

Brigitte Eurich-Menden and Helmut Döhler, Darmstadt, and Eberhard Hartung, Hohenheim

# Good Agricultural Practice on Reducing Ammonia Emissions in Agriculture

*Rules of “good agricultural practice” (GfP) on reducing ammonia emissions in agriculture have been worked out by a KTBL task group and been published in a aid-KTBL brochure. The experts have assessed the abatement measures in the fields animal nutrition, animal housing, pasture management as well as storage and application of farm manure and concluded the rules of “good agricultural practice” on reducing ammonia emissions in agriculture.*

Ammonia emissions lead to acidification and eutrophication of natural surfaces. Most of these ammonia emissions are caused by agriculture, mainly by the livestock sector. Therefore some international strategies took place to reduce these emissions. One of these strategies is the 1999 UN/ECE Protocol to the 1979 Convention on long-range transboundary air pollution. By ratifying this UN/ECE Protocol to abate acidification, eutrophication and ground-level ozone Germany contracted to reduce ammonia emissions in agriculture to 550 kt/y in 2010.

To reach the national target, the emissions have to be reduced for manure application by about 30 %, for animal housings by 20 % and for storage of manure by 40 %. The reduction for housing systems and for storage of manure applies for new animal housing on large pig farms (> 2000 fattening pigs places or > 750 sow places) or poultry farms (> 40 000 poultry stock places), while the reduction concerning application of manure includes the total manure application in Germany. The contracting parties agreed further on measures to reduce emissions by urea-based mineral fertilisers.

In addition Germany has to describe, derive and publish an advisory code of Good Agricultural Practice (GAP) for reducing ammonia emissions. Therefore a national expert group has defined the most acceptable abatement measures in livestock feeding and for housing systems for pigs and cattle, as well as measures concerning storage and application of manure. The advisory code of GAP is published as an aid/KTBL Brochure (aid 1545, 2003).

## What does Good agricultural Practice (GAP) mean?

Abatement measures comply with the GAP when they are

- scientifically confirmed
- acknowledged to be necessary, appropriate and adequate
- recommended by official advisory services and
- known by competent farmers

It is notable, that the Code of Good Agricultural Practise does not represent a regulation (like the German fertiliser ordinance, which describes the Code of Good Fertilising Practice). The major target for publishing GAP is

to enable a distinction between appropriate and non appropriate manners.

The GAP will give more transparency which structural and technical measures are the most appropriate for farmers, consultants, public authority, consumers and policy makers. The GAP is valid for all kind of farm types and sizes. The implementation of the GAP depends on the local circumstances of each individual farm.

## Which measures are GAP?

For cattle, pigs and poultry the most acceptable abatement measures in livestock feeding and housing systems, as well as measures concerning storage and application of manure were described. To show the effectiveness of the abatement measures in pig and cattle production, special abatement models for single farm types (pig farm with 1000 fattening places; dairy farm with 70 cows) were calculated.

The following measures were defined to be Good agricultural Practice:

### .....livestock feeding strategies

#### *Forage growing and forage conservation*

- professional forage growing (use, fertilisation, variety choice etc.)
- maximum use of pasture grazing in cattle management
- high quality of forage, avoidance of forage losses during production, conservation and feeding

#### *Feeding*

- appropriate planning of the feeding ration and control
- feedstuff analysis (e.g. roughage, corn-cob-mix and cereals) and use of tested estimation procedures
- adaptation of the feed composition to the needs and performance of the animals

#### *Cattle:*

- separate feeding rations for dry period and lactation period
- crude protein respectively compensation of the ruminal nitrogen balance as far as possible

#### *Pigs:*

- separate feeding rations for pregnant and suckling sows
- different diets for different growth stages

Dr. Brigitte Eurich-Menden and Dr. Helmut Döhler are scientists working at the KTBL, Bartningstr. 49, D-64289 Darmstadt; e-mail: [b.eurich-menden@ktbl.de](mailto:b.eurich-menden@ktbl.de)

PD Dr. Eberhard Hartung is a scientist at the Institute of Agricultural Engineering of the University Hohenheim.

## Keywords

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of fattening pigs (phase feeding)

- adding pure amino acids, if costs will benefit

Poultry:

- phase feeding during fattening period
- adding pure amino acids, if costs will benefit

*Utilisation of the livestock productivity*

- considering stocking rates and animal welfare needs

### ....livestock housing

*Generally*

- clean and dry surfaces in the whole housings and in open yards
- only short term slurry storage in the building, storage of slurry outside the building in separate containers with a cover or a natural floating crust
- guarantee low air inlet temperatures, low indoor temperatures and low ventilation rates, but considering house climate requirements and animal welfare

*Naturally ventilated housing systems*

- orientation of the building across to the main wind direction to ensure adequate incoming air flows and an optimal indoor ventilation without interference due to incoming flow barriers

*Straw-based housing systems*

- litter should be used at sufficient quantity and be fresh, clean and dry, without harmful substances; urine, which is not fixed by litter, should be drained to a pit by slope and gutters
- frequent dung removal and fresh littering
- securing the reliability of the drinkers

*Cattle*

- expansion of pasture grazing
- dung removal from solid floor areas several times daily

*Pigs*

- development of separate functional areas for lying, eating and dunging should be possible
- pens with partly slatted floor: clean and dry solid floor area

*Poultry*

- laying hens in aviary systems and floor management: cleaning the belts once a week (ventilated and nonventilated systems)
- laying hens in cage batteries: cleaning the belts twice a week (non ventilated system), once a week (ventilated system)
- laying hens, broilers or turkeys: use nipple type drinkers with
- broilers or turkeys: use drinkers, which are

height-adjustable

### ....storage of manure

*Slurry (cattle, pigs)*

- the store should be of sufficient storage capacity, to have liquid manure applicable for the times of highest plant nutritional requirements
- cover the store with a natural or artificial floating crust
- fill in the slurry below the crust (natural or artificial)
- for new buildings: reduce the surface area or emitting surface of the store (height to diameter 1:3 to 1:4))
- avoiding unnecessary slurry movement

*Farm yard manure (cattle, pigs, poultry)*

- make the surface area of the stack as small as possible
- collecting liquid manure, rain- and percolation water in closed pits

*Air-dried laying hens excreta*

- keep the manure as dry as possible, e.g. storing on an impermeable underground and under a roof

### ....application of manure

- sufficient homogenisation of slurry before application
- slurry, liquid manure, solid manure and air-dried droppings from laying hens on arable land with growing crops or grassland: application at cool and rainy, humid weather conditions
  - alternative: application in the evening
  - alternative pig slurry and liquid manure to growing crops: application with trailing hoses
  - alternative cattle slurry in small farms with fields nearby: sufficient dilution of slurry with water before application
- slurry and liquid manure on arable land (bare soil): incorporation into the soil within 1 h after application
- manure from cattle and pigs, manure from poultry and air-dried droppings from laying hens on arable land (bare soil): incorporation into the soil at the same day (latest 24 h after application)

The detailed description of the measures is given in the aid/KTBL brochure. Most of the GAP measures are practised already in farming and are part of national regulations (e.g. TA Luft or VDI guidelines). A combination of measures concerning livestock feeding, storage as well as application of manure can lead to a higher reduction. But even the practice of one single measure to reduce ammonia emissions is already regarded as GAP.