MOŽNOSTI UPLATNENIA TECHNOLÓGIÍ REDUKCIE AMONIAKOVÝCH EMISIÍ A NUTNOSŤ ICH REDUKCIE V CHOVE ZVIERÁT U NÁS

THE POSIBILITY OF APPLICATION OF ANIMAL BREDING TECHNOLOGIES TO REDUCE AMONNIA EMISSIONS - NECESSITY OF THESE MEASURES IN OUR COUNTRY

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Abstract

In view of existing environmental policy the measures for ammonia reduction in our agriculture and animal production come into foreground. Ammonia reduction is a multifactorial problem (e.g. technology, animal feeding, environmental aspects), which must be dealt with also in our country. It is necessary to balance ammonia production by all farm animals. The real ammonia emissions in Slovakia come to **27 kt NH_3** per year (1998). The **UN-ECE** scenario declared the reduction of ammonia emissions in Slovakia to the level of **39 kt NH_3** per year. In 1990, the emitted ammonia amounted to 47 kt-NH_3 and in 1998 the emissions were by about 12 **kt NH_3** lower than the maximum allowed in SR. From this point of view it appears problematic to ask our farmers to reduce ammonia production by means of new technology and environmetally-friendly animal housings. This process of rebuilding or reconstruction raises more problems as it requires high investments and one must pay for the know-how too.

INTRODUCTION

Environmental impacts are today on program for more reasons. Important is the real influence of animal breeding, its technology systems and equipment for manure treatment, or plant for storage and economical processing and its application give in more details information about the effect of ammonia emission on the environment. For the knowledge about influence of the rearing systems on environment process it is necessary to define the ammonia production in our country.

Staff farm animals were reduced in the Slovak Republic during last ten years. Reasons of this reduction were different. More important were very low demands for animal products, slightly over production coming from it, liberalisation of market, continuously increasing prices of production inputs a many other.

These reductions of farm animal staff is direct and more decisive reason of the reduction of the ammonia emission, its productions in our country, which was reduced more than was fixed by expert group **UN ECE** for the Slovak Republic at the present, it is 39 kt NH_3 per year. Environmental influence of ammonia emission from our farm animals was smaller than in West European countries, (have a look at the **Concentration of NH_3 in European Countries from 1990, (by Asman and Jaresvel,1990)**.

MATERIAL AND METHOD

Balance of ammonia emission from animal rearing was calculated after the **Emission Inventory Guidebook 15 February, 1966 B 1040-1**. Method of total balance is based on average of emission factors and animal class numbers [in kg NH_3.animal^{-1}/ per animal = animal^{-1}/ and per year]; Emission factors per animal as counted in the annual agricultural census. It is for all animal classes and their average numbers per year in Slovakia. Technology and rearing is described for stable, storage in outside stable, surface spreading of waste, grazing. Total emission is summed from previous specification. Total emissions were balanced for the important animal classes: dairy cows, other cattle, fattening pigs, sows, sheep and goats, laying hens, broilers and other poultry.

RESULTS AND DISCUSSION

It is very hard to find the way how to solve problems with ammonia emissions, economical rearing systems with smaller imission concentration in air, or to achieve significant reduction of ammonia emission in our country in near future. Exact problems are to receive atmosphere with smaller immision effect in bigger regions in more states at given and often changing weather, circulation conditions and with approximate week (8 day) persistence of ammonia in contact flux layer of atmosphere. The animal production is the main producer of ammonia in Slovakia.

However, it is necessary to say that Slovak animal production is in fact one of the smallest in Europe, (tab.1). According to the data from 1990 animal production as the whole produced approximately 47 thousand **kt** of ammonia emissions per year (tab.2). Since that time the numbers of all kind and categories of farm animals have decreased very rapidly. The number of milk cattle was reduced by about 50 %, from it dairy cows by 47%, other cattle 52%. The total decrease of pigs were 33 % and poultry 11%. It is not excepted there will be significant increase in number of farm animals in Slovakia in the near future.

The decreasing number of farm animals influenced the total ammonia production or ammonia emission in Slovakia. According to the current numbers of farm animals is ammonia emission slightly higher than 27 **kt** per year(tab.2), from it 16.2 **kt** are produced in large scale farms (tab.3), consisting of a number of production centres, in co-operatives or other economical forms at present (private form of production farms etc.). In comparison with high production countries the total production in our country is lower as well as per square kilometre of land, country side, on average. The change of animal housing systems and manure treatment and their application system is the way which gives the possibility to reduce ammonia in transformed animal production in the Slovak agriculture. This process needs more investment means which are probably not possible receiving at present time in our agriculture.

These reductions of farm animal staff is directly and more decisive reason of the reduction of the ammonia emission, its production in our country, which was more than was fixed from expert group **UN ECE** for the Slovak Republic at present, it is 39 kt NH_3 per year. Environmental influence of ammonia emission from our farm animals is smaller than in West European countries, (have a look at the **Concentration of NH_3 in European Countries about Asman and Jaresvel,1990**) which have bigger ammonia emission from farm animal staffs. Therefore there have been "defined or prepared" new programs "for recent ammonia reduction from housing systems and at manure storage, or at their application techniques with lower ammonia emission. This is described, as review defined from UN-ECE (1998,1999) and other study and literature and from world conferences etc. The purpose of this document is to provide guidance to the parties to the convention in identifying ammonia control options and techniques for reducing emission from agriculture -animal rearing and manure application. For the different techniques are defined reductions efficiencies and the necessary investment extra cost per place and per year. Application of lower ammonia technique in our

country at present is starting. The further development of this process will depend on possibility to release investment means by the farmers for this aim.

Tab.1 Number of farm animals in SR/in thousand /

	Cattle	Dairy cows	Total pigs	Sows	Fattening pigs	Sheep and goats	Poultry	Hens
1990	1 563	549	2 520	180	1 286	611	16 478	7 966
1998	745	290	1 670	130	66	447	14 657	6 885

Tab.2 Ammonia emission from animal production in kt per year

	Cattle	Dairy cows	Sows	Fattening pigs	Sheep and goats	Poultry	Hens	Total
1990	14 506	15 638	2 992	8 221	818	2 336	2 947	47 458
1998	6 506	8 265	2 162	4 896	599	2 144	2 547	27 119

Tab.3 Ammonia emission from large animal production in kt per year

	Emission factors /kg /	Number of farm animals /in thousand/	Total emission /kt/
Dairy cows	28.50	208.854	5.952
Cattle	14.30	370.850	5.303
Sows	16.36	34.499	0.565
Fattening pigs	6.39	390.794	2.497
Poultry	0.28	3 297.120	0.923
Hens	0.37	2 626.753	0.972
Total			16.212+)

+) that is 59.78% from total emission (27.119kt) in SR

CONCLUSION

Animal production is the main producer of ammonia in Slovakia too. Partial is ammonia produced from chemical industry too. However, it is necessary to say that the Slovak animal production is in fact one of the smallest in Europe. In 1990 animal production as the whole produced approximately 47 thousand **kt** of ammonia emissions per year. Since that time the numbers of all farm animals class numbers have decreased very rapidly. The number of milk cattle was reduced by about 50 %, from it dairy cows by 47%, other cattle 52%. The total decrease of pigs were 33 % and poultry 11%. As far as the approximate tendency of food consumption is planned there is no assumption that the number of farm animals will be significant increased in the near future. The decrease of the staff farm animals influenced the total ammonia production or ammonia emission in Slovakia. According to the current numbers of farm animals is ammonia emission slightly more than 27 **kt** per year, from it 16.2 kt are produced in large scale farms, in all staff farm animals in agriculture, composed types of farm which are divided into more production centers, in co-operative or other economical forms at present (private form of production farms etc.). In comparison with high production countries is smaller not only the total production but also the average per square kilometer of land, country side. The change of animal housing systems and manure treatment as well as of their application system is the way of ammonia reduction at transformed animal production in Slovak animal production too. This process needs more investment means which are probably not possible to receive at present - or in near future too, in our agriculture and animal housing.

S Ú H R N

V súčasnom období i v podmienkach SR je naznačovaná tendencia na znižovanie amoniakálnych emisii v poľnohospodárstve, ktoré vznikajú v dôsledku chovu zvierat. Základnou otázkou za daného stavu, početného zníženia hospodárskych zvierat, hlavne hovädzieho dobytka, ošípaných a hydiny, (i v rámci jednotlivých kategórií) je, či toto opatrenie je ekonomický únosné. Ďalší veľmi dôležitý je faktor skutočného dopadu, preukazného vplyvu na eko-systémy, ktoré by malo byť stanovené na základe experimentálne definovanej imisnej záťaže podľa uvedeného ukazovateľa, resp. priameho vplyvu na eko-systémy. Preto je v našich podmienkach nutné prijímať rozhodnutia a následné opatrenia o exaktnom znížení uvedenej záťaže, emisií amoniakom s ohľadom na uvedené skutočnosti

zníženia stavov HZ. Stav hovädzieho dobytka sa znížil o 50 %, z toho dojníc o 47%, ostatný dobytok o 52%. Celkové zníženie ošípaných bolo o 33%, a hydiny cca o 11%.

Podstata problému vo všeobecnosti a pri posudzovaní našich pomerov je v tom, že amoniakálne emisie v absolútnom vyjadrení boli v SR rapídne znížené v porovnaní z rokom 1990, ktorý je nápočtovým rokom i v pracovných scenároch UN-ECE. V tomto období sme na Slovensku v rámci veľkovýroby produkovali cca 47 **kt NH_3** ročne. V ďalšom období sme v dôsledku uvedeného zníženia stavov hospodárskych zvierat v nápočtovom, porovnávacom roku 1998 podstatne znížili i amoniakálnu emisiu, ktorá bola v celkovom objeme iba cca 27 **kt NH_3** ročne, oproti požiadavkám medzinárodného scenára, (požadované zníženie iba na 39 **kt NH_3**) bola absolútna úroveň nižšia o 12 **kt NH_3** ročne. Z celkovej bilancie je 16,2 kt NH_3 produkcia z veľkokapacitných objektov, vyjadrené zo štatistických podkladov o stavbách a stavoch zvierat, za podniky ako celok.

Veľkokapacitné objekty v uvedenom kontexte sú zastúpené koncentráciami pre hovädzí dobytok 500 ks a vyššie, ošípané 5000 ks a vyššie, hydina 50 000 ks a vyššie. Nie je však možno konštatovať, že uvedená bilancia veľkochovov - veľkých zdrojov znečisťovania je v rámci jedného výrobného strediska (hospodárstva), kde je možno predpokladať "určitý ekologický dopad" v dôsledku "bodovej emisnej záťaže". V nasledujúcom období je na základe platných predpisov sa uvedená kategorizácia zdrojov radovo posunula na minimálne koncentrácie a to: v chove dobytka iba na 100 ks a viac, v chove ošípaných 500 ks a viac. Najväčšia definičná zmena je v chove hydiny kde je posunutá kategorizácia iba na 1000 ks a viac. Zníženie klasifikácie, kategorizácie veľkých zdrojov je diferencované v chove dobytka 5x, v chove ošípaných 10x, v chove hydiny až 50x (iba na 1000 ks). Uvedená predchádzajúca klasifikácia veľkých a stredných (nových) zdrojov slúži v súčasnosti ako základ na stanovenie poplatkov za znečisťovanie ovzdušia **amoniakom (NH_3)**, v SR. Treba k objektivizácii uvedeného legislatívneho stavu v SR uviesť že, podobný postup nie obvyklý v západoeurópskych krajinách pri radovo 10-15 x vyššej záťaži, znečisťovania ovzdušia NH_3, v porovnaní absolútnej a relatívnej produkcie na danú plochu resp. na m^3. Čo sa týka technologicko-chovateľských opatrení na zníženie amoniakálnych emisii, treba uviesť, že pre riešenie uvedených otázok sú potrebné v rámci vlastného procesu pomerne vysoké investičné prostriedky. Aby sa uvedený proces i u nás mohol realizovať opakovane, jednalo by sa o významnú prestavbu súčasného stavu bez ohľadu na doterajší stupeň technologickej

modernizácie. Doteraz známe know-how ako napríklad sprejovacia - sprchovacia zhrňovacia lopata, špeciálne upravené spády stojísk, materiálna skladba a povrchová úprava, sklon podlahy, minimalizácia ustajňovacej plochy, recirkulačné a kolaugačne systémy, predsušenie trusu na páse a ďalšie sú rovnako systémové prístupy, ktoré v našich podmienkach treba experimentálne overiť a až potom riešiť ich opakované uplatňovanie v praxi. Sekundárnym riešením je biofiltracia odvádzaného vzduchu, ktorá je vysoko efektívna a účinná metóda, ale súčasne investične náročná. U nás sú nateraz známe riešenia nadväzujúce na kafilerné objekty, a teda z aspektu redukcie výrazných **zápachových emisi**í.Významný podiel na pomernom znížení emisií je v procese skladovania a manipulácie s tekutým a maštaľným hnojom a v systéme technológii ich aplikácie a včasnosti ich zapravenia do pôdy pri ich povrchovej aplikácii. Perspektívne sú systémy s priamou aplikáciou, resp. aplikáciami, ktoré znižujú uvoľňovanie amoniaku.

Kľúčové slová: chov zvierat , amoniakálne emisie, redukcia emisii v SR

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SO_2 and NH_3 emission of the central scenario JI compared to the REF case.

Percentage changes relate to the year 1990. (tab 3.3.)