

# Balance of organic wastes in bulgarian animal husbandry

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## Introduction

The soil-animals link is bidirectional. Fertile and ecologically clean soil of meadows and pastures provides the nutrition for livestock. Wastes from livestock represent a high quality organic fertilizer – farmyard manure, which can be used for increasing soil fertility and quality. Used in combination with other organic wastes, farm yard manure can provide a source of balanced nutrition for crop growth.

The main obstacle for Bulgarian agriculture is fragmentation, followed by low effectiveness. Production quality, environmental protection from pollution by manures and other wastes from animal husbandry is related to the control possibilities, and this is only realistic on large, modern farms. The structure of Bulgarian animal husbandry is characterized by a small number of large farms and many farms at domestic level (Stankov, 2003). Professional farms for cattle production account for 2.8% of all farms, with 20.7% of total cattle. For the pig production, 1.7% of all farms are professional with 39.2% of total pigs. Generally, farmers are poorly qualified, lacking the knowledge to create conditions of balanced livestock nutrition, mechanization of work is low, as is utilization of modern technologies for breeding, milking and manure removal. Small farms have little possibility to create safeguarded manure storage.

## Results and discussion

Farmyard manure application is a traditional practice in Bulgaria. It was the only way to supply crops with additional nutrients. However, in recent years manure application has become a less common practice and the area to which farmyard manure is applied is decreasing. In 2001, 13,600 ha were dressed with manure, in 2002 – 11,900 ha, in 2003 – 6,800 ha from about 3,000,000 ha of arable land (Agrarian report - 2003, 2004, 2005). If we assume that the average application rates is 20 t ha<sup>-1</sup>, then the total manure applied each year ranges from 140,000 to 270,000 t.

More than 4 million t of crop wastes are produced in Bulgaria every year. Usually these are burnt and this is increasing processes of soil degradation and green house gas emissions. Incorporation of crop wastes into the soil has increased in recent years, related with agriculture development. Composting of crop wastes is very rare. This is why the level of manure utilization must be increased.

Table 1. Chemical composition of different manures (generalised data)

Manure type	Nitrogen - %	P2O5 - %	K2O - %
Cattle	0,15 – 0,50	0,20 – 0,40	0,40 – 0,60
Sheep	0,70 – 0,90	0,20 – 0,40	0,60 – 0,80
Poultry	2,40 – 5,00	1,70 – 2,80	0,80 – 2,00
Pigs	0,45 – 0,60	0,30 – 0,50	0,40 – 0,65
Horses	0,40 – 0,60	0,25 – 0,40	0,45 – 0,65

Chemical composition of different types of manure is very variable (Table 1), depending on ratio between solid phase, liquid phase and litter and influenced strongly by storage management. In addition to the macronutrients, manure is also rich of micronutrients: - Mn – 4-6 mg %, Zn - 1 – 2 mg %, B – 0,2 – 0,5 mg %, Cu – 0,2 – 0,3 mg %, Co – 0,02 mg %,

Mo – 0,013 mg %. (Gorbanov et al., 2005). The dry matter content of manure is rich in hydrocarbons – cellulose, hemicelluloses, pentosans, lignins, sugars, etc.

An important aspect of manure nutrients is that they are made available to crops slowly. This ensures balanced plant nutrition and decreases nutrients losses. In addition to nutrients, many energetic materials are supplied by the manure for soil micro flora. Manures play a major role in the sustainable management of soil organic matter.

Soil micro organisms mineralise about 1-2% of available organic matter annually. Only a small part of this is restored through crop residues. The most important source for replenishing humus stocks in soil is manure application – 1 t of manure contributes 100 kg of organic mater.

The 2003 census of Bulgarian farms showed that only 565 farms – 0.116% of all animal husbandry farms, have purpose built, safeguarded, farmyard manure storage (Table 2). For over 20% of farms, no facilities for farmyard manure storage exist. Therefore, even on large farms (more than 14 000), normal conditions for storage and treatment of farmyard manure do not exist.

Table 2. Farms with own disposal of safeguarded or ordinary manure storing places

Type of manure store	Items	Percent
Farms with ordinary manure storage (in heaps)	484836	99.884
Farms with own disposal of safeguarded manure storage:	433	0.089
A) with capacity for 1 to 6 months	138	-
B) with capacity for 7 to 12 months	295	-
Farms with own disposal of safeguarded storage for slurries :	132	0.027
A) with capacity for 1 to 6 months	49	-
B) with capacity for 7 to 12 months	83	-
Total number of farms with own disposal of safeguarded manure storage	565	0.116
Total number of farms:	485401	100.00

Source: Ministry of Agriculture and Food Supply , Directorate Agrostatistics, Census of farms in Bulgaria, 2003

Table 3. Animals in Bulgarian agriculture (thousands)

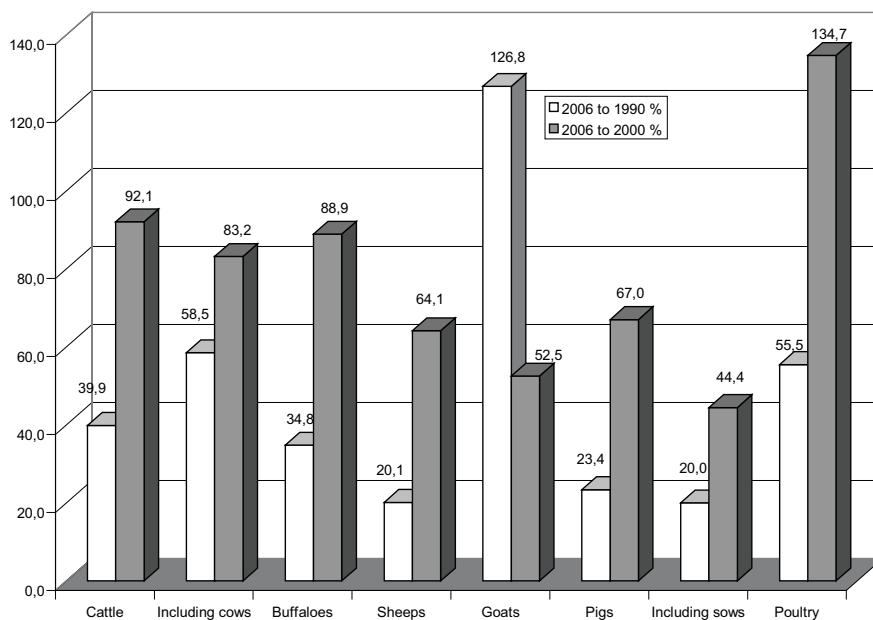
Animals	1990	2000	2003	2006
Cattle	1575	682	728	628
Including cows	617	434	378	361
Buffaloes	23	9	8	8
Sheeps	8130	2549	1598	1635
Goats	433	1046	725	549
Pigs	4332	1512	1032	1013
Including sows	380	171	79	76
Poultry	36338	14963	21691	20157
Including laying hens	No data	8304	9550	10419

Source : Statistical yearbook of Republic Bulgaria

A range of livestock types are produced in Bulgaria (Table 3), producing a considerable quantity of organic wastes. The fact that manures are not used as fertilizers results in an accumulation of organic wastes from farms everywhere in the country.

Figure 1 shows the changes in livestock numbers in Bulgaria inform 1990 to 2006. The decrease is from x2 to several times over these 16 years. Only the goat population has shown a small increase. Even compared to 2000, the number of animals in 2006 has decreased, with the only exception being poultry.

Figure 1. Changes in livestock numbers in Bulgaria – 1990 to 2006 and 2000 to 2006



In 2003, 12 millions tons of manures were produced in Bulgaria, containing 66,600 t of nitrogen, 35,000 t of  $P_2O_5$  and 36,700 t of  $K_2O$  (Table 4). In the same year, mineral fertilizer use was 165,000 t of nitrogen, 30,000 t of  $P_2O_5$  and 3,000 t of  $K_2O$ .

It is obvious that manures produced yearly could cover 40% of the nitrogen fertilizer requirement, and cover totally the requirement for phosphorus and potassium fertilizer. If every year we apply 8 millions t of manure, at a rate of 20 t ha<sup>-1</sup>, a total of 400,000 ha could be fertilized. For 6-7 years the arable land could be fertilized with organic fertilizers alone.

Table 4. Manures and nutrients quantity obtained yearly in Bulgaria

Years	Quantity tons	Nutrients, tons		
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
2002	11 679 300	63 700	30 800	35 250
2003	12 503 000	66 600	34 900	36 800
2004	11 968 000	64 800	33 100	38 100
2005	11 321 100	61 500	31 100	36 100

Utilization of reasonable technologies of storage and application of farmyard manure is a key factor of sustainable management of soil fertility and obtaining sustainable yields with high quality. The effect of manures application is increasing with the common action of other agricultural practices – crop rotation, cover crops, green manures, liming ,etc.

The transition to a new fertilization system, giving priority to the use of organic fertilizer has several advantages:

- **ecological:** utilization of organic wastes restricts and reduces the hazard of an important environment pollutant, preventing water and air pollution.
- **economical:** replace the expensive mineral fertilizers, providing a high quality crop production and, in the case of organic crop production, higher prices.
- **agronomical** – soil fertility is improved – enrichment with macro and micro elements, beneficial micro flora, humic acids, enzymes, vitamins. Soil function is maintained or improved. Soil texture and water regime of soils are improved.
- **social** – improvement of the animals breeding environment and the quality of animal and crop production, improvement of human living environment.

## Conclusions

Effective use of organic wastes from animal husbandry could be ensured by obtaining quality farmyard manure and applying to the fields. In Bulgarian agriculture the use of mineral fertilizers is very low, but, at the same time a valuable resource in organic manures is remaining unused and causing environmental damage instead of ecological and economical benefits.

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