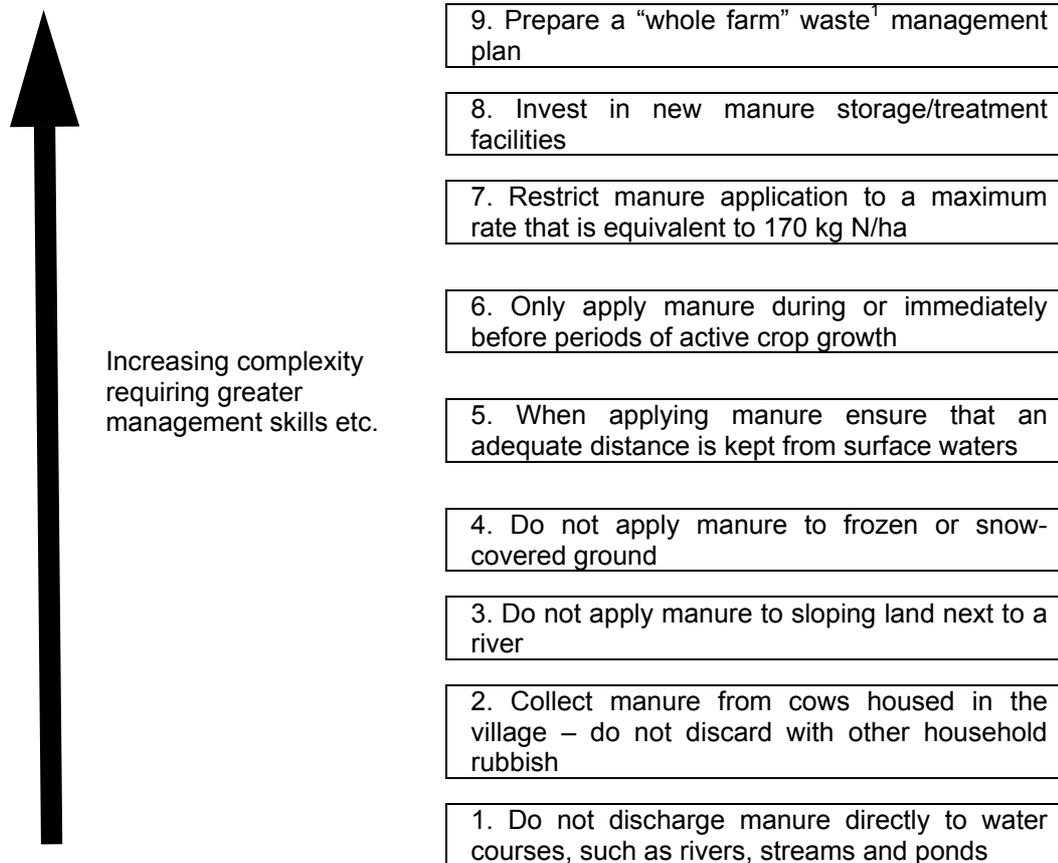
The Project uses the same definition of Best Agricultural Practice as in Phase 1 of the Danube Regional Project: "...the highest level of pollution control practice that any farmer can reasonably be expected to adopt when working within their own national, regional and/or local context in the Danube River Basin".

Focus in Phase 1 was on the use of agrochemicals. This project considers the handling of manure as a central issue in BAP implementation in the lower Danube countries. This project will also promote the approach that introduction of BAP will have positive effects on the environment as well as on the farm production economy.

The report "Recommendations for Policy Reforms and for the Introduction of Best Agricultural Practice" outlines three main levels of environmental performance in agriculture that relate to good/best practice:

"Red Zone"	These are the practices by farmers that are considered unacceptable and therefore commonly prohibited by law to protect natural resources, human health etc.
"Blue Zone"	This includes the minimum level of environmental management that it is considered "reasonable" to expect a farmer to undertake as part of "usual" farm management and without expecting any form of compensation/financial assistance. There are significant variations in the way that "good practice" is defined in different countries, but it is likely to include respect for environmental legislation (i.e. avoidance of the "red zone"), following advice from extension services, taking into account scientific and technical progress etc.
"Green Zone"	This involves a higher level of environmental management practice that delivers greater environmental benefit, but usually at greater "cost" to the farmer which may require some form of compensatory payment

The phase 1 report on Policy Reforms and for the Introduction of for BAP gives the following simple hierarchy relating to BAP for the collection, storage and application of manure:



This project addresses the upper part of the table with focus on point 6 to 9.

Point one is not relevant for the region, since discharge of manure directly to water courses is not occurring.

Point two is not relevant for the region, manure is stored separately since used for fertilising, just not stored and used in most appropriate way.

Point three doesn't have importance for most of the region since sloping land is extremely rare, the region is mainly flat.

Point four considering application of manure to frozen snow-covered ground is not occurring since manure is distributed mainly in autumn together with deep ploughing except for pig farms which have no sufficient storage place for slurry, and these pig farms usually dump it all the time in to the immediate environment (not just arable land) during the whole year without any special plan. And those included in the Pilot Project will be advised to change the practice by providing sufficient storing capacity for 6 months, so that they can apply it in time when plants are growing on the field.

¹ This project considers manure as an important resource and source for nutrients not as a waste product.

4. SELECTION OF THE PILOT PROJECT AREA

Srednji Banat was chosen in dialogue with the provincial Secretary of Agriculture in Vojvodina because of the area is intensively farmed with maize, wheat, sugar beets, soy beans, and other arable crops. Furthermore livestock production within the area is also representative for the region, especially pigs, dairy cattle and poultry production, which, consequently, produce a large quantity of organic manure as a potential source of pollution. The appointed area is centred on the local centre town, Zrenjanin.

5. FARM TYPES

Two overall types of farms is found in the region: family farms and agricultural enterprises. Family farms mostly compromise different kinds of agriculture productions. Most of farms possess 5-15 ha of arable land on which they grow mainly maize, wheat, sunflower, soybean, sugar beet and alfalfa. Farms usually use communal grazing land, but some also possesses pastures which are regularly located on salty soils. Arable land is mainly in zone of czernozem-black soils of high quality, but also heavy clay lands on lower positions. Family farms mainly produce on their arable land feeds for their animals, and mainly provide just vitamins from the market. Most of sales crops are also partly bartered for soy meal, sugar beet dry pulp or other similar by-products from processing industry, which are then used on the farm for feeding livestock.

5.1. Family farms

Most of family farms have diverse livestock production, compromising almost regularly cattle and pig production, with minor poultry production for own use on the farm. Milk is regularly delivered to dairies, and fatteners and pigs offered without special market strategy to anyone who want to by them, either on open livestock markets, or to private purchasers. These farms are mostly under-equipped with modern mechanisation and equipment. Farms are often improvised, or old and worn-out. Family farms are based on the long tradition of farming, so often suffer of inherited bad habits, miss-practice or old fashioned management of land. Recently, being in crisis, these farms turned to minimisation of inputs in production, causing their production to rely on severe exploitation of natural resources. What farmers mainly gave up first was intensive use of chemicals, particularly fertilisers, turning their production to more extensive. One can say that actually all production is in class of semi-intensive. However, with changes in economic situation and rural business environment, family farms tend to fast turn back to more intensive production, however without rationalisation in any sense.

These farms, although poses valuable heritage in traditional farming systems are in lack of modern knowledge in production technologies, farm management and marketing, which influence in large extend their profitability. Being small, but still unwilling to cooperate, these farms are susceptible to market conditions and changes for inputs and outputs, so tend to round their production in large extent. Yet, being small, they are quite flexible, to change fast production structure. That, however, prevent them modernise their production and specialise for one but keep them going on with few of different kind, which can bring just continuous survival without prosperity. Besides of serious structural changes, family farms have to pass, they need to work hard on rational use of resources and assets they possess. Out of this fact, one can find extreme value for environmental protection, since mixed farms of the region hide high potential for creating environmentally sustainable production systems.

5.2. Agriculture enterprises

Agriculture enterprises in the region could be divided in two groups – large old social agriculture “combinates” (usually compromising primary production and processing of meat) which were recently privatised and new, deriving from strong large family farms. Both of these owners have officially registered as farms and start investing large capital in their modernisation.

5.2.1. Social agriculture “combinates”

Large previously socially owned enterprises often have no land, but just livestock production or vice-versa, which makes them dependable on market of inputs stronger than needed. That also makes

problems with nutrients balancing, since manure produced on livestock farms is disposed in immediate environment without control on small dumping surfaces. If enterprise possesses land, that land is mostly state owned. Recently this land is leased from state, which means that new users have to compete to get this land, and then obliged to pay for their use, which previous owner was not doing. This makes enterprises recalculate when direct investments in upgrading production technology and mechanisation, and reconstruction of farms are required. The slow process of reconstruction of these farms makes them serious danger for environment in the region which asks for large investments one small project is not capable to do.

At the same time regulations make these farm not obliged yet to do anything about nature protection or rational use of resources in general. Most of these farms have sufficient number of specialists, experts employed which are doing pretty good job considering rationalisation of production, but this rationalisation is not in line with conservation of resources and environmental sustainability but is putting additional burden on them as much as on small family farms. These farms are unlikely to be environmentally sustainable without serious investments in changing technology of production, rebuilding or adapting stables etc.

5.2.2. Strong family farms

The second group of agriculture enterprises which derives from strong family farms, are those State of Serbia intend to support the most through diverse grant schemes, subsidised credits etc. In fact, this strategic support already influenced some family farms to tour seriously to specialised large-scale production of milk and meat, particularly in pig and cattle business. However limitations to this process exist with limited land possessions.

In last years this is also changing, since after privatisation of large socially owned farms, large portion of their land become available on the market, so family farms start leasing it and increase their production. These enterprises mostly tend to balance their crop production with needs of their livestock production which make sense.

However, being still with one leg in traditional system, they still don't know how to balance production in the best way, often invest too much in equipment, machinery and expensive facilities without rounding production to really make it work before further increase etc. They also continue doing part of production in extensive way and apply old-fashioned way of organising for instance extensive grazing on communal lands, or wasting manure etc. These farms often need more investments in knowledge, capacity building for organising and cooperation and skills than big investments in hardware. They also need more skills in fund raising, specially now when lot of opportunities are laying around.

Skills are needed also in farm expansion process, since ambitious changes in farm structure and increase of production is not putting burden on farmers budget, but also additionally press natural resources and endangered environment. Increase and modernisation of these farms is often not going in line with demands for reduction of pollution, but in contrary increase pollution through its increase, because production remain traditional, which also means often bad.

Most of farms in the region, no matter how big they are, represent serious source of pollution for environment. Their contribution to it is different – relative to the farms size, but important even in cases of small farms, since they dominate in farm structure.

6. VISITED FARMS

Twelve farms were visited during preparation of the project, out of which 7 were family farms and 5 agricultural enterprises. The farms were identified in dialogue with the provincial Secretary of Agriculture in Vojvodina. All farms are privately owned. All were situated in municipalities of Zrenjanin, Zitiste and Secanj in region of Banat, eastern part of Voivodina province. During the first assessment, the following data were collected (note that these were adjusted during following assessment missions):

1. A large agriculture enterprise producing dairy cattle, beef and pigs

This farm has about 3,500 ha of arable land of which 450 ha may be irrigated, 550 cows, 2,000 cattle in total, and 3,500 growing/finishing pigs. 100 employees are taking care of the production. On the land is grown: Sugar beets (650 ha), maize, wheat (1000 ha), soy beans, clover grass. The yields per ha are: 3.6t soy beans, 8t yellow corn, 4.5t wheat, 6t sugar beets. Milk yield for cows is on average 6.5t/year. Animal manure is used for 450 ha of sugar beets in September. Besides there is in the autumn used NPK fertilisers, of which there are two types: 10-20-30, and 10-30-20.

The cattle herd consists of Red & white cattle, and Holstein-Frisian. It looks well kept, but there need to be better hygiene as to cleaning and feed in the heifer sheds. There is no real storage for solid manure, which is taken into the fields directly from the stables. As to urine, this runs in open canals into open collectors – causing evaporation of ammonia -, and from the collectors it is also brought directly to the field. In both cases this impedes the proper utilisation of the nutrients in the animal manure.

This is classical large farm for Voivodina. Equipped with machinery and people, and as usually possessing most of the available knowledge about regular production procedures, they implement everything they could take from regular farming practice advised by extensionists and professionals in the country. This farm is hard to be changed or upgraded since system is rigid and too heavy unless the advice comes and as checked and already demonstrated practice from the previously mentioned knowledge dissemination system.

2. A large agriculture enterprise producing poultry

This company produces and slaughter 20 mill broilers per year, and is also owner of a slaughter house in Voivodina. The company would like to use waste from the abattoir as fertiliser in the fields, but the project strongly recommended not using this practice for sanitary reasons – e.g. wildlife picking up remnants of fowls in the fields. Company had twenty ha of agricultural land close to a chicken farm producing 1 mill. broilers per year. More land was available to the South. On the land is produced sunflowers, maize, wheat, sugar beets, and soy beans, but maize would not be grown on the nearest twenty ha next year.

Chicken manure is kept in heaps on the bare soil, as there is no storage for the manure. The farm is not ideal for project purposes, because it is a very special case.

3. A large pig farm agriculture enterprise

The enterprise has a production of 7,500 pigs for slaughter per year, based on 750 sows. Only one row of buildings is in use, and the manure system is based on water flushing of slurry. As the pump that was supposed to pump the slurry to a lagoon is not working, the slurry has flooded part of the soil around the farm. There is no land available for trials on the farm, no equipment for transport. Slurry was low in dry matter (far under 1%), so it would not even pay for the necessary transport, and there was neither machinery, nor land belonging to the enterprise.

4. A mid-large size agriculture enterprise – pig farm

The farm has 200 ha in the neighbourhood of the pig farm, and 1,300 ha are rented from state elsewhere, in a remote village, starting with year 2005 for crop production. On the farm are 300 – 500 pigs, including 56 – 72 sows and 1,000 – 1,200 finishing pigs weighing 100 – 110 kg are yearly delivered to the abattoir. There is a concrete, closed slurry tank under part of the pig housing; its capacity is 60 m³. On the farm is much machinery, including a slurry tanker with a sucking pump, but no distributor.

5. A mid size family agriculture enterprise – pig farm

The farm has 60 ha, and 1200 pigs delivered per year, no sows, weaners are bought in for the production, some egg laying hens in cages.

6. A small mixed family farm 1

The farm has 20 ha, cows and pigs, grows maize, wheat, and sunflower. Besides manure NPK (15:15:15) fertiliser, ammonium nitrate, and urea is used.

7. A mid mixed family farm 2

The farm has 100 ha, 24 cows, 8 heifers. The land is grown with maize, triticale, wheat, sunflower, alfalfa, and besides there is also 60 ha pasture. Uses manure, NPK, Urea, and ammonium nitrate.

8. A small family farm 3

The farm has 20 ha, 20 cows, 5 pigs, very well handled manure. Grows alfalfa, sugar beets, maize, and wheat. Uses manure, and NPK and urea fertilisers.

9. A mid family pig farm in expansion 4

The farm has 11 ha, but is renting additional 300 ha next year. 15 sows now, but is building for a sectioned stable for 2000 finishing pigs. Will later build stables for weaners as well. Grows wheat and triticale.

10. A dairy cattle family farm 5

The farm has 43 ha, 15 cows, 10 pigs. Grows wheat, sunflower, maize for silage, and alfalfa. Have old manure spreader, uses manure, NPK and urea.

11. A dairy cattle agriculture enterprise farm

The farm has 30 ha plus 70 ha rented. 150 Holstein-Frisian cattle, hereof 80 cows, but is increasing to 100 ha. Grows maize for silage (yield 400 tons from 15 ha), barley, triticale, and alfalfa. 400,000 litres of milk sold per year. All manure goes to the 30 ha plus urea. A stable for 100 dairy cows has just been constructed, only the milking parlour is not finished yet.

12. Medium dairy cattle family farm 6

The farm was not interested to cooperate.

7. SELECTION OF FARMS

7.1. Selection criteria

Farms in the region were selected to reflect the typical situation in agriculture of the region.

Three types of farms were considered:

- dominating traditional small mixed farms above 10 ha with cattle or pigs
- medium-scale farm enterprises in development (expanding commercial farms)
- large old-fashioned enterprise farms in transition

Selection process:

1. Farms were also selected to represent dominated cattle dairy and pig sector as the main source of pollution in the region.
2. The second step of the selection process was a reality check. The checking criteria was possibility to make a large difference on the farm with small scale investments and transfer of knowledge. Being limited in resources, after doing first survey we had to drop those large farms which refuse to cooperate or their wish to cooperate was not followed by real possibility to make difference with available assets, due to huge problems with production technology in place. We had to give up of two farms, one poultry and one cattle farm of large size and one medium-size family owned cattle dairy farm.
3. The third step was to check with farms what is their opinion of suggested best agriculture practices, their need and possibility for them to be implemented. The expressed interest was compared once more with the scale of the problem for which wish was expressed to be solved and possibilities with available budget.

Being privatised recently and still with not clear future one of farms was omitted because their production technology and facilities are so bad that can't be upgraded, but completely replaced.

Also the large cattle farm which was also privatised during last few years has to be omitted from the list of those which will hold some kind of demonstration activity. It was too large and complicated in management structure, to be even observed for collecting data, and plus to that their willingness for cooperation was connected with support for large investments which project was not capable for. Being an enterprise they are also not eligible for grants and credits provided from Ministry of agriculture, forestry and water management, which seems to be the only source of additional money for launching serious operations which can help this farm improve agriculture practices. Also this farm management was not very keen in voluntary demonstrations, and their organisation seems to be complicated for later demonstration of pilot projects. The last, but not least is the fact that demonstration fields on this farm had to be huge in size, since all available land plots are too large, so they are not willing to cut them in to peaces for demonstrating different fertilising practices, except these are not done under special arrangements such they use to have with commercial demonstrations (dealers and companies which produce different chemicals and seeds).

7.2. Selected farms

The Project have selected 8 Farms for further negotiations to participate: 3 farms with pig production, one medium in expansion and two larger medium farm enterprises, all privately owned and in expansion. 2 dairy cattle farms were also selected – one small and one medium privately owned, both in expansion. 3 farms with mixed production, but mainly cattle dairy family farms were selected. All of these farms were very positive for cooperation with the project, and has signed a preliminary cooperation agreement (Annex A). Farms, according to detailed assessment have the following characteristics:

ID farm 1

This is a small family dairy farm on which changes have started with modernization of equipment and machinery, but still organized in old fashioned way. Production is based on the following resources:

Dairy cows	19
Heifers	10.5
Calves	2.5
Bulls for slaughter	1.0
Ha	55

The main problem of this farm is bad way of manure management. Storing is inappropriate - improvised, on land surface, no floor, no fence or wall; manure is not prevented to pollute soil and not stored properly to preserve its value. Distribution is bad because of worn-out manure spreader with narrow spreading capacity



ID farm 2

This is a medium-large private cattle dairy farm which is example of developing process occurring in the strongest farms in the region which are dealing with dairy production. It has been recently constructed and filled with animals using large own investments and state grants, but not completed yet. It is based on the following resources.

Dairy cows	124
Heifers	20.0
Calves	13.0
Ha	30

This expanding farm is not completed yet. The main missing thing considering reduction of pollution is manure storing place and scraper in the stable. At the moment farm is in mud and dirt, with animals in very bad condition. Farmers needs lot of knowledge and technical assistance to provide their farm functioning in really efficient way.



 ID farm 3

This is a medium private farm enterprise with fatteners and egg production which provides some concentrated feeds on their own crop fields. It is successful, but still expanding and have to be organized better. It is based on the following resources:

Fatteners	1,400.0
Laying hens	1,000.0
Ha	40

This is a modern farm in lot of aspects, but with same problems connected to rational nutrient cycling because of limited capacity of slurry tanks. Also distributing equipment is primitive. Farm have insufficient land to distribute slurry, so often spread it without control in surroundings.



 ID farm 4 –

This is a typical successful medium private farm enterprise with whole cycle pig production in expansion. Farm is based on following resources:

Sows	63.3
Piglets	1270
Fatteners	1270
Ha	200

This farm have is recently increased its land possession by leasing 1.200 ha of land, however on remote place which provides no functional connection with the existing farm.

All slurry produced on farms is used on farm crops. There is not enough slurry for 200 ha, which is close to the farm, but since tanks for storing slurry are not sufficient to hold slurry, farm still wastes slurry in May and Jun by spreading it on neighboring farms.



ID farm 5

This is a typical traditional small family mixed (dairy cattle-beef-pig-crops) farm of the region which compromise livestock production and crop production which is mainly intended to produce feeds. Farm is very poor considering equipment and machinery. It is based on the following resources.

Sows	2.5
Piglets	20.0
Fatteners	20.0
Dairy cows	3
Heifers	2.5
Calves	2.5
Bulls for slaughter	1.0
Ha	18

Critical for this farm is collecting and storing of manure, as much as distribution, however production of manure on this farms is so small that purchase of required machinery for appropriate distribution of manure on this farm was never seriously considered. Building manure storage place, however seems to be priority.



ID farm 6

This is a farm with mixed crop-livestock production (dairy cattle-crop farm) which is example of farm on which crop production dominates and livestock production is not very well organised. The production is based on the following resources:

Dairy cows	21.5
Heifers	2.0
Calves	13.5
Ha	100

Critical for this farm is collecting and storing of manure. Farm is a pure disaster considering stables, which are actually few improvised shelters plus one old stable without even basic conditions for dissent keeping of animals and collection of manure and effluents-liquid parts of manure. Effluents are running from shelter all around the farm in small creeks merging with those coming from stored manure and sucked in to soil. After manure is manually collected from stable, together with straw it's stored in improvised way on two places in the yard. Manure is losing in many ways its value and polluting environment. From other side this is a good example of over-equipped farm with different machinery which is not used in full capacity and rationally.



ID farm 7

This is a typical mixed family dairy cattle-beef-pig farm with diverse productions, and well maintained in classical way. However farm is not well equipped, stables insufficient and production might be better organized. The production is as follows.

Sows	2.0
Piglets	20.0
Fatteners	20.0
Dairy cows	5.0
Heifers	3.5
Calves	3.0
Bulls for slaughter	1.5
Ha	18

This farm has few problems considering manure management. One is definitely storing of manure directly on soil, another manual distribution on fields. Considering their good habits in storing manure in very organized way, improving it with concrete storage and better distribution through purchase of manure distributor will help this farm look fine.



ID farm 8

This small private pig farm enterprise in expansion is a typical farm owned by young entrepreneur which is developing ambitiously, using recently large investments, but without sufficient knowledge about the organisation of the farm now appropriate dynamics for its development. The production on the farm is based on the following figures:

Sows	27.5
Piglets	500.0
Fatteners	300.0
Ha	11

Although in expansion, this is a farm which still hasn't solved basic problems. The critical issue is storing and management of slurry. What is missing are tanks, mixing and pumping equipment and distribution equipment. At the same time farmer plan to expand production, and again have no plans about increasing manure storing capacities. Farm poses no sufficient land surfaces to use rationally manure produced at the moment and even less if farm expand, but plans about expanding land possession exist, although pretty uncertain.

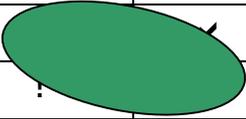


8. PLANNED INTERVENTIONS ON EACH FARM

The planning interventions on the 8 farms have been taken in the following steps:

- a) Signing of an agreement with the farmers (the agreement is shown in Annex A) following the workshop on 24 January 2006. Each farmer stipulates in the agreement which BAPs he is interested to cooperate on.
- b) Further clarification of the possibilities and wishes during farm visits in the days 3 to 5 February 2006. It was in this connection decided to exclude 1 of the farms – the large pig farm Senchanj; it had been clarified that the slurry on the farm due to diluting with water had a dry matter content of less than 1 % (!!!) and it would require rebuilding of the stables with better manure removal systems to handle this problem. The farm had further been sold to Slovenian owners, and we felt on this basis an uncertainty about the possibilities for reaching of an agreement which would bind the farm to some immediate, large and necessary investments.
- c) Full proposals elaborated for each farm, including estimated costs and timing of the interventions.
- d) Presentation of the inventions, their costs and the possibilities for economic support from the state and the project on a meeting in Belgrade. 6 farmers participated (from farm No 1, 2, 4, 6, 7 and 8). A representative from Ministry of Agriculture, Forestry and Water Management was present to explain the procedures, timing and preconditions for getting state support for investments. Further an advisor in farm buildings from Institute for Animal Husbandry, Belgrade was present to supplement the project staff on the technical issues in building storage for manure. The Project presented a draft proposal for an agreement for the farmers, see Annex C: Example on letter to pilot farms and answer letter

On basis of this the following interventions are planned:

BAP No	Farm No.							
	1	2	3	4	5	6	7	8
	Small family dairy farm	Medium-large private cattle dairy farm	Medium private farm enterprise	Medium private farm enterprise	Traditional small family mixed farm	Farm with mixed crop-livestock production	Mixed family dairy cattle-beef-pig farm	Small private pig farm enterprise in expansion
1	Basic cooperation between the project and all the farms							
2								
3								
4								
5	✓	✓	✓	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓	✓	✓	✓
7	✓	! a		✓	✓	✓	✓	✓
8	■	■	!	!	!d	■	■	■
9	■	■	✓	✓	!d	■	■	■
10	■	■	■	■	!d	■	■	■
11								
12	■	■	■	■	■	■	■	■
13	■	■	■	■	■	■	■	■
14	■	□	■	■	□	■	■	■
15	■	□	■	□	□	■	□	□

- ✓ In order already
- ! Not in order, but the farmer says he will resolve the problem, and we can anyway not do anything from the project side
- Project intervention
-  Farmer cooperation to be established
- Not in order, but the farmer did not wish to cooperate on this BAT
- a There is a reason to believe that he will be able to take over 300 ha land, which is now communal grazing area, in the near future.
- b The problem shall be solved by cooperation with Dragisha Boric – together they have land enough for the present production, and almost enough even with planned expansion of the production.
- c The problem shall be solved by cooperation with Dragish Boric, who shall build additional manure storage capacity and buy transport/spreading equipment for slurry. The slurry can be moved from the store of Rajka Kandic to the larger store (in the future) of Dragish Boric according to needs. The most of the slurry will anyway go to his fields.

- d He has presently no store (only a small, insufficient liquid manure store) for the present small pig production. He plans to build new stables and manure stores for 100 sows + fatteners and move the fatteners to the present stables and convert them to slurry production, so there is no idea in trying to uphold the present situation.
- e Some equipment exist.
- f Needed to resolve in other way.

The interventions related with BAPs 8 and 11 require investments for which the farmers can apply MAFWM for subsidies.

9. TIMING ON INTERVENTIONS ON EACH FARM

The following timing of the interventions is planned:

BAP No	BAP	Month											
		2	3	4	5	6	7	8	9	10	11	12	1
1	Nutrient balance calculations												
	1.1 Collect data for nutrient balances	X											
	1.2 Elaborate Serbian nutrient balance program	X											
	1.3 Prepare nutrient balance calculations	X											
2	Soil sampling	X											
3	Field and fertiliser planning												
	3.1 Collect data for field and fertiliser plans in connection to soil sampling	X											
	3.2 Elaborate Serbian field and fertiliser plan program	X											
	3.3 Preparation of field and fertiliser plans	X											
	3.4 Seminar on results of nutrient balance calculations and fertiliser planning		X										
4	Milk recording and feeding planning												
	4.1 Transfer of cattle herds to milk recording under ZAI		X	X									

BAP No	BAP	Month											
		2	3	4	5	6	7	8	9	10	11	12	1
	4.2 Seminar on cattle feeding and milk recording – focus on summer feeding and preparation of winter forage				X								
	4.3 Seminar on pig feeding – focus on protein level and phosphorus norms				X								
	4.4 Individual feeding planning and preparation of monthly feed lists									X	X	X	X
5	Hinder dilution with water from cleaning of stables	Already in order											
6	Hinder spill of water from water nipples												
7	Maximally 170 kg N in livestock manure per ha	Where problem, this follows passively establishing of manure storage capacity											
8	Manure storage facilities												
	8.1 Calculate necessary manure storage capacity	X											
	8.2 Conduct seminar on design of manure stores and estimate of price	X											
	8.3 Individual establishment of manure storage facilities					X	X	X	X	X			
	8.4 Open days at established stores										X		
9	Hinder rain water dilutes the manure	Where problem, this follows passively establishing of manure storage capacity											

BAP No	BAP	Month											
		2	3	4	5	6	7	8	9	10	11	12	1
10	No spreading from 15 October till 1 March												
11	Use of proper transport / spreading technology												
	11.1 Visit to other joint machine rings in Serbia	X											
	11.2 Farmers collect offers	X											
	11.3 Equipment is procured					X	X	X	X	X			
12	Incorporation of manure into the soil before 6 hours	Question of management											
13	Spraying planning												
	13.1 Seminar on planning of spraying with preparation of plans for each farm			X									
	13.2 Visits to each farm 3 times for check of fields and adjustment of plans				X	X	X						
14	Test of spraying equipment												
	14.1 Procurement of simple equipment for test of field sprayers			X									
	14.2 Test of field sprayers												
15	Locked store for pesticides				X								

10. BUDGET

To calculate the figures the amount of manure ex. storage (the principle of manure ex. storage reflects EU rules) has to be known. As an input to the calculation of the amount of manure ex. storage the project has elaborated a draft manure standard (see Annex D: Serbian manure standard), based upon information achieved from the farms during the farm visits.

A way to optimise the use of expensive machinery for spreading manure is to share the requirement between a number of farms. An example of an agreement between the farmers sharing machinery for spreading manure is shown in Annex F: Standard by-laws for joint machine pool.

The following table shows budget for pilot project budget split on activities on each farm. The table shows total costs of the interventions plus the part of costs the project has possibility to contribute with:

	Farm No 1	Farm No 2	Farm No 3	Farm No 4	Farm No 3 & 4	Farm No 6	Farm No 7	Farm No 8
No. of livestock								
Sows					27.5	2.5	-	2.0
Sows				63.3	-			
10 piglets produced				127.0	50.0	2.0	-	2.0
10 piglets produced								
10 fatteners produced								2.0
10 fatteners produced			140.0	127.0	30.0	2.0	-	
Dairy cows	19.0							
Dairy cows		140.0				3.0	21.5	5.0
Heifers	7.0	50.0				2.5	2.0	3.5
Calves	2.0	10.0				2.5	13.5	3.0
Bulls for slaughter	-					1.0	-	1.5
Suckler cows with calves								
Horses								
Sheep		15.0						
100 laying hens			10.0					
Amounts								
Ha	55	30	40	200	11	18	100	18
Tonnes	336	1,972	859	1,345	239	81	292	110
Kg N	1,725	10,342	5,452	6,918	1,912	440	1,503	580
Kg P	343	2,062	1,249	1,698	523	102	311	132
Kg K	1,848	11,409	2,575	3,357	688	342	1,540	519
Harmony								
Tonnes per ha	6.1	65.7	21.5	6.7	21.7	4.5	2.9	6.1
N per ha	31	345	136	35	174	24	15	32
P per ha	6	69	31	8	48	6	3	7
K per ha	34	380	64	17	63	19	15	29
Value of manure								
N value, €/kg	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
P value, €/kg	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Value of manure with 80% field effect, €	1,258	7,547	4,148	5,381	1,543	336	1,109	441
Do, din	103,148	618,872	340,122	441,250	126,516	27,518	90,932	36,133
Necessary storage								
Additional washing water, etc.		420.0						

	Farm No 1	Farm No 2	Farm No 3	Farm No 4	Farm No 3 & 4	Farm No 6	Farm No 7	Farm No 8
Necessary 6 months storage capacity, tonnes	168	1,196	429	672	119	41	146	55
Necessary 6 months storage capacity, kbm. (+10% for solid manure)	185	1,316	429	672	119	45	161	60
Present storage capacity, kbm.	-	-	120	200	30			3
Necessary size of stores (+10%), kbm.	204	1,447	340	519	98	49	177	63

Price of manure store

Type of manure store	Store for solid and liquid manure	Store for solid and liquid manure	Slurry tank	Slurry tank	Slurry tank	Store for solid and liquid manure	Store for solid and liquid manure	Store for solid and liquid manure
Diametre/side-length	10	27	6.0	7.4	3.2	5	9	6
Kbm concrete	1.5	4.0				0.7	1.4	0.8
Kbm reinforced concrete	28	142	30	44	11	11	25	12
Kbm sand	18	117	21	32	8	5	16	6
Price normal concrete, din/kbm	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300
price, reinforced concrete, din/kbm.	7,100	7,100	7,100	7,100	7,100	7,100	7,100	7,100
Price of sand, din/kbm	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Price of concrete, reinforcement and sand, din	228,536	1,148,213	235,890	344,609	83,549	84,797	205,460	99,666
Possible subsidies	114,268	574,106			41,775	50,878	123,276	59,800
Project cost, €	1,394	2,125	1,438	2,101	509	414	1,002	486
Farmers own contribution, including own works	-	399,856				-	-	-

Price of equipment

Solid manure spreader	Continue present practice	Continue present practice	Not necessary	Not necessary	Not necessary	Continue present practice	Continue present practice	Continue present practice
Liquid manure spreader incl pump	Cooperate with Kandic + Dragish	Cooperate with Kandic + Dragish		2,460,000	Cooperate with Kandic + Dragish			
Slurry mixer	Not necessary	Not necessary		820,000		Not necessary	Not necessary	Not necessary
Total, din		-		2,460,000				-
Possible subsidies	-	-		738,000		-	-	-
Project cost, €				9,250				-
Farmers own contribution, including own works	-	-		963,500		-	-	-

11. POSSIBILITIES FOR SUPPORT FROM OTHER SOURCES

The possibilities for support from suppliers of equipment (e.g. Samson Agro A/S in Denmark) has been investigated, but although there were interest from the suppliers the project has not been able to making agreement.

Support possibilities from state and regional funds has also been investigated.

MAFWM Rural development grant scheme (30-60% of reimbursement for registered farmers up to 40 years old (optional 55 for marginal areas – in the region only Sechanj municipality) for investments in primary production and marketing, agriculture and rural economy diversification and agro-environmental work, rural infrastructure and organic agriculture (see more details in attached directive)

MAFWM Investments in agriculture grant scheme (30-50% of reimbursement for registered farmer no matter of age for investments in machinery, equipment and facilities in primary production, processing, packaging and storing

MAFWM Subsidised credit lines, short and long term credit lines operated through commercial banks for all kinds of investments in inputs (short-term) and hardware of primary production and marketing

Voivodina Secretariat rural development grant schemes - agri-environmental part) – details still not defined, will be available as soon as issued in Secretariat.

ANNEX A: OUTLINE FOR AN AGREEMENT WITH THE FARMERS

1. The agreeing partners are the UNDP/GEF Danube Regional Project, represented by Local project Co-ordinator, Mr Slobodan Milosovic and farm owner, Mr _____.
2. The agreement period is from signature of this agreement till project end 31 January 2007 with a possible extension till 30 June 2007.
3. The farm owner declares that his farm to his understanding already respects the following BAPs (tick off in the table below), and
4. that the farm owner is committed to implement the indicated BAPs on his farm in cooperation with the project (ticks in the table below), here under the compulsory BAPs.

BAP no.	BAP	Already implemented on the farm (tick off)	Agreed cooperation under this agreement (tick off)
1	Green accounts one time per year		Compulsory for 2005
2	Soil analyses one time per 5 years		Compulsory for minimum one test field of minimum 5 ha to be selected
3	Crop rotation and fertiliser planning one time per year		
4	Feed balancing minimum 2 times per year		
5	Renovation of stables to avoid cleaning of stables with water		
6	Renovation of watering nipples and alike to avoid spill of water in the stable		
7	Maximally 170 kg N in livestock manure per ha		
8	Minimum 6 months storage capacity for livestock manure		
9	Rain water is collected separately to avoid diluting of livestock manure with rain water		
10	No spreading of livestock manure in the wintertime or on frozen or sloping fields		
11	Use of proper livestock manure spreading technology (especially for liquid manure)		
12	Incorporation of livestock manure into the soil before 6 hours after spreading (for broad-spread manure)		
13	Crop protection planning and use of reduced doses		
14	Test and renovation of field sprayer minimum once per 5 years		
15	Installation of locked store and book keeping of purchase and use of PPP		

5. The farm owner agrees to cover his/her part of the costs of the implementation of the indicated BAPs. The project gives a financial support to the implementation costs in the following way: Presented and official invoices for purchase of eligible and agreed services, equipment or building materials are reimbursed with 75% of the costs exclusive of VAT. The VAT part shall appear from the invoice. Payment is done by the project co-ordinator within 2 weeks after presentation and approval of the invoices.
6. The project reserves the right to refuse to cooperate on specific BAPs in case the project budget for support to implement BAPs already have been reserved. The agreement would in that case have to be revised.
7. The farm owner agree in connection with this agreement to
 - deliver requested information for calculation of N and P balances and for the estimation of the use of PPP
 - perform the requested registrations about farm operations, here under registrations of purchased or used inputs in the production, sale of farm products, dates of specific operations, etc.
 - allow the organising of open days on the farm and the use of data on the calculated or estimated economic and environmental effect of the implemented BAPs on the farm
8. In case the farm owner violates this agreement or if it is terminated after wish of the farmer, then he/she is obliged to pay back the financial support already given by the project.

Signed at _____ in _____

Project Co-ordinator _____

Farm owner _____

ANNEX B: PROPOSAL FOR AGREEMENT WITH ZRENJANIN AGRICULTURAL INSTITUTE

The project can offer

- on-the-job training of 5-8 advisers in the following specialisms, including test and certification by project end
 - Nutrient balance calculations
 - Field and fertiliser planning
 - Plant protection
 - Milk recording and feeding planning for dairy cows
 - Organisation of farmers
- the ZAI can take over the use of the field and fertiliser plan programme the project will develop;
- the ZAI can take over the use of the nutrient balance programme the project will develop;
- the ZAI can take over the use of possible other sheets and computer models the project will develop;

The project expects on the other hand that the ZAI and the involved advisers as part of their on-the-job training will perform the following:

- Participate in nutrient balance calculations and do this for at least one farm independently.
- Undertake soil analysing and participate in soil sampling – the results of the soil analyses have to be ready till 1 March (if the soils are not frozen);
- Participate in the collection of information for field and fertiliser planning in connection with soil sampling;
- Carry out field and fertiliser planning for some of the farms according the instructions we give latest 1 March;
- Convert the pilot farms with cattle to monthly milk recording under the ZAI latest 1 May 2006;
- Participate in dairy cow feeding planning in Autumn 2006 and carry out feeding planning for some of the farms according the instructions we give. Ensure update of monthly feed lists to all the dairy cattle farms in the period September 2006 till February 2007.
- Participate in the formulation of written agreements on establishing of joint machine cooperation.

It is informed, that the trainees will be the following persons:

No	Name	Tel.	Specialisation
1			Nutrient balance calculations
2			Field and fertiliser planning
3			Cattle feeding and milk recording
4			Organisation of farmers

There can maximally be 2 trainees per subject.

Approved on _____ at _____

Signature:

ANNEX C: EXAMPLE ON LETTER TO PILOT FARMS AND ANSWER LETTER

Dear Aleksandar Moldovan,

Based on your interest for cooperation with the project and our preliminary investigations for the possibilities on your farm we have the following, concrete proposal for cooperation:

1. We have already collected data for calculation of nutrient balances for 2005 concerning N and P. You will get the results around 1 March.
2. We will come and sample all fields and ensure the samples are analysed, hopefully before 1 March and in any case as soon as possible. Probably staff of Zrenjanin Agricultural Institute will assist us with this.
3. We will prepare field and fertiliser plans for your farm as soon as we have the results of the soil analyses, hopefully around 1 March. Data for calculations will be collected when we come for soil sampling. We will in this connection invite you for a seminar on nutrient balance calculations and field and fertiliser planning in March.
4. We will ensure that your dairy cows are transferred to milk recording under Zrenjanin Agricultural Institute latest 1 May. You will be invited for a seminar on cattle feeding in May. Preparation of feeding plans and monthly feeding lists on basis of milk recording will start from September 2006.
5. We have not found any problems with spill of water from cleaning of stables, and
6. neither any problems with spill from watering of livestock
7. The livestock density on your farm is well below the indicative level of 170 kg nitrogen in livestock manure ex storage per ha - see the tables below.
8. The necessary storage capacity for livestock manure at your farm is shown below:

		Aleksandar Moldovan
No. of livestock		
Dairy cows		17
Heifers		7
Calves		2
Bulls for slaughter		
Amounts		
Ha		55
Tonnes		305
Kg N		1,567
Kg P		312
Kg K		1,677
Harmony		
Tonnes per ha		5.6
N per ha		28
P per ha		6
K per ha		30
Value of manure		
N value, €/kg		0.65
P value, €/kg		1.30
Value of manure with 80% field effect, €		1,143
Do, din		93,732

Aleksandar Moldovan	
Necessary storage	
Necessary 6 months storage capacity, kbm.	153
Present storage capacity, kbm.	-
Necessary size of stores (+10%)	168
Price of manure store	
Type of manure store	Squared separation store with 1.5 metre walls
Diametre/side-length	9
Kbm concrete	15
Kbm reinforced concrete	17
Kbm sand	25
Price normal concrete, din/kbm	4,000
price, reinforced concrete, din/kbm.	6,000
Price of sand, din/kbm	2,000
Price of materials for storage, din	209,825
Possible subsidies	104,912
Project cost, €	1,279
Farmers own contribution, including own works	-
Price of equipment	
Solid manure spreader	Use existing
Liquid manure spreader	!
Pump	!
Slurry mixer	Not necessary
Total, din	
Possible subsidies	-
Project cost, €	
Farmers own contribution, including own works	-

It is a condition for financial support from the project that you take the necessary steps to apply for subsidies for the manure stores.

9. The manure store shall be built in a way that will lead to minimum dilution of the manure with rain water. It is a requirement that you participate in a seminar on design and construction of manure stores that will be held on Friday 24 February.
10. We anticipate that you after the building of the manure store will ensure not to spread manure in the period from 15 October till 1 March, and in any case not on to frozen land or land with a slope of more than 7°.
11. Proper technology should be used for spreading of livestock manure. Liquid manure and slurry should be spread with band laying system or be injected into the soil. We suggest that you continue to use your solid manure spreader. It is for the spreading of the liquid manure a condition for our cooperation that you form an agreement on use of liquid manure spreader and pump with Radovan Padejski, and that you take part in an excursion to visit other farmers, who cooperate on ownership and use of farm machinery.
12. We remind that livestock manure should be incorporated into the soil within 6 hours in case it is not spread onto land with growing plants.
13. We will organise a seminar in April concerning planning of plant protection on your farm, and further ensure that the indicative plan is followed up with visits from advisers 2-3 times in the growing season for adjustment of the plan to the situation.
14. We offer a test of your field sprayer in April.
15. We will during the project period find a solution for a locked store for pesticides.

The cooperation we offer is in general given on the condition that

- You agree to cover your part of the costs of the interventions as stipulated above. The project gives a financial support in the following way: Presented and official invoices for purchase of eligible and agreed services, equipment or building materials are reimbursed with the costs exclusive of VAT. The VAT part shall appear from the invoice. Payment is done by the project co-ordinator within 2 weeks after presentation and approval of the invoices.
- The project reserves the right to change the proposed cooperation in case Radovan Padejski refuse to cooperate with the project.
- You perform any requested registrations about farm operations, here under registrations of purchased or used inputs in the production, sale of farm products, dates of specific operations, etc.
- You allow the organising of open days on the farm and the use of data on the calculated or estimated economic and environmental effect of the implemented BAPs on the farm

In case you violate this cooperation or if it is terminated after wish from your side, then you are obliged to pay back the financial support already given by the project.

Please confirm by your signature on the below statement that you agree to the above.

Best regards,

Slobodan Milosevic

To Slobodan Milosevic

Concerning BAP interventions on my farm

I agree to the proposed cooperation in your letter of 10 February. I have the following comments:

Best regards,

Aleksandar Moldovan

ANNEX D: SERBIAN MANURE STANDARD

Id	Livestock type	Productivity level	Housing system	Bedding type	Tonnes	kg N/t	kg P/t	kg K/t	kg P2O5/t	kg K2O/t	N total	P total	K total
1	Sows	20 weaned piglets per sow per year of 7.5 kg	Solid floors with straw bedding, including marginal separate collection of urine	Straw	3.8	6.2	2.1	3.8	4.8	4.5	23.6	8.0	14.3
2	Sows	20 weaned piglets per sow per year of 7.5 kg	Partly or fully slotted floors	Sawdust or nothing	6.8	4.6	1.3	1.8	3.0	2.2	31.1	8.8	12.2
3	10 piglets produced	From 7.5 to 25 kg	Solid floors with straw bedding, including marginal separate collection of urine	Straw	1.1	4.3	1.5	3.5	3.4	4.2	4.7	1.7	3.8
4	10 piglets produced	From 7.5 to 25 kg	Partly or fully slotted floors	Sawdust or nothing	1.6	4.4	1.2	2.2	2.7	2.6	7.2	2.0	3.6
5	10 fatteners produced	From 25 to 105 kg	Solid floors with straw bedding, including marginal separate collection of urine	Straw	5.3	5.1	1.4	3.6	3.3	4.3	26.5	7.6	18.7
6	10 fatteners produced	From 25 to 105 kg	Partly or fully slotted floors	Sawdust or nothing	6.1	5.6	1.2	2.7	2.7	3.3	34.3	7.4	16.5
7	Dairy cows	6,000 kg milk per cow per year	Solid floors with straw bedding, including marginal separate collection of urine	Straw	15.5	5.1	1.0	5.5	2.3	6.6	79.1	15.5	85.3
8	Dairy cows	4,000 kg milk per cow per year	Solid floors with straw bedding, including marginal separate collection of urine	Straw	12.0	5.1	1.0	5.5	2.3	6.6	61.2	12.0	66.0
9	Heifers	From 6 months to calving, 700 gram daily gain	Solid floors with straw bedding, including marginal separate collection of urine	Straw	5.5	5.3	1.1	5.7	2.5	6.9	29.2	6.1	31.4
10	Calves	Up to 6 months age, 800 gram daily gain	Solid floors with straw bedding, including marginal separate collection of urine	Straw	1.7	5.6	1.8	2.5	4.1	3.1	9.5	3.1	4.3
11	Bulls for slaughter	From 6 months age to 450 kg, 450 g,	Solid floors with straw bedding, including marginal separate collection of urine	Straw	3.5	6.5	1.4	4.0	3.2	4.8	22.8	4.9	14.0
12	Suckler cows with calves	1 calf per year, continental breed	Solid floors with straw bedding, including marginal separate collection of urine	Straw	9.8	5.5	1.0	6.5	2.3	7.8	53.9	9.8	63.7
13	Horses	600 kg live weight	Solid floors with straw bedding, including marginal separate collection of urine	Straw	5.1	8.3	1.8	13.4	4.1	16.1	42.3	9.2	68.3
14	Sheep	2 lambs per year, 150 gram daily gain	Solid floors with straw bedding, including marginal separate collection of urine	Straw	1.2	12.3	2.7	31.0	6.2	37.3	14.8	3.2	37.2
15	100 laying hens		Battery system, manure removal without adding of water	-	10.0	6.5	2.2	2.6	5.0	3.1	65.0	22.0	26.0

ANNEX F: STANDARD BY-LAWS FOR JOINT MACHINE POOL

The following by-laws were prepared by DAAS, National Centre, for use as a basis for Danish farmers entering of cooperation about joint ownership and operation of farm machinery.

The by-laws has been translated and adapted for use in this project as the pilot project interventions require 3 such farmer cooperation are established.

The by-laws should be translated to Serbian and used as a basis for farmer's discussions and modifications before signing of agreements.

AGREEMENT on joint ownership and cooperation about farm machinery

Clause 1

Signatories

_____, _____,
_____ and _____ (in the following:
Signatories) have today entered into this Agreement.

Clause 2

Purpose

The purpose of this Agreement is to regulate the joint ownership and cooperation about use of farm machinery.

Clause 3

Share of ownership

The share of ownership in each of the machines is variable from machine to machine. The share of each Signatory is agreed on the acquisition, however, conferring to Clause 5.

Agreement is necessary on acquisition of new machines.

Finance of new machines under this Agreement is made by each of the Signatories.

Clause 4

Liability, receipts and expenses

Receipts and expenses for each of the machines are distributed for each one of the machines according to share of ownership, however, conferring to Clause 5.

The Signatory who causes any damage to a machine under this agreement pays for the reparation expenses. If the value of the machine is improved during the reparation, then this improved part is shared between the Signatories according to their share of ownership.

Clause 5

If the area of one of the Signatories is extended or reduced, the Signatory has to pay, according to the changes in area, a proportionally bigger or smaller share in the maintenance costs and depreciation for the implicated machines.

If any of the Signatories area is extended by more than 30%, the other Signatories can demand that the Signatory with the extended area takes over a bigger share of ownership of the implicated machines.

The demand for a bigger share of ownership has to be made in writing within 3 months after the other Signatory has been informed about the extended area.

The price fixed for the transfer is that the machines from the date of acquisition and 10 years ahead are depreciated straight-line by 10% per annum to a value of zero.

Clause 6

The Signatories liability is only a joint and several liability when this is agreed upon, or if one of the Signatories has been legitimated to act on behalf of the co-ownership.

In case one of the Signatories has discharged outstanding liabilities of the co-ownership, including paying of outlay for the co-ownership, the mentioned Signatory has the right to immediate proportionate repayment from the other Signatories.

The debtor is obliged to pay interest of the non-payments 8 days after a written demand from the other Signatory. The interest is the discount rate plus 4%.

Non-payment of the above mentioned amount is to be perceived as an essential breach of the Agreement of co-ownership if the amount has not been paid within 2 weeks on written demand from the other Signatory.

Clause 7

The Signatories joining and outgoing

With accept of all Signatories new Signatories can be admitted on the condition that these accept the terms stipulated in this present Agreement.

Clause 8

One of the Signatories can for one or more machines cancel his participation in the co-ownership at 3 months notice, however, the expiry can only take place in the period from 1/1 to 28/2.

If one of the Signatories sells his farm, conferring to Clause 2, he can always cancel his participation at 6 months notice for expiry at the end of a month.

The co-ownership comes to an end according to the conditions stipulated in Clause 13.

Clause 9

The transfer of the share of ownership can only take place with accept of all Signatories.

In case one of the Signatories dies or has been declared incapable of managing his own affairs, the husband/wife of the mentioned Signatory has, however, always the right to join the Agreement. The notice about joining the Agreement shall be stated in writing and given to the other Signatory not later than 3 months after the Signatory in question has received the notice about the incapability of affairs or death.

If the husband/wife does not want to join the Agreement, then the joint co-ownership stops irrespective of what is put down in Clause 8, with effect at the end of the calendar year, in which the Signatory died or has been declared incapable of managing his own affairs or immediately after the mentioned 3 months notice.

The husband/wife joining the Agreement receives the same rights and duties as the outgoing Signatory.

In case of discontinuation the co-ownership comes to an end according to the terms stipulated in Clause 13.

Clause 10

The co-ownership stops without any further notice if one of the Signatories goes bankrupt, irrespective of Clause 8, with effect at the end of the calendar year.

The discontinuation of the co-ownership happens according to the terms stipulated in Clause 13.

Clause 11

Planning of right of use and maintenance, etc.

The Signatories have a meeting as often as required. At the end of March they exchange crop plans. In this way the Signatories have the possibility of planning the coming season together.

A decision report is made on the agreed terms at the meetings.

The Signatories can in complete agreement rent the co-owned machines to work as a machine pool for others. The rent is fixed in complete agreement for each machine.

According to share of ownership the Signatories have the right to use the machines.

A Signatory has an obligation to inform the other Signatories in case a machine is not in use during the period where a Signatory has the right to use the machine. In such cases it can be agreed that one of the other Signatories use the machine instead.

A machine is picked up by the Signatory, who wants to use the machine. A machine can be picked up or delivered only at _____ or _____. Machines under this agreement have to be delivered in a good order, ready for use.

The preparation for the winter and storage takes place according to the joint ownership.

Clause 12

Default

If one of the Signatories has violated an obligation towards the joint ownership or the other Signatories seriously, the other Signatories can, regardless of Clause 8, in a written notice cancel

the agreement of joint ownership in the whole. The cancellation takes place at one months notice to the end of a calendar month.

The decision to cancel the joint ownership because of default shall be given in a written notice to the defaulter within a month after the Signatory, who is cancelling, has learned about the default.

The cancellation takes place according to the terms stipulated in Clause 13.

In case of default the defaulter has to pay a fine amounting to Dinar _____. The fine is indexed as to the net consumer-price index based on the value of Dinar per 1/1 2006. The fine goes to the other Signatories. Default based on the inability to pay, according to Clause 6, is not comprised by the fine.

The settlement of the fine does not excuse from the obligation to pay the compensation, and if one Signatory has caused the other Signatory or the joint ownership a loss, the one in question is responsible for the loss according to the Serbian laws common regulations for damages.

Clause 13

Ceasing

The joint ownership ceases to exist in whole or in part when this is decided according to the Clauses 8, 10 and 12, or when it is agreed upon by the Signatories.

Having the termination date as the date of completion, the joint ownerships accountant makes a final settlement. The final settlement comprises all rights and obligations.

The price for one or more of the joint farm machines is set by the Signatories in a closed envelope making their bid for one or more of the machines. Together with the joint ownerships accountant the bids are opened. The highest bidder has the obligation to buy. For each machine is a separate bid. Each one of the Signatories has got the right to invite a third party to make his bid.

The settlement from the accountant has to be ready within 4 weeks from the termination date.

Clause 14

Accounts

The Signatories appoint an accountant.

The joint machinery co-ownerships accounting year is the calendar year.

For each one of the machines separate accounts are kept, in which both receipts and expenses are included.

Profit and loss for each of the machines are distributed according to share of ownership, according to Clause 4 or the actual application, according to Clause 5.

A profit is distributed to the Signatories within 2 weeks after the completion of the accounts.

A loss is also to be settled within 2 weeks after the completion of the accounting year.

Clause 15

Insurance

The joint machinery co-ownership takes out the necessary and relevant personal property insurance and liability insurance.

The insurance premium is distributed according to the share of ownership.

Clause 16

Disputes/arbitration

Disputes between the Signatories concerning the interpretation of the present agreement or concerning the Signatories cooperation in view of the present agreement are to be settled finally by an arbitration tribunal.

The arbitration tribunal is performed by one or two impartial experts.

In case no agreement is reached about having only one arbitrator, the Signatories each appoint one.

When one of the Signatories has chosen his arbitrator and informed the other Signatory, and the other Signatory within a week has not appointed his, the first Signatory is entitled to have the judge in civil cases in _____ appoint the other arbitrator.

Before starting the transaction the arbitrators can appoint a third arbitrator. If no agreement can be reached, the third arbitrator is appointed by the judge in _____.

Each of the Signatories has the right to make comments in writing twice and does only have a fortnight each time to make the comments, unless the arbitrators are granting an extension of time.

If the deadline is disregarded the Signatory in question has lost his right to make further comments. Moreover, it is up to the arbitration itself to decide its procedure, including which supplementary documents it may want to be procured.

When the arbitrators have reached the stage of judgment, they are obliged to return a verdict within four weeks. If not so each of the Signatories has the right to reject the arbitration and demand the dispute to be settled in court.

The arbitrators determine who should pay the costs involved with the case.

The verdict ends the case completely and the case can therefore not be brought before the ordinary courts.

If questions to the understanding or meaning of this clause arise, the clauses of the arbitration law apply.

Any modification of the terms of this Agreement require accept of all Signatories. Any modification has to be written on a supplement to this Agreement, signed by each Signatory and attached to this Agreement.

If a practice is set on the conditions of the co-ownership, the practice can at any time be cancelled by each one of the parties. The notice of termination is to be made in writing to the other Signatories, and is binding on all future decisions.

Accepted on the date _____

AA

BB

CC

DD

ANNEX G: OUTLINES FOR NUTRIENT BALANCE CALCULATIONS FOR 2 FARMS

The farm balance

Harvest 2005

Rajka Kandic
Svetosavska 45
Lukicevo

0 LU
60 ha cultivated
0 LU per ha

Nutrient balance on the farm

	Items	kg N	kg P	kg K	kg Mg	kg S	kg Cu
1	Feed and straw	12163	2912	2660			
2	Mineral fertilizer	6055					
3	Seed	28	5	6			
4	Livestock	675	138	62			
5	Organic fertilizer						
6	Ammonia for straw						
7	Nitrogen fixating						
8	Deposition						
9	Total input to the farm	18921	3055	2728			
10	Livestock	4041	825	375			
11	Milk						
12	Eggs	239	26	17			
13	Crops (sale)						
14	Farmyard manure (sale)	2394	1260	1386			
15	Removal from the farm in total	4280	851	392			
16	On-farm produced feed - change in stock						
17	Change in herd						
18	Farmyard manure - change in stock						
19	Total change in stock on the farm						
20	Nutrient surplus on the farm	14641	2204	2336			
21	Nutrient surplus per ha	244	37	39			

06/02/2006

The farm balance**Harvest 2005**

Boric Dragisha

Bircaninova 71
Lukicevo0 LU
1700 ha cultivated
0 LU per ha**Nutrient balance on the farm**

	Items	kg N	kg P	kg K	kg Mg	kg S	kg Cu
1	Feed and straw	5838	2950	1454			
2	Mineral fertilizer	189000	37500	37500			
3	Seed	919	196	256			
4	Livestock	231	47	21			
5	Organic fertilizer						
6	Ammonia for straw						
7	Nitrogen fixating	11416					
8	Deposition	3000					
9	Total input to the farm	210404	40693	39231			
10	Livestock	1856	378	172			
11	Milk						
12	Eggs						
13	Crops (sale)	77249	15536	21190			
14	Farmyard manure (sale)	3477	1830	2013			
15	Removal from the farm in total	79105	15914	21362			
16	On-farm produced feed - change in stock						
17	Change in herd						
18	Farmyard manure - change in stock						
19	Total change in stock on the farm						
20	Nutrient surplus on the farm	131299	24779	17869			
21	Nutrient surplus per ha	77	15	11			

06/02/2006



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