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Adaptation of slovene livestock to environment friendly animal husbandry

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ABSTRACT

Environment friendly animal production is considered as the best production due to the natural conditions in Slovenia. Small farms, on average having 5-6 hectares are the main holders of Slovene agriculture. These small scale farms are oriented to animal production, where ruminants prevail. The prescribed number of animals per hectare of land for feedstuff production regarding European and Slovene legislation enables environment friendly methods of husbandry. In Slovenia there are eight large scale pig farms that produce 2/3 of fattened pigs for the market. On five smaller pig farms, slurry is applied on their own fields and on the fields of surrounding family farms. On three larger ones the slurry is separated and as concentrated organic fertiliser transported to the more distant fields. The remaining part of the slurry undergoes further processing. On one of the farms anaerobic rotting of slurry is performed, where the formation of bio-gas is used to provide electricity. Poultry manure is mostly used on the fields, only a smaller part as concentrated organic fertiliser. In Slovenia we are in the process of adaptation to the legislation which is in line with EU regulations and which provides minimal animal protection requirements in livestock production.
(Keywords: Slovenia, livestock, sustainable agriculture, legislation, practical use)

INTRODUCTION

The Republic of Slovenia belongs to the group of countries which have a very diverse relief and very different quality of agricultural land, both representing rather unfavourable conditions for intensive animal production. Two thirds of the farmland in Slovenia is spread on areas with such conditions, therefore it is difficult to organise intensive animal production without harmful effects on environment. Steep mountain slopes do not permit the usage of powerful mechanisation, and fragmented patches of land do not allow cheaper technologies, such as pasture. Small farms in these regions have to rely on production that can give best results in such limited conditions. Animal production proved to be one of them, enabling farmers to improve their income per land unit. However, small farms are the obstacle for more prosperous larger herds, and thus cheaper production on one hand, but on the other, they are the representatives of the picturesque and attractive Slovene countryside. They are also important for the development of tourism, offering additional employment, and promoting their farm goods by selling them to tourists. Home made farm products will be, as expected, even more appreciated when sustainable farming is introduced in these areas (*Osterc*, 1997).

Additional problem for the Slovene agriculture represents the karst, covering at least one third of the land. Underground world of the karst, and its permeable ground do

not allow industrial methods in animal production, neither the maximal level of fertilisation with animal manure, otherwise accepted in normal farming conditions.

In Slovenia there are few cultivated fields, only 0.08 hectares per capita, where grains for human nutrition, and concentrates for animal feeds can be produced. For this reason we produce less than half of grains for animal feeds, so more than half have to be purchased. The purchase of grains also means the purchase of many plant nutrients, which end up in manure. Inadequate usage of manure can therefore be a great burden to the land and harmful for the environment.

The mentioned factors are the main reasons why we consider environment friendly livestock production as the only real possibility for Slovene agriculture. After our independence in 1991, when we got our own state, we started to adapt the Slovene livestock production to sustainable production, which is at the same time environment friendly and also kind to animals (*Osterc*, 1998, 1998a). In the last decade a lot has been achieved, but we still have a lot of work in this respect.

THE STATE OF FACT IN SLOVENE AGRICULTURE

Slovene agriculture is dispersed. More than 90% of farmland is private in the possession of farmers, the rest is state owned, often given to farmers on lease. Private farms, also called family farms, are small (*Table 1*).

Table 1

Number of family farms in Slovenia; size structure in the period from 1991 to 2000

Year	No. of farms	Size of farms – ha ALU** (% rate)				Average size (ha)	
		Up to 2	2-5	5-10	Over 10	All the land	ALU
1991- ECF*	111951	34.1	36.5	21.8	7.6	7.8	4.1
2000	86336	26.6	35.2	25.6	12.6	...	5.3

*Source: SURS, 2000; Agricultural inventory 2000 – Data for April 2002; *European standard comparable farms; according to census 1991; **Agricultural land in use*

Data in *Table 1* also tell us that the number of farms in the last decade dropped for as much as 25615, or 22.9%, or 2.5% at yearly level. On average (9 years) 2846 farms were abandoned, which means that as many as 7 to 8 farms disappeared each day. According to the 1991 census on farm heritage and data on development ambitions on Slovene farms, *Kovačič* (2002) states that there are about 40% of farms, which are going to die out as production units with the flow out of the current generation. It is expected that in regard to this prognosis, the approximate number of 112000 farms (1991) will be reduced to 67000 by the year 2010, which also means that each year 2200 to 2300 farms will disappear. Furthermore, we can expect this process to be equally, if not even more intense in the next ten years, especially if we bare in mind the coming strict economic conditions. This means that by the year 2010 there will only be about 60000 farms left in Slovenia.

However, the decrease in the number of farms contributes to the improvement of size structure, which can be seen in *Table 1*. The presented data clearly shows the rising trend in size group above 5 hectares of farmland in use, and a falling trend in the smaller size group. Additionally, the average size of farms, measured in ha ALU, increased for as much as almost 30%. Similarly, the percentage rate of farms with over 10 ha of ALU

increased 66% in the last decade. But, there are still 87% farms cultivating less than 10 hectares of farmland. If the current trend of farm disappearance continues, the average functional size of farms may increase to close to 7 hectares of farmland. Compared to other European countries this does not contribute to the improvement of ownership structure.

According to *Kovačič* (2002) there are mostly cattle farms in Slovenia. In spite of drastic reduction in the number of farms in Slovenia, the number of cattle in the republic decreased only 10% in the last ten years. The remaining farms increased the number of cattle. Here, cattle production relies on feedstuff that is produced on the farms. Farmers are buying only the concentrates as the addition to the basic ration. On the majority of farms, milk production does not exceed 6000 kg of milk in lactation, therefore the additionally purchased concentrates in the ration also do not attain over 20% of dry matter. This means that the additionally purchased plant nutrients equal the amount of nutrients sold from the farm as animal products. Careful balance of nutrients enables these farmers to make the plant nutrients circle complete. This way they avoid overloading of environment with harmful plant nutrients.

Cattle – dairy cows and fattening bulls are produced also on farming enterprises which developed from the former state combinates and cooperatives. Here, the size of herds is adapted to the available agricultural land, so that all cattle manure is used on their own fields.

Sheep and goats – are also kept on farms, mostly depending on the available farmland. In the last ten years the number of sheep increased five times, and the number of goats three times. According to the statistical data there are about 100000 sheep and more than 22000 goats in Slovenia at present (*SURS*, 2002).

The situation is somehow different in the case of pig production. Close to 40% of pork is produced in Slovenia on eight large pig farms. Very large are three pig farms, where 60000 to 80000 fattening pigs can be produced on each of them annually. Most of the large farms have a problem of not having adequate farmland, where pig feedstuff could be produced. One of these farms is even without any farmland. It has to be mentioned that about 12.5% of the separated slurry is accepted by family farms close by and applied to their fields. Large farms are strongly or entirely dependent on feed purchase. Such high concentration and no farmland is a consequence of past industrialisation of Slovene agriculture. Today it represents a great obstacle in the efforts of adaptation to ecological requirements in livestock production. This problem was the reason why Slovenia made the decision in 1985 to abandon building of large scale pig farms, and rather promote pig production on small scale family farms. Currently, close to 60% of pork is produced on family farms. According to the analysis of 730 pig farms, we are talking of larger family farms with 8.9 hectares of their own farmland and 5.2 hectares of the land on lease (*Pribožič-Kramar*, 1999). About 125 pigs of all categories are produced here. The average animal unit (AU) / ha is 1.3 AU of pigs, or 2.0 AU of all animals per one hectare of the agricultural land. Self-supply of pork in Slovenia varies between 70% and 80%.

Poultry production is well developed in Slovenia. Poultry meat is produced much above the market needs. There is also enough turkey meat and hen eggs. The main part of poultry production is organised by three large enterprises. At the moment they are in the process of organised joined production. Heavy concentration of animals at one place is not a case here, because the mentioned enterprises organise the production through cooperative farmers, who also have enough farmland for poultry manure to be utilised.

ADAPTATION TO ENVIRONMENT FRIENDLY LIVESTOCK PRODUCTION IN SLOVENIA

Legislation and other regulations

By signing the Agenda 21 in Rio de Janeiro in 1992, Slovenia is, like other countries in this project, obliged to put all the efforts to the sustainable development in agriculture. Because of this agreement, and because of the previously mentioned sensitive environmental conditions, Slovenia joined the process of preparation and acceptance of legislation and other provisions which promote sustainable agriculture, and as such, also the sustainable livestock production.

In the year 1993 the Slovene Parliament adopted an important document "Strategy for Agricultural Development in Slovenia". With this document Slovenia accepted the obligation to develop its agriculture mostly on family farms, because here the principles of sustainable agriculture and thus eco-social development could best be implemented. Further to this, the agricultural principles of EU countries are stated in the mentioned document.

Following was the preparation and adoption of certain documents, representing the basics for the implementation of sustainable principles in Slovene livestock production, at the same time adapted to EU legislation.

Environment can be seriously threatened by unsuitable usage of animal manure, in regard to time and the amount. This is why the document "Provisions on application of dangerous substances and plant nutrients to soil" was accepted in 1996 (*Uradni list RS*, 1996, *Ministrstvo za okolje*…, 2000). This provision states maximal levels of plant nutrients permitted to be applied to the soil by using animal manure, annually. These levels are as follows: 210 kg nitrogen, 120 kg phosphorus – expressed as P_20_5, and 300 kg potassium – expressed as K_20. The prescribed levels allow farmers to have 3 animal units (AU, or 1500 kg live weight of cattle) per hectare of farmland, or 2 AU pigs, or 2 AU poultry. This provision also prescribes the most appropriate time for the application of separate fertilisers. If single economies do not have enough land for the utilisation of animal manure, they have to organise the acceptance of surplus by other owners or users of agricultural land, or they must organise reproduction and marketing of surplus manure. In 1996 the "Environmental Protection Act" and "Act on Veterinary Practice" were adopted, both discussing the problem at some places. In the same year the "Convention on Animal Biodiversity" was signed, and on the base of this document, "Gene Bank in Animal Husbandry" was founded. The latter presented grounds for the research project "Preservation of Autochthonous Farm Animal Breeds in Slovenia". Today, the research includes 18 autochthonous breeds of eight domestic animal species: 3 horse breeds, 1 cattle, 1 pig, 4 sheep, 1 goat, 1 poultry, 1 Carniolan honeybee, 1 Marble trout, and 5 autochthonous dog breeds (*Šalehar et al*., 2001).

"Animal Protection Act" was adopted in 1999 and lays down some ethological and ethical requirements for animal production.

A decree from 1996 was completed and adapted in the year 2000 with the "Guidelines on Good Agricultural Practices in Regard to Fertilisation" (*Uradni list RS*, 2000), where the exact instructions on storage and usage of animal manure are presented.

We also have to mention the important document "Rules and Regulations on Ecological Production of Farm Goods, Mainly Foodstuffs", where the rules for animal production are included.

Of large importance for the development of sustainable livestock production is in the year 2002 adopted "Act on Animal Husbandry" (*Uradni list RS*, 2002), dealing with exact methods for the sustainable livestock production, providing also the basics for financial support in different sustainable livestock production practice.

We have listed the most important provisions and guidelines, adapted to similar acts and documents in EU, and presenting the foundation for sustainable, environmental and animal friendly production. The mentioned documents enabled the acceptance of "Agri-environmental Programme of Slovenia" (SKOP) in 2001 (*Ministrstvo za kmetijstvo…*, 2001). It promotes the agricultural practice focused on its environmental function. Livestock production is part of agriculture therefore it will gradually adapt to the regulations on environmental protection. The adaptation will, no doubt, reduce negative and retain positive effects of livestock production on the environment. According to the programme, farms that will reduce animal density to 1.9 AU per hectare of farmland will get direct payments, as will farms, introducing one of the sustainable livestock production methods. Furthermore, direct payments are going to be provided for farmers who will start with mountain pasturing, as well as those, who will take over the production of autochthonous and traditional animals. SKOP has started the experimental period last year, and is expected to be fully practised by the year 2006.

ADAPTATION OF SEPARATE, ESSENTIAL ANIMAL SPECIES

As we have mentioned, the usage of animal manure is most dangerous for the environment, if inadequately used. Among different substances, nitrogen is the most threatening, because in bigger quantities it can be washed into the soil and can spoil underground natural water reserves. Other substances are just as dangerous, especially if they reach rivers, lakes, etc in bigger quantities. This is why we are going to present the adaptation efforts for separate, more important animal species. Methods for solving the problems on animal manure usage will be discussed, with the main goal to reduce or, if possible, to suppress the negative effects on the environment.

Cattle

In line with the Provision form 1996, cattle production family farms, as well as larger farming enterprises must have the number of animals adapted to the available farmland, so that they can use all the manure on their fields. On intense dairy farms and on farms with intense fattening of bulls, special problem represents the application of slurry. Some of these farms will have to arrange adequate capacities to store slurry for longer periods, which will enable slurry application to the fields at appropriate time of the year. Distribution of slurry is also problematic, since the farmers are still in need of equipment, which would allow as little nitrogen emission to the atmosphere as possible.

Lately, Slovenia is also facing the growing specialisation in cattle production. Less and less farmers are oriented to milk production, and more to the production of suckler cows. The number of suckler cows has reached 50% of cow population in Slovenia. This kind of production prevails in regions with unfavourable farming conditions, therefore there is no problem of burdening the environment with animal manure, for animal density is less than 1.9 AU per hectare of farmland. Currently, there is also a constant rise in the number of farms starting with ecological farming and introduction of farming control. Such farms have no problems with animal manure surplus.

Small ruminants

Sheep and goats are usually produced on less favourable areas, mostly hilly and mountainous regions. During summer months animals are outside on pastures and in winter they are kept in stables with deep litter. Thus, negative effects on environment are almost none.

Pigs

In Slovenia pigs are produced on family farms and on eight large scale pig farms, which were in the former Yugoslavia state owned, but are today private enterprises. Two thirds of all the pigs are produced on family farms, but due to lower productivity and slow turnover of herds, they produce only 40% of market pigs. Most family farms have enough farmland, their own or on lease, where the manure, mostly slurry can be applied. The situation is different on large pig farms. Although five of them made arrangements with neighbouring farmers to take the slurry and use it on their fields, there is still a problem occasionally, mostly in winter months, when the storage for slurry becomes too small. This happens on family farms and on large pig farms. On these problematic locations new storage capacities will have to be build.

Special problem in this respect are three large scale pig farms with the capacity of 60000 to 80000 fattening pigs each. One of them has no land where the slurry could be used. Anyhow, in line with the EU directive IPPC (Integrated Prevention and Pollution Control) these farms will have to adjust the production till 2010. They are trying to find the most suitable solution for the slurry problem, thinking of the application of purifying plant on the farm combined with complete purification on municipal plants. Pig slurry can easily sediment. This characteristic is favourable for the separation process, where the thinner part can be used for washing the canals in stables, and the thicker part, the result of further separation, represents concentrated organic fertiliser with 30% of DM. Concentrated manure can easily be transported to more distant farmland, and the farmers like to take it for the application on their fields. It can well be used for composting, as well. Many customers are interested in buying it. The remaining thin part of the slurry after the separation undergoes further processing. The most suitable proves to be anaerobic rotting, where the end product results in bio-gas. It is a mixture of methane and carbon dioxide in the rate 70:30, and used to produce electricity. In April this year Slovenia legally settled the usage of bio-gas following EU regulations and announced to purchase all the electrical energy by paying the guaranteed price. Thus, the anaerobic rotting of slurry and production of bio-gas became financially very interesting. The liquid, which remains after the rotting process, is planned to be drained to the municipal purifying plants. Unfortunately, the remaining liquid still has too high nitrogen content, so additional processes will be required to further reduce this element.

Still, we can easily say that a good work has already bore fruits, especially in the case of appropriate usage of pig and cattle slurry on cultivated land. In addition, quite some investments have been made in regard to slurry storage facilities, which are required mainly in winter months when the application of slurry is not allowed (from 15th November to 15th February). Much better are also the logistic processes in the transportation of slurry. In order to reduce the amount of slurry at its source (in and around the stables) the reduction of water used for technological processes and omission of meteoric water, both represent as much as 2/3 of the total amount of slurry in lagoons, have been strongly considered. In future plastic covers will be used on slurry storage lagoons, which will at the same time prevent the emission of ammonia to the atmosphere, thus reducing the unpleasant smell in the environment. Since the animals on small farms had been substantially reduced, the farmland is adequately scarcely fertilised with animal manure. Large livestock production farms can therefore without much effort find small farmers who are prepared to take the liquid fraction of slurry for the fertilisation of their fields. In such cases the separation process is not applied, especially if the storage capacities are big enough. The emission of ammonia to the atmosphere depends on the method of slurry application. The applying equipment and the methods

of application are constantly improving, but the prices of modern new mechanisation are very high. Therefore, governmental support on these investments would be appreciated.

Poultry

Owners of the majority (90%) of poultry in Slovenia are three poultry production enterprises; all three are in the process of joined production in one large enterprise. Each one will specialise in one line of poultry production. Apart from the egg production unit the mentioned enterprises have poultry production organised on farms throughout Slovenia. Such dispersion means low animal density, and the usage of poultry manure on the fields is not problematic. Yet, on some production plants, where such utilisation is not possible because of bigger amounts of poultry manure, they compost it and produce rich organic fertiliser. It can be bought in suitable shops everywhere in Slovenia. Fertiliser BOGATIN, for example, produced by JATA EMONA enterprise contains 75-85% DM, 45-55% organic matter, 5-6% nitrogen, 4-5% P_20_5, 2-3% K_20, 7-12% CaO, 1.5-2.5% MgO. It has pH value 6.6-7.0. People, who grow their own vegetables in small gardens, like to use organic fertiliser.

CONCLUSIONS

Because of the highly sensitive natural conditions for farming in Slovenia, because of the strong wish to preserve healthy environment and attractive countryside, to keep the agricultural land cultivated and in the function of successful food supplier, to keep the remote country areas populated, and because we wish to respect the EU requirements – Slovenia would like to become the EU member shortly – we have decided for environment friendly livestock production with respect to all the essential ethological requirements in animal husbandry. We are sure that in our conditions these goals can best be achieved on family farms (*Osterc* and *Ferlin*, 1996; *Osterc*, 1996a). Because of this strong belief we have stated in our political documents that we shall promote eco-social agriculture on family farms. After its independence in 1991 Slovenia tries to actively participate in the international associations which are contributing to the environment friendly agriculture. A lot of Slovene legislation has already been adapted to the EU legislation, the rest will be adapted in the near future. Directions leading to livestock production which is environment friendly and at the same time kind to animals became legal by adopted legislation and promoted by the governmental support, especially by direct payments, as it is done in EU countries. We are certain that such decisions are in the long run the best for the agricultural development in the Republic of Slovenia.

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