



**Recycling Agricultural, Municipal and Industrial  
Residues in Agriculture Network**

A network in the framework of the European System of Cooperative  
Research Networks in Agriculture (ESCORENA)

**Glossary of terms  
on  
livestock and manure management  
2011**

**Second Edition**

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## **Preface**

The management and the potential impacts of livestock and manure management on the environment are topics of high relevance across Europe. It is well recognised that internationally coordinated research and development and exchange of experience can greatly benefit science, technology transfer and the development of the corresponding policy framework across Europe.

A major handicap in international collaboration and a major source of misunderstandings in these areas is the lack of a standardised terminology. This is not only true for the translation between different languages but also within most languages.

Furthermore, livestock and manure management practices vary from country to country. Country or regional specific terms used to describe such practices are not always widely or clearly understood. Even between specialists, confusion over definitions may lead to serious misunderstandings and difficulties in understanding livestock and manure management systems in other countries. This has also hindered activities aimed at producing surveys of livestock and manure management practices across Europe and has considerably restricted the significance and reliability of such surveys. In addition, a sound glossary is a means of supporting the European information exchange process on "Best Available Techniques" (BAT) for intensive livestock farming of poultry and pigs under the EU directive on Integrated Pollution Prevention and Control (IPPC).

Some years ago, RAMIRAN, the FAO/ESCORENA "Recycling Agricultural, Municipal and Industrial Residues in Agriculture Network" became aware of the problem of unclear or ambiguous terminology. With the help of a working group, which included representatives from different parts of Europe, Brian Pain and Harald Menzi compiled a Glossary of Terms on Livestock Manure Management which was published in 2003 and disseminated via the RAMIRAN network.

Support from the EU project "Best Available Techniques for European Intensive Livestock Farming - Support for the Implementation of the IPPC-Directive" (BAT-Support) provided the opportunity to revise and update the Glossary between 2007 and 2010. Some definitions were revised and many others added to make the glossary more comprehensive and bring it in line with definitions used by IPPC and BAT-documentation. In addition, terms relating to livestock management were included where these were considered to be relevant to the consideration of manure management.

The successful fulfilment of the task was only possible thanks to the enthusiastic support of the project by all the members of both working groups involved and by other members of the RAMIRAN network and the BAT-Support Project. Many thanks!

Brian Pain and Harald Menzi

## **Scope of the glossary**

The glossary comprises mainly terms concerning the properties, collection, storage, treatment and utilisation of manures produced by farm livestock, but also includes relevant, broader terms concerning livestock management, fertilisers, crops, and wider environmental issues. There are also some terms concerning other types of organic materials that are commonly applied to agricultural land. Similarly, although it is primarily a glossary of terms used in Europe, some terms in common use in North America are included. For more details of the latter, refer to American Society of Agricultural Engineers ([www.asae.org](http://www.asae.org)) glossaries: ASAE S292.5. Uniform Terminology for Rural Waste Management; ASAE S466.1. Nomenclature/Terminology for Livestock Manure Handling Equipment; ASAE S501. Uniform Terminology for Livestock Production Facilities.

Efforts to translate a selection of important terms into different languages and thus produce a multilingual glossary will be made in the framework of RAMIRAN.

**NB Terms in capital letters in “DEFINTION/DESCRIPTION” are defined/described elsewhere in the glossary.**



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## TYPES AND COMPOSITION OF MANURE AND ORGANIC WASTES

### General terms on manure

MANURE	A general term to denote any organic material that supplies organic matter to soils together with PLANT NUTRIENTS, usually in lower concentrations compared to INORGANIC FERTILISERS.
LIVESTOCK MANURE	MANURE produced by HOUSED LIVESTOCK. Usually a mixture of FAECES and URINE with or without BEDDING material, depending on the type of ANIMAL HOUSING SYSTEM.
MANURE MANAGEMENT	The collection, storage, transport and application of MANURES to land. May also include TREATMENT.
MANURE SURPLUS	An amount of MANURE containing PLANT NUTRIENTS in excess of those required by crops.
EXCRETA	Waste expelled from the body: FAECES plus URINE.
EXCREMENT	Solid waste matter discharged from the body: FAECES.
FAECES	Solid waste or undigested material voided by animals.
URINE	Wastes removed from the blood stream via the kidneys and voided as a liquid.
DUNG	FAECES from mammalian LIVESTOCK.
DUNGING	The deposition of FAECES by LIVESTOCK but often used to refer to deposition of FAECES and URINE (e.g. in an ANIMAL HOUSE or YARD) by LIVESTOCK.
DROPPINGS	Waste voided by POULTRY.
MUCK	A colloquial term for LIVESTOCK MANURE, most commonly SOLID MANURE.
MUCKING OUT	A colloquial term for removing MANURE, usually SOLID MANURE such as FARMYARD MANURE from a building housing LIVESTOCK.



## Liquid manure

LIQUID MANURE	A general term that denotes any MANURE from housed LIVESTOCK that flows under gravity and can be pumped. There are several different types of LIQUID MANURE arising from different types of LIVESTOCK housing, MANURE storage and TREATMENT.
SLURRY	FAECES and URINE produced by housed LIVESTOCK, usually mixed with some BEDDING material and some water during management to give a LIQUID MANURE with a DRY MATTER content in the range from about 1 – 10%.
LIQUID FRACTION	<p>Varying degrees of separation of solids and liquid may occur during the management of manures giving rise to LIQUID and SOLID FRACTIONS. There are no specific terms to denote the different types of LIQUID FRACTIONS but their properties vary with the proportions of URINE, FAECES, BEDDING and water that they contain. They include:</p> <ul style="list-style-type: none"> <li>• Part of the EXCRETA collected in liquid form together with washing water and some LITTER in TIED STALLS with regular removal of SOLID MANURE (manually or with specific installations). The proportion of URINE and FAECES will vary depending on management practice. Can be called "SLURRY (liquid fraction from liquid/solid manure systems in TIED STALLS".</li> <li>• Seepage or drainage from MANURE in LIVESTOCK houses or on concrete surfaces used by LIVESTOCK (HARDSTANDING).</li> <li>• Seepage or drainage (primarily urine) from cattle bedded on DEEP LITTER straw systems in LOOSE HOUSING.</li> <li>• Seepage or drainage from SOLID MANURE stores.</li> <li>• Liquid from a STRAINER BOX in a SLURRY LAGOON or from a WEEPING WALL STORE.</li> <li>• Liquid derived from the MECHANICAL SEPARATION of SLURRY.</li> <li>• CLARIFIED LIQUID (or SUPERNATANT) obtained from the upper layer following the settlement of SLURRY in a LAGOON.</li> <li>• Thickened liquid remaining following settlement of SLURRY in a LAGOON and removal of the upper layer of CLARIFIED LIQUID.</li> </ul>
CLARIFIED LIQUID	Liquid from the uppermost layer following settlement of SLURRY in a LAGOON.

**AERATED SLURRY** Slurry that has undergone the process of AERATION i.e. oxygenation using special equipment, to stabilise or purify or to reduce ODOUR or nitrogen content.

**AEROBICALLY PROCESSED SLURRY** AERATED SLURRY

**ANAEROBICALLY DIGESTED SLURRY** SLURRY that has undergone the process of ANAEROBIC DIGESTION using special plant and equipment, to stabilise, purify, reduce ODOUR and produce BIOGAS.

**SEPARATED SLURRY** AERATED SLURRY

### **Solid manure**

**SOLID MANURE** MANURE from housed LIVESTOCK that does not flow under gravity, cannot be pumped but can be stacked in a heap. May include MANURE from cattle, pigs, poultry, horses, sheep, goats and rabbits. There are several different types of SOLID MANURE arising from different types of livestock housing, manure storage and treatment.

**FARMYARD MANURE (FYM)** FAECES and URINE mixed with large amounts of BEDDING (usually straw) on the floors of cattle or pig housing. May also include horse or STABLE MANURE.

**DEEP LITTER** Faeces or droppings and urine mixed with large amounts of BEDDING (e.g. straw, sawdust, wood shavings) and accumulated over a certain time on the floors of buildings housing any type of LIVESTOCK or POULTRY.

**DEEP LITTER MANURE** DEEP LITTER

**SOLID FRACTION** See LIQUID FRACTION above. Common types of SOLID FRACTION include:

- Solid remaining (mainly straw BEDDING and FAECES) following the drainage or seepage of the LIQUID FRACTION from CATTLE bedded on straw on a sloping floor e.g. in TIED STALLS or TETHER STALLS.
- Solids or fibrous material derived from the MECHANICAL SEPARATION of SLURRY

The solid fraction is normally stackable.

**SEMI-SOLID MANURE** MANURE from housed LIVESTOCK that cannot be pumped or stacked in a heap.

YARD SCRAPINGS	Mixture that may contain FAECES, URINE, waste FEED, water from cleaning a HARDSTANDING by mechanical means (e.g. with a tractor mounted or hand-held SCRAPER); can be liquid or semi-solid.
FRESH SOLID MANURE	SOLID MANURE immediately after removal from the LIVESTOCK housing.
STORED SOLID MANURE	SOLID MANURE that, following removal from the LIVESTOCK housing, has undergone a period of storage in a heap.
COMPOSTED MANURE	SOLID MANURE that has undergone a COMPOSTING process; COMPOST.
HORSE MANURE	Horse FAECES, URINE and straw BEDDING.
STABLE MANURE	Manure from animals housed in STABLES e.g. HORSE MANURE.
POULTRY LITTER	DROPPINGS mixed with a layer of, for example sawdust or wood shavings, on the floors of buildings housing POULTRY.
BROILER LITTER	BEDDING of absorbent material, e.g. sawdust, wood shavings, straw, mixed with DROPPINGS on the floors of buildings housing BROILER chickens (i.e. raised for meat).
BROILER MANURE	BROILER LITTER
TURKEY MANURE	As for BROILER LITTER but from buildings housing turkeys.
LAYING HEN MANURE	DROPPINGS collected in buildings housing CHICKENS for egg production.
LAYER MANURE	LAYING HEN MANURE.
DEEP PIT MANURE	DROPPINGS collected in a pit beneath cages or AVIARY SYSTEM housing LAYING HENS.
VERMICOM- POST	SOLID MANURE that has undergone the process of VERMICOMPOSTING.
MANURE ASH	Residue from the incineration of SOLID MANURE (normally BROILER LITTER) in a power station.
ASHED MANURE	MANURE ASH

**Farm waste water**

WASTEWATER	A general term for contaminated water e.g. with FAECES, URINE, milk, chemicals etc. so posing a risk of pollution but of little value as a fertiliser.
WASH WATER	Water used to clean milking equipment and parlours, HARDSTANDINGS used by LIVESTOCK, farm machinery, etc.
DIRTY WATER	Water derived from washing of equipment and floors in milking parlours, rainfall RUN-OFF from concrete areas or HARDSTANDINGS used by LIVESTOCK and contaminated with FAECES, URINE, waste animal feed etc. Sometimes referred to as BROWN WATER. Contains organic matter and so poses a risk of water pollution but has negligible FERTILISER VALUE.
BROWN WATER	DIRTY WATER
GREEN WATER	PARLOUR WASHINGS
PARLOUR WASHINGS	Water used for washing equipment and floors in milking parlours. Sometimes referred to as GREEN WATER.
MILK-HOUSE WASH WATER	PARLOUR WASHINGS
DAIRY SHED EFFLUENT	DIRTY WATER
COLLECTING YARD WASHINGS	Water used for washing concrete areas or HARDSTANDINGS on which LIVESTOCK are gathered e.g. DAIRY COWS prior to milking.
SILAGE EFFLUENT	The liquid arising from a crop during ENSILING e.g. in a clamp. It is usually collected in a shallow channel and stored in a pit (or EFFLUENT TANK) or in the SLURRY store because it has a very high BIOLOGICAL OXYGEN DEMAND (BOD) thus poses a risk of water pollution. Highly polluting potential but very low FERTILISER VALUE.

**Other organic wastes**

ORGANIC WASTES	A general term for any wastes from organic rather than inorganic origin and so containing carbon (e.g. LIVESTOCK MANURE, SEWAGE SLUDGE, ABATTOIR WASTES).
ORGANIC RESIDUES	Organic material resulting from dead plant material or by-products from processing organic materials of the food industry or other industry.

EFFLUENT	Liquid e.g. from MANURE or SEWAGE TREATMENT or industrial processes. Often used to describe a liquid discharged into the environment, usually water, with permission and to appropriate standards or conditions. See also SILAGE EFFLUENT.
SLUDGE	The liquid or semi-solid fraction arising from the sedimentation or flocculation of liquid waste or LIQUID MANURE.
SUPERNATANT	The upper LIQUID FRACTION after sedimentation of liquid waste or LIQUID MANURE.
BIOSOLIDS	Organic solids resulting from waste water TREATMENT that can be usefully recycled.
SEWAGE	Liquid domestic and municipal waste.
RAW SEWAGE	Untreated liquid domestic and municipal waste.
SEWAGE SLUDGE	By-product of SEWAGE TREATMENT that concentrates solids. It contains significant quantities of PLANT NUTRIENTS.
UNTREATED SLUDGE	Product of the sedimentation of screened SEWAGE that has not been subjected to any chemical, biological or heat TREATMENT; typically has a DRY MATTER content of 2-7%.
LIQUID UNDIGESTED SLUDGE	UNTREATED SLUDGE
LIQUID DIGESTED SLUDGE	Product of TREATMENT of SEWAGE in ANAEROBIC DIGESTERS; typically with a DRY MATTER content of 2-5%.
CAKE SLUDGE	Produced by pressing centrifuged liquid sludge after pre-treatment with lime or other conditioning chemicals; typically with a DRY MATTER content of 20-35%.
ABATTOIR WASTE	Blood and gut contents together with MANURE from LIVESTOCK awaiting slaughter.
SLAUGHTER-HOUSE WASTE	ABATTOIR WASTE

## LIVESTOCK

### General livestock terms

ANIMAL CATEGORY	The type of animal or LIVESTOCK according to species, sex, age and reason for production (breeding, meat, milk, wool etc.).
LIVESTOCK	Domesticated animals such as CATTLE, PIGS, POULTRY, SHEEP, horses, goats. Any creature kept for the production of food, wool, skin or fur or for the purpose of its use in the farming of the land or for amenity purposes.
HOUSED LIVESTOCK	LIVESTOCK that are kept indoors for all or part of the year.
RUMINANT	An animal that has a complex digestive system including a four-part stomach. They consume large amounts of fibrous food such as grass that their stomach is able to store and digest. Includes CATTLE, SHEEP, GOATS, deer.
HERBIVORE	Animals, especially CATTLE, SHEEP and GOATS feeding on grass and plants.
MONOGASTRIC	An animal with one simple stomach, such as PIGS, as opposed to a RUMINANT.
FATSTOCK	LIVESTOCK fattened for sale in a market.
BREEDING	The production of offspring from LIVESTOCK. BREEDING stock are animals kept to produce offspring rather than for slaughter.
REARING	The keeping of growing LIVESTOCK.
BATCH SYSTEM	A method of REARING LIVESTOCK in which a group of animals, e.g. BROILERS or PIGS, of similar LIVEWEIGHT are put into a building or PEN and all removed when they have grown to a specified LIVEWEIGHT. The building or PEN is then cleaned prior to introducing another batch.
ALL IN ALL OUT SYSTEM	BATCH SYSTEM
FATTENING	Rearing of livestock for meat production.
LIVEWEIGHT	The weight of a live animal (as opposed to the weight of the carcass or DEADWEIGHT).
DEADWEIGHT	The weight of the dressed or prepared carcass.

CARCASS WEIGHT	DEADWEIGHT
SLAUGHTER WEIGHT	Weight of a live animal immediately prior to slaughter.
LIVESTOCK UNIT (LU)	A unit used to compare or aggregate numbers of animals of different species or categories. Often 1 Livestock Unit = 500kg LIVEWEIGHT of an ANIMAL CATEGORY. Other equivalences are defined on the feed requirements (or sometimes nutrient excretion). For example for the EU, one 600 kg DAIRY COW producing 3000 litres of milk per year equals 1 LIVESTOCK UNIT (LU), a SOW equals 0.45 LU and a EWE equals 0.18 LU.
ANIMAL UNIT (AU)	Usually considered to be one mature cow (1000 lb, 455kg) either dry or with a calf up to 6 months of age, with an average daily forage consumption of 15 kg of dry matter. Livestock which consume more or less forage than the standard animal unit, because of kind, class, or size are rated on an animal unit equivalent (e.g. 1300 lb cow = 1.3 AU; 1 sheep = 0.1 AU).
DUNGING UNIT	LIVESTOCK UNIT (LU) in countries limiting LIVESTOCK density via nutrient excretion.
STOCKING RATE	The number of LIVESTOCK (or LIVESTOCK UNITS) per unit area of land.
FREE-RANGE	A system for keeping LIVESTOCK in which the animals are allowed to run free over a field or an area of land.  For POULTRY it means the birds have free access to an outside area during daytime but are usually housed at night.
<b>Cattle</b>	
CATTLE	A collective term for BOVINE LIVESTOCK. DAIRY CATTLE are kept for milk production and BEEF CATTLE are reared for meat.
BOVINE	Concerning CATTLE.
COW	A female bovine animal. For CATTLE, the female is usually termed COW on bearing her second CALF.
DAIRY COW	Cows kept for producing milk or for rearing CALVES for a dairy herd.
DAIRY CATTLE	CATTLE raised for milk, and production of dairy products, rather than meat
DAIRY FOLLOWERS	Young stock on a dairy farm not yet in milk but growing to become DAIRY COWS.

CALF (plural CALVES)	The offspring of a cow. Males are termed BULL CALVES and females HEIFER CALVES.
HEIFER	In the UK, a female cow that has not yet born two CALVES. A pregnant heifer is termed an in-calf HEIFER. Sometimes used for female CATTLE before giving birth to first CALF in some countries.
BEEF COW	Cow kept mainly for rearing CALVES for beef production.
SUCKLER COW	A cow that is allowed to rear its own CALF before this is reared for beef production rather than for milk production.
NURSING COW, NURSE COW	SUCKLER COW
STORE CATTLE	CATTLE kept at a steady rate of growth prior to later fattening for slaughter.
BULLOCK	A castrated BULL.
STEER	BULLOCK
BULL	An uncastrated adult BOVINE animal.
BEEF CATTLE	Cattle kept for the production of beef. Usually slaughtered at 450-550 kg live weight at an age of 13-16 months for intensive in-house feeding (SILAGE, CONCENTRATES) or 17-30 months for grazed animals.

## **Pigs**

PIG	A domesticated animal derived from the wild boar kept for meat production.
SWINE	PIGS. Mainly used in US.
HOG	PIG
BOAR	An uncastrated male PIG used for breeding.
SOW	An adult female PIG after having produced her first LITTER of PIGLETS.
GILT	A young female PIG before she has produced a LITTER.
DRY SOW	Adult female PIG between lactations.
GESTATING SOW	Pregnant SOW.
FARROWING SOW	Sow between parturition (giving birth) and weaning the PIGLETS.



NURSING SOW	FARROWING SOW
LACTATING SOW	A SOW having recently given birth and producing milk.
LITTER	All the offspring born to a female (usually a PIG) at one time.
PIGLET	The offspring of a SOW.
SUCKLING PIGLET	A PIGLET taking milk from the SOW.
WEANER	A PIGLET that has been weaned from the SOW`S milk at between 2 – 5 weeks old (in the EU not less than 28 days), with LIVEWEIGHT of 4 – 10 kg depending on the rearing system, up to an age of usually about 10 weeks.
FATTENING PIG	A general term for PIG reared for meat production between GROWER and slaughter.
FATTENER	FATTENING PIG
GROWER (PIGS)	PIG from about 20 kg LIVEWEIGHT fed a generous diet to achieve high growth rates to about 50 - 60 kg LIVEWEIGHT.
FINISHER	PIG between about 50-60 kg and slaughter.
FINISHING PIG	FINISHER
PORK PIG	A PIG bred for quick growth and maturity at light LIVEWEIGHT (about 40-60 kg).
PORKER	PORK PIG
BACON PIG	A PIG reared with a long carcass bearing minimum fat for bacon and usually slaughtered at 60-80 kg LIVEWEIGHT.
BACONER	BACON PIG
CUTTER	A general purpose PIG, different parts of which may be used for pork, bacon or processing after slaughter at about 80 kg LIVEWEIGHT or heavier.
HEAVY HOG	A general purpose PIG slaughtered at about 120 kg LIVEWEIGHT or heavier and used for bacon, pork, ham and various by-products.

## Poultry

POULTRY	Domesticated birds kept for meat or egg production. Includes chickens, turkeys, geese (singular = goose) and ducks, guinea-fowls or pigeons.
FOWL	General term for birds often used for domestic CHICKEN.
CHICKEN	Most important POULTRY species including LAYING HENS, BROILERS.
CHICK	A young bird about to be hatched or newly hatched.
LAYING HENS	CHICKENS kept for egg production.
LAYER	LAYING HEN
GROWER (POULTRY)	CHICKEN between a CHICK and a PULLET before it starts to lay eggs, usually up to 18-20 weeks old.
LAYER BREEDER	Parent stock (males and females) kept to produce fertile eggs for commercial LAYING HEN production.
BROILER	CHICKENS reared for meat production.
TABLE CHICKEN	BROILER
COCKEREL	A male CHICKEN usually less than 18 months old or male turkey less than 12 months old.
CAPON	A castrated COCKEREL.
PULLET	A female CHICKEN in its first egg laying year between 20 weeks and 18 months old. A young LAYER. Sometimes termed GROWER in US.
BROILER BREEDER	Parent stock (males and females) kept to produce fertile eggs for BROILERS production.
TURKEY	Large POULTRY species kept for the production of meat.
STAG	A male TURKEY (also male deer).
POULT	A young turkey less than 8 weeks old.
DUCK	Usually denotes a female duck. The male is called a drake.
DUCKLING	A young duck, usually less than 8 weeks old.
GOOSE	Large aquatic bird sometimes kept as domestic animal for meat and for feathers.
GEESE	GOOSE plural

**GUINEA FOWL** A pheasant like bird from Africa raised for ornamental qualities, meat, feathers for crafts and fly tying, or vermin control.

**PHEASANTS** A species of game bird that comes in many breeds and varieties. They are raised for meat, feathers, and ornamental value or to be released into the wild for shooting.

### **Other livestock**

**SHEEP** A ruminant kept mainly for meat and wool and sometimes for milk (SHEEP = singular or plural).

**EWE** An adult female SHEEP.

**LAMB** A young SHEEP until it is weaned or the meat derived from it.

**RAM** An uncastrated male SHEEP.

**TUP** RAM

**WETHER** A castrated, adult male SHEEP.

**OVINE** Concerning SHEEP.

**GOAT** A RUMINANT allied to SHEEP and kept for milk, meat and sometimes wool.

**GOATLING** A female GOAT between one and two years old.

**NANNY- GOAT** An adult female GOAT.

**CAPRINE** Concerning GOATS.

**MARE** Mature female horse.

**STALLION** Mature uncastrated male horse.

**GELDING** Castrated male horse.

**FILLY** Young female horse

**FOAL** Young horse in its first year.

**COLT** Young uncastrated male horse.

**EQUINE** Concerning horses.

**RABBIT** A domesticated rodent kept for fur and meat.

**DOE** A female RABBIT, deer or hare.

**BUCK** A male RABBIT, deer, GOAT or hare.

## Feeding

RATION	The allowance of food given to an animal.
MAINTENANCE RATION	The amount of food needed by an animal to keep it healthy and maintain a constant LIVEWEIGHT.
PRODUCTION RATION	The amount of food needed by an animal in excess of MAINTENANCE RATION to gain weight, produce milk etc.
TOTAL MIXED RATION	Containing all the ROUGHAGE and CONCENTRATE components of the RATION mixed together.
DIET	The food offered to LIVESTOCK.
FEED	The various foods available for farm LIVESTOCK.
DRY FEED	FEED for LIVESTOCK, usually PIGS or POULTRY, formulated as pellets or meal without any addition of water.
WET FEED	FEED for LIVESTOCK, usually PIGS that is formulated as a mixture of FEED, water and other ingredients so that it can be pumped.
DRY/WET FEEDER	Equipment for dispensing DRY FEED, usually to PIGS, that incorporates a means of providing water, e.g. NIPPLE DRINKER, to the animals.
LIQUID FEED	WET FEED
FEEDSTUFF	FEED
FEEDINGSTUFF	FEED
FEED ADDITIVE	An ingredient or combination of ingredients added, usually in very small quantities, to the basic LIVESTOCK FEED to fulfil a specific need. May also refer to substances that are added to LIVESTOCK FEED or water to change the properties of the MANURE e.g. to reduce ammonia or ODOUR emission.
COMPLETE FEED	A nutritionally adequate FEED for a specific animal in a specific physiological state. It is compounded to be fed as the sole DIET without any additional substances apart from water.
PREMIX	FEED ingredient covering the animals basic needs for VITAMINS and TRACE ELEMENTS and, possibly, some AMINO ACIDS and nutritional additives. Incorporated into COMPLETE FEED e.g. for PIGS.

FODDER	Food given to LIVESTOCK that may have been dried e.g. STRAW, HAY but not manufactured. Sometimes used loosely to mean FORAGE.
FODDER CROP	FODDER
FORAGE	Crops consumed in the green state by LIVESTOCK, particularly CATTLE and horses, e.g. kale, maize, lucerne, or made into SILAGE. Sometimes used loosely to mean FODDER.
FORAGE CROP	FORAGE
SILAGE	A FEEDSTUFF consisting of a FORAGE CROP e.g. grass, maize harvested in the green state and preserved by ENSILING in a SILO or clamp. This involves the FERMENTATION by bacteria of carbohydrates in the plant material to organic acids and PROTEIN to AMINO ACIDS.
ENSILING	To make SILAGE from green fodder.
SILO	A container in which SILAGE is made and stored. It may be in the form of a SILAGE CLAMP or BUNKER SILO or a wood, concrete or steel tower. Also a term used to describe some types of grain store.
SELF-FEED SILAGE	A feeding system in which LIVESTOCK, normally CATTLE, are allowed to graze on SILAGE in a clamp. The amount taken is usually controlled by an electric fence or movable barrier a short distance from the silage face.
SILAGE CLAMP	A heap of SILAGE usually on a rectangular concrete base and supported by three walls. It is usually covered by a plastic sheet to maintain the ANAEROBIC conditions needed for FERMENTATION.
BUNKER SILO	SILAGE CLAMP
ROUGHAGE	A FEEDSTUFF containing fibre in significant amounts such as HAY and STRAW.
HAY	A term applied mainly to grasses (but may include legumes and herbs) that have been cut and dried, usually in the field, to preserve as FODDER.
STRAW	A term used mainly for the dry stems of CEREALS after the grain has been removed. May be used for BEDDING or as a low quality FEEDSTUFF.

CONCENTRATES	A manufactured FEEDSTUFF with a high food value relative to volume and a low fibre content usually for dairy cows. May be rich in PROTEIN, CARBOHYDRATE or FAT.
CAKE	A general term for processed FEEDSTUFF such as CONCENTRATES.
MEAL	A FEEDSTUFF consisting of a single or a mixture of finely ground ingredients such as cereals, oil seeds, fish, etc. and commonly fed to PIGS and POULTRY.
MINERALS	Minerals, i.e. inorganic substances including TRACE ELEMENTS, fed to LIVESTOCK and that are required for the normal functioning, growth and health of the animal. Often added to CONCENTRATES or CAKE.
MINERAL MIXTURES	MINERALS
COMPOUND FEED	LIVESTOCK feed composed of several different FEEDINGSTUFFS, MINERALS and TRACE ELEMENTS in proportions to provide a balanced MINERALS or DIET.
PROTEIN	Complex, organic compound made up of AMINO ACIDS that contain carbon, oxygen, nitrogen, hydrogen and sometimes phosphorus and sulphur. With water, they form the basic constituents of living cells and of the structure of plants and animals.
AMINO ACID	The chemical units that link together to form PROTEINS and are of fundamental importance to life.
ESSENTIAL AMINO ACIDS	Those AMINO ACIDS that cannot be made by a plant or animal but must be obtained from the environment or food.
CARBOHYDRATE	Complex, organic compounds containing carbon, hydrogen and oxygen that are essential to all living organisms. The energy stored in carbohydrates is released to power living processes.
FAT	Storage material in living organisms found mainly as oils in plants and solid forms (adipose tissue) in animals. Most animals deposit fat in their bodies as an energy store. Also used to denote LIVESTOCK reared for their meat (FATSTOCK).
VITAMIN	A class of organic substances required by animals in small amounts for normal functioning, growth and health. Farm animals can synthesise some, e.g. vitamin C, in their bodies but most must be provided in their DIET.

ENZYME	A type of PROTEIN present in living organisms that catalyses (speeds up) chemical changes without being changed itself.
PHYTASE	ENZYME that can break down the undigestible phytic acid (phytate) part of the phosphorous found in grains and oil seeds and thus release digestible phosphorus, calcium and other nutrients. Phytase is used in PIG and POULTRY DIETS to enhance the amount of digestible phosphorous and reduce P excretion.
LOW PROTEIN DIET	LIVESTOCK DIET that is formulated with less PROTEIN-rich FEEDSTUFF, e.g. soya bean meal for PIGS, to reduce nitrogen excretion and, hence, AMMONIA EMISSION. Appropriate amounts of ESSENTIAL AMINO ACIDS needed for optimal animal performance are incorporated into the DIET.
PHASE FEEDING	The provision of different RATIONS or DIETS to LIVESTOCK at different stages of growth or performance to match the RATION closely to the requirements of the animals.

### **Grazing**

SET STOCKING	A grazing system e.g. for CATTLE, SHEEP, in which a fixed number of LIVESTOCK graze a given area for the entire season.
STRIP GRAZING	A grazing system e.g. for CATTLE in which the animals are given access to a limited area of fresh PASTURE up to twice daily by means of a movable fence. Grazed strips are “back-fenced” to allow for regrowth of the grass.
ZERO GRAZING	A system for feeding CATTLE in which grass or other FODDER is cut daily and taken back to the animals in a building or YARD.
ROTATIONAL GRAZING	A grazing system e.g. for CATTLE, in which successive areas or PADDOCKS, are intensively grazed for a period and then rested to allow for regrowth of the grass.
PART TIME GRAZING	Grazing by HOUSED LIVESTOCK for a proportion of the time e.g. grazing by day but housed by night.
FULL GRAZING	Production system for DAIRY COWS in which the animals receive no additional ROUGHAGE and only very limited amounts of CONCENTRATE besides the grazing to reduce production costs. The system is usually combined with calving in spring to synchronise feed requirements with meadow growth.

## LIVESTOCK HOUSING

### General housing terms

ANIMAL HOUSING SYSTEM	This is defined by the way LIVESTOCK are kept, MANURE is managed and stored, the VENTILATION system installed to control climate in the building and the type and regime used to provide feed and water to the animals.
ANIMAL PLACE	Space provided per animal in an ANIMAL HOUSING SYSTEM according to animal welfare standards or regulations. The number of animals produced per place per year or per m <sup>2</sup> depends on the ANIMAL CATEGORY and type of management.
ANIMAL HOUSE	A general name for a building in which LIVESTOCK are kept. Also termed LIVESTOCK HOUSE or LIVESTOCK BUILDING.
LIVESTOCK HOUSE	ANIMAL HOUSE
LIVESTOCK BUILDING	ANIMAL HOUSE
BARN	A general name for a farm building used for housing livestock, storing machinery or crops, etc.
SHED	BARN
STABLE	Building or part of a building for horses.
OPEN CLIMATE HOUSE	An ANIMAL HOUSE with NATURAL VENTILATION only.
CLOSED HOUSE	An ANIMAL HOUSE with artificial (e.g. MECHANICAL VENTILATION) rather than NATURAL VENTILATION.
IN HOUSE CLIMATE	The general environmental conditions e.g. temperature, air quality) within a LIVESTOCK building.
INSULATION	The prevention of passage of heat in or out of e.g. a LIVESTOCK building by incorporating non-heat conducting material into the walls and roof.
VENTILATION	The circulation of fresh air in order to provide fresh air and to remove gaseous products, heat and moisture to ensure a suitable climate in a LIVESTOCK building.
VENTILATION RATE	This is usually expressed as the volume flow of air (m <sup>3</sup> /hour <sup>-1</sup> ) through the whole LIVESTOCK building or per ANIMAL PLACE.



MECHANICAL VENTILATION	VENTILATION of building, usually for PIGS, POULTRY or CALVES, through the use of electrically powered fans in the walls or roof that are normally controlled by the temperature in the building. Also MECHANICALLY VENTILATED BUILDING.
MECHANICALLY VENTILATED BUILDING	LIVESTOCK BUILDING with MECHANICAL VENTILATION
FORCED VENTILATION	MECHANICAL VENTILATION
EXHAUST VENTILATION	MECHANICAL VENTILATION of a building by running fans in the walls or roof so that fresh air is drawn in through openings or vents.
PRESSURE VENTILATION	MECHANICAL VENTILATION of a building through the use of fans to blow fresh air into the building.
NEUTRAL VENTILATION	VENTILATION of a building by a combination of EXHAUST VENTILATION and PRESSURE VENTILATION.
NATURAL VENTILATION	VENTILATION of a building, e.g. for CATTLE, by openings or gaps designed into the roof and/or sides of the building. Also NATURALLY VENTILATED BUILDING.
NATURALLY VENTILATED BUILDING	LIVESTOCK BUILDING with NATURAL VENTILATION
HANDCONTROLLED VENTILATION	VENTILATION of a building through vents in the sides or roof that are opened and closed manually.
AUTOMATICALLY CONTROLLED NATURAL VENTILATION (ACNV)	VENTILATION of a building through openings or vents in the sides or roof that are opened and closed by electrically driven motors in response to sensors in the building.
ZONE HEATING	A means of heating an ANIMAL HOUSE with heating elements radiating heat onto the animals.
ROOM HEATING	A means of heating an ANIMAL HOUSE by preheating the air entering the building.
EVAPORATIVE COOLING	A means of lowering the temperature in a LIVESTOCK BUILDING in regions with high summer temperatures. Evaporation of water is used to cool the air in the building.
PEN	A small enclosure for LIVESTOCK, within a house or outdoors.

SINGLE PEN AREA	A PEN with no separate functional areas for dunging, resting, feeding.
MULTI PEN AREA	A PEN with separate functional areas for dunging, resting, feeding etc.
STALL	A division or compartment for an animal or animals, usually within a house.
CRATE	A small PEN or container for LIVESTOCK, allowing very restricted movement.
BEDDING	Material placed on the floors of LIVESTOCK houses with SOLID FLOORS or PARTIALLY SLATTED FLOORS to provide some comfort to the animals and to absorb moisture and urine. Commonly straw, chopped straw, sawdust, wood shavings, sand, peat. Rubber or plastic mats may also be provided for animals to lie on.
HOUSED PERIOD	Period for which LIVESTOCK are kept within a building, e.g. during the winter months.
SOLID FLOOR	The floor of a building normally constructed of a hard, impermeable material such as concrete.
SLATTED FLOOR	A metal, concrete or plastic floor with slots that allow FAECES and URINE from LIVESTOCK to drop into a CHANNEL or pit beneath.
FULLY SLATTED FLOOR	A floor where the whole area is SLATTED.
PARTIALLY or PARTLY SLATTED FLOOR	A floor that is partly SOLID and partly SLATTED. Commonly used in PENS for housing PIGS and designed so that the animals defecate and urinate on the slatted part.
PERFORATED FLOOR	Like SLATTED FLOOR, but with holes rather than slots.
TRIANGULAR SLATS	Components of SLATTED FLOORS, e.g. in PIG PENS, usually made of metal, plastic or concrete. They are triangular in cross section with the apex of the triangle facing down so that the slots between them are wider on the underside of the floor. This ensures that SLURRY readily falls down into the MANURE PIT beneath the floor and prevents the slots from becoming blocked.
CHANNEL	A long, watertight compartment often constructed beneath a slatted or gridded floor in a building designed to collect FAECES and URINE as SLURRY or LIQUID MANURE prior to discharging under gravity to longer-term storage. A gate valve or sluice gate may be built into the channel to provide short-

	term storage. Commonly used in housing for FATTENING PIGS or TIED STALL for CATTLE.
SLUICE GATE	A gate or valve that is opened or closed by sliding in supporting grooves e.g. to control liquid flow in a CHANNEL.
SLANTED SIDE WALLS (Ref. CHANNEL)	The sides of MANURE CHANNELS e.g. beneath the SLATTED FLOORS of PIG PENS often have a slope out toward the bottom to reduce the surface area of the MANURE. The aim is to reduce AMMONIA EMISSION.
OVERFLOW CHANNEL	As CHANNEL, except a barrier in the channel retains a layer of SLURRY or LIQUID MANURE in the channel. The retained layer of liquid prevents the build up of solids that may block the channel. The surplus flows over the barrier and out of the building.
FLUSHED CHANNEL	As CHANNEL, except the channel is regularly emptied by opening a gate valve or sluice gate and flushing out the contents with water or treated SLURRY.
GUTTER	Normally refers to a shallow CHANNEL that may be preformed e.g. to collect rainfall from a roof, or built into a concrete floor to collect and transport e.g. a LIQUID FRACTION. May also mean the same as CHANNEL.
DEEP PIT	A below-ground, watertight compartment for collecting and storing LIQUID MANURES or SLURRY or POULTRY DROPPINGS.
STRAW FLOW SYSTEM	A STALL or PEN with a slightly sloping floor with STRAW being provided or dispensed at the top of the slope and “flowing” down the slope to be collected as SOLID MANURE at the bottom.
GROOVED FLOOR	A type of SLATTED FLOOR in which the slots are mostly sealed on the underside leaving rows of holes through which URINE can drain rapidly. Used as a means of reducing AMMONIA EMISSIONS from CATTLE.
SCRAPER	A device used for cleaning the floors of concrete surfaces such as PASSAGEWAYS and HARDSTANDINGS or emptying CHANNELS in LIVESTOCK HOUSES, through scraping FAECES, URINE, waste BEDDING and FEED into a CHANNEL or pit etc. Include: <ul style="list-style-type: none"> <li>• MANUAL SCRAPER</li> <li>• TRACTOR MOUNTED SCRAPER</li> <li>• AUTOMATIC SCRAPER</li> <li>• RECIPROCATING SCRAPER</li> </ul>

MANUAL SCRAPER	Either simple hand-held tools, often with a rubber scraper, or equipped with motorised wheels used for cleaning PASSAGEWAYS and HARDSTANDINGS.
TRACTOR MOUNTED SCRAPER	SCRAPER mounted on the front or rear of a tractor, these are commonly used for cleaning PASSAGEWAYS in CATTLE houses.
AUTOMATIC SCRAPER	SCRAPER that are usually fixed permanently in PASSAGEWAYS or CHANNELS and driven by a stationary MECHANICAL POWER or HYDRAULIC POWER unit. In CHANNELS, they usually comprise chains or cables fitted with metal flaps, blades or flights. Rubber scrapers are more common for cleaning PASSAGEWAYS.
RECIPROCATING SCRAPER	SCRAPER where the direction of movement is reversed at intervals.
MECHANICAL POWER	Power is transferred from a fixed electric motor by means of a gear reduction device to chains, cables, etc. that operate a SCRAPER or other equipment. Reciprocating movement (e.g. for RECIPROCATING SCRAPERS) is achieved by alternating the direction of rotation of the motor.
HYDRAULIC POWER	A pump powered by an electric motor supplies hydraulic rams with oil to drive equipment such as a SCRAPER. Such systems give greater flexibility in power transfer between electric motors and equipment and are more common in colder climates because they are less likely to freeze up. Reciprocating movement is achieved through the use of dual rams and a pressure sensitive valve.
PISTON, RAM, PRESS RAM	These are usually HYDRAULICALLY POWERED and designed to press MANURE through CHANNELS or large pipes within LIVESTOCK HOUSES. They can also be used to move MANURE from the house to a store.
SPIRAL SCREW	A screw or AUGER is fitted into a pipe and is powered by an electric motor. They are used to lift MANURE from, for example, a CHANNEL in a house to a store or heap.
CONVEYOR, ELEVATOR	These comprise a powered SPIRAL SCREW or moving belt to move MANURE. Belt CONVEYORS are suitable for SOLID MANURE.  A CONVEYOR angled upwards to lift MANURE e.g. into a store or heap.
AUGER	A large rotating screw for moving manure.

## Cattle housing

TIED STALLS, TIED HOUSING	<p>A housing design in which LIVESTOCK (usually CATTLE) are permanently restrained in a stall whilst they are kept in the house and so have restricted freedom of movement. The floors of the stalls may be:</p> <ul style="list-style-type: none"> <li>• Level concrete with a CHANNEL covered by a grid at the rear of the animals to collect FAECES and URINE as SLURRY.</li> <li>• Sloping concrete with BEDDING (e.g. straw, chopped straw, sawdust) and a shallow gutter at the rear of the animals to collect part of the FAECES and the URINE, whilst part is regularly removed as SOLID MANURE. In some cases the gutter is equipped with a drainage pipe to collect seepage.</li> <li>• As above but with a deeper CHANNEL instead of a gutter to collect and store the LIQUID FRACTION.</li> </ul>
TETHER STALLS	TIED STALLS
SEMI-TIED STALLS	As above except DAIRY COWS are released to walk to a milking parlour or to be fed. Often most of the feed is served in front of the stalls.
LOOSE HOUSING	Animals have free access over the whole area of the building or PEN. It is common for a deep layer of BEDDING (usually straw) to be spread over the floor that is removed from the building, typically once or twice per winter, as FARMYARD MANURE. A concrete floor, which is cleaned more frequently by scraping, may be provided in the area where the animals stand to feed and/or drink.
CUBICLE HOUSE	<p>The building is divided into rows of individual stalls or cubicles in which animals lay when at rest but are not restrained. A small amount of BEDDING (e.g. sawdust, wood shavings, chopped straw, sand, rubber or plastic mats) is placed in each cubicle. FAECES and URINE are excreted in the concrete PASSAGEWAYS between the rows of cubicles. PASSAGEWAYS may be SLATTED FLOORS, concrete, asphalted concrete or concrete covered with rubber. PASSAGEWAYS are cleaned at least once per day, e.g. by a <i>tractor mounted</i> or more frequently by an <i>automatic SCRAPER</i>, and the manure is removed from the building as SLURRY.</p>
WOODCHIP CORRAL	<p>An outside, unroofed enclosure that is bedded with a layer of coarse woodchip. Used mainly for keeping cattle over winter as an alternative to expensive buildings. Lined corrals, sometimes called stand-off pads, have provision to collect and manage drainage EFFLUENT.</p>

**FEEDLOT** A concentrated, confined livestock operation outdoors wherein the LIVESTOCK are fed at the place of confinement and crop production is not sustained.

## **Pig housing**

**PIGGERY** A place where PIGS are kept.

**PIG HOUSE** Pigs are normally kept in thermally insulated buildings with forced or natural ventilation. There are large differences in PIG housing systems both between and within countries in Europe. Also, different designs are used for different stages of production (SOWS, weaned PIGLETS from weaning up to 25-30 kg LIVEWEIGHT, GROWERS-FINISHERS or FATTENERS from 25-30 kg up to 90 – 160 kg LIVEWEIGHT).

**INDIVIDUAL HOUSING FOR MATING AND GESTATING SOWS** Pregnant SOWS are kept in individual CRATES.

- SOWS are kept in CRATES measuring about 2 m X 0.6 m, the rear end being equipped with a SLATTED FLOOR to collect SLURRY in a deep or shallow CHANNEL that is emptied at intervals depending on its capacity. A central PASSAGEWAY with a SLATTED FLOOR runs between rows of CRATES.
- SOWS are kept in CRATES similar to above but with a solid concrete floor often with a layer of straw BEDDING to produce SOLID MANURE or FARMYARD MANURE. There is a drain system in the central passageway to collect and remove LIQUID MANURE that is mainly URINE.

**GROUP HOUSING FOR MATING AND GESTATING SOWS** Several pregnant SOWS are kept together in enclosed compartments or PENS that may have:

- A solid concrete floor with a deep layer of straw BEDDING to produce SOLID MANURE or FARMYARD MANURE.
- A PARTIALLY SLATTED FLOOR. This provides a lying area with straw BEDDING and a SLATTED FLOOR above a collection CHANNEL in the dunging and SLATTED FLOOR feeding area that may be emptied using SCRAPERS.

**HOUSING FOR FARROWING SOWS** SOWS that are about to give birth may be:

- Confined with restricted movement in a FARROWING CRATE to prevent her lying on the PIGLETS. The floor may be FULLY or PARTIALLY SLATTED with SLURRY collected in a CHANNEL or DEEP PIT. The lying area for the PIGLETS is usually not slatted.
- Allowed free movement in PENS with PARTIALLY SLATTED FLOORS to collect SLURRY and separate lying areas with a SOLID FLOOR for the SOW and for

the PIGLETS.

FARROWING  
CRATE

CRATE for FARROWING SOWS

HOUSING FOR  
WEANERS

WEANERS are kept in small groups (often 8-12) in PEN houses that are heated and ventilated. PENS may have:

- A SOLID FLOOR with straw BEDDING to produce SOLID MANURE
- A FULLY SLATTED FLOOR or
- A PARTIALLY SLATTED FLOOR to produce SLURRY.

FLAT DECK

This was developed in 1960/70 as a specialised housing system for rearing weaned pigs. It originally comprised a low, well-insulated building with a linked heating and ventilation system to maintain temperature at any desired level. Each house contains several PENS with FULLY SLATTED FLOORS above a SLURRY CHANNEL. The system has evolved over the years and the term is now often used to describe loosely any SLURRY-based housing system for WEANERS.

HOUSING FOR  
GROWERS-  
FINISHERS

A thermally insulated, FORCED or NATURALLY VENTILATED house divided into PENS containing groups of PIGS. May have:

- FULLY SLATTED FLOOR. PENS have FULLY SLATTED FLOORS with no physical separation between lying, feeding and dunging areas. SLURRY is collected in a CHANNEL or pit beneath the floor that may connect to a central CHANNEL for emptying.
- PARTIALLY SLATTED FLOOR. Similar to above except the floor is divided into a slatted area (for dunging), with a SLURRY CHANNEL or pit beneath it, and a solid, non-slatted (for feeding and resting) area. Some straw is sometimes provided where there is a SOLID FLOOR and a smaller slatted area. The SOLID FLOOR may have a slight slope so that SLURRY and STRAW move towards the slats (STRAW FLOW SYSTEM).
- SOLID FLOOR. Straw is spread over the floor to provide BEDDING or in smaller amounts for animal welfare or may be washed down with water if no bedding is used.

PARTLY SLATTED  
PIG PEN

PIG PEN with PARTIALLY or PARTLY SLATTED FLOOR

OUTDOOR PIGS

SOWS and weaned pigs (WEANERS) up to 30-35 kg LIVEWEIGHT or FATTENING PIGS are kept outdoors in fields with small huts, or arks, for shelter.

KENNEL	A type of pig PEN, usually for WEANERS. A sleeping section with a hinged roof that can be raised or lowered to control temperature and ventilation.
KENNEL HOUSE	A LIVESTOCK HOUSE containing KENNELS.
COVERED BOX	KENNEL
VERANDA HOUSE	A type of house for weaned pigs (WEANERS) comprising two rows of KENNELS with a central PASSAGEWAY all under the same roof. Outside the roof on each side of the building there is a SLATTED FLOOR area, or veranda, above a SLURRY CHANNEL.
MONOPITCH HOUSE	A type of NATURALLY VENTILATED house for finishing pigs (FINISHERS) in which the roof slopes from front to back. It may be open-fronted for ventilation with wind barriers or have ventilation flaps or shutters at the front and rear.
FLUSHED GUTTERS	See also GUTTER. Installations to collect and remove SLURRY from beneath the SLATTED FLOOR of PIG houses. Small plastic or metal GUTTERS are fitted beneath the floor and flushed once or twice a day, often with SEPARATED SLURRY or AERATED SLURRY.
FLUSH TUBES OR PIPES	Installations to collect and remove SLURRY, especially URINE, from beneath the SLATTED FLOOR of PIG houses. Plastic tubes or pipes are incorporated into the concrete under the slats and liquid drains into these through slots. SEPARATED SLURRY and AERATED SLURRY is normally used to flush out the pipes.
MANURE SURFACE COOLING FINS	Devices designed to cool the surface, and hence reduce AMMONIA EMISSION, from MANURE PITS beneath SLATTED FLOOR in PIG houses. Arrays of plastic or metal fins are filled with cold water to act as a heat exchanger and floated on the MANURE surface.
CONVEX SOLID FLOOR	A solid concrete floor in PARTLY SLATTED PIG PENS designed to slope in two directions so that SLURRY flows into two CHANNELS.
MANURE PAN	A prefabricated container sometimes fitted beneath the SLATTED FLOOR e.g. of CRATES for SOWS, to collect SLURRY.



## Poultry housing

BATTERY CAGE HOUSE	A closed building with forced ventilation and with or without a lighting system for LAYING HENS. Birds are kept in tiered cages, usually made of steel wire, arranged in long rows. After 2012 conventional cages will be banned in EU member states. After 2012 only enriched cages are allowed. They can be replaced by ENRICHED CAGES or AVIARY SYSTEM.
BATTERY CAGES	Small enclosures, usually made of wire or metal bars and arranged in rows or tiers, in which LAYING HENS are kept. Banned in many countries for animal welfare reasons
CAGES	BATTERY CAGES
FLAT DECK DESIGN STAIR STEP DESIGN COMPACT DESIGN BELT DESIGN	These terms describe the arrangement of the CAGES in BATTERY CAGE HOUSES. In FLATDECK, STAIRSTEP and COMPACT DESIGN, MANURE is collected in a pit or canal located beneath the CAGES. In the BELT design, the manure falls onto a movable MANURE BELT situated beneath each tier of CAGES and conveyed to a store.
HIGH RISE BUILDING	A BATTERY CAGE HOUSE where DROPPINGS are collected at ground level and CAGES installed on a floor above.
DEEP PIT HOUSE	LAYING HENS are housed in cages or in AVIARY SYSTEM in one or more tiers. DROPPINGS fall into a manure pit (DEEP PIT) or a CHANNEL beneath the cages by themselves or with the aid of a SCRAPER together with spilled water from the drinkers. The LAYER MANURE is removed once a year or less frequently by scraper or FRONT LOADER on a tractor. In some systems, the ventilation system for the house is designed so that warm air is used to dry the wet manure in the DEEP PIT or CHANNEL.
MANURE BELT	Movable belts, e.g. made of “non –stick” polypropylene, below the cages on which DROPPINGS from LAYING HENS are collected and are periodically transported outside the house to a closed storage or direct application.
PERFORATED MANURE BELT	As MANURE BELT except the belt has holes or perforations, to increase airflow through the DROPPINGS for drying.
VENTILATED MANURE BELT	MANURE BELT equipped with a VENTILATION system to dry the manure and reduce AMMONIA EMISSION (e.g. WHISK-FORCED AIR DRYING or FORCED AIR MANURE DRYING).
STILT HOUSE	This is similar to a DEEP PIT house for LAYING HENS except that there is a variable valve between the cage and dropping storage areas and large openings in the dropping store walls that allow wind to pass through and assist drying. Cage and dropping areas of the building are separated so DROPPINGS

	can be removed at any convenient time without disturbing the birds.
CANAL HOUSE	A type of BATTERY CAGE housing system for LAYING HENS. MANURE from the tiered CAGES falls down into a canal about 100cm deep. To dry the MANURE, air drawn into the building by fans is warmed by passing through the cage area before flowing over the MANURE in the canals and leaving the house.
ENRICHED CAGE	A new type of BATTERY CAGES for LAYING HENS that, compared to conventional systems, provides more space for the birds and is equipped with structural features like perches, a nest box and litter or scratch area to stimulate natural behaviour. DROPPINGS are removed via MANURE BELTS.
WHISK-FORCED AIR DRYING	An in-house system for drying manure collected from LAYING HENS kept in vertically tiered CAGES or AVIARY SYSTEMS. A series of whisks situated above a MANURE BELT are moved to and fro, so moving the air and drying the manure.
FORCED AIR MANURE DRYING	An in-house system for drying manure collected from LAYING HENS kept in vertically tiered CAGES or AVIARY SYSTEM. Air, that is normally preheated, is blown over the MANURE collected on a MANURE BELT through a perforated tube.
DRYING TUNNEL OVER CAGE	A system for drying MANURE from LAYING HENS kept in a BATTERY CAGES housing system. MANURE is collected on a MANURE BELT beneath the CAGES and conveyed up to separate belts located in a ventilated tunnel above the CAGES or AVIARY SYSTEMS for drying.
AVIARY HOUSE	Multi-level barns. A house for LAYING HENS with thermal insulation, forced ventilation and either natural or artificial light. The birds have freedom of movement over multiple different stories. The house is divided into separate functional areas for feeding and drinking, sleeping and resting, scratching, egg laying. DROPPINGS may be collected in a DEEP PIT or removed by a MANURE BELT.
PERCHERY	AVIARY HOUSE
AVIARY SYSTEM	House where birds are kept in large groups and enjoy freedom of movement over the entire house area. Housing space is subdivided into different functional areas (feeding and drinking, sleeping and resting, scratch area, egg laying area). The birds can use several house levels that allow for higher stocking densities compared to the commonly used floor regime (deep litter). Droppings are removed via manure belts into containers, or into a manure pit, or otherwise collected in a manure pit.
DEEP LITTER HOUSE FOR LAYING HENS	Single-level barns. A simple closed building that is thermally insulated and with forced ventilation. At least a third of the floor area must be covered with BEDDING (e.g. chopped straw,

wood shavings). The rest is arranged as a pit covered with slats to collect DROPPINGS over the 13 – 15 month egg laying period. Alternatively the droppings may be removed periodically with a scraper. Laying nests, feeders and water supply are placed over the slatted area to keep the litter dry.

BROILER HOUSE	A house for intensive BROILER production. It is usually a simple closed building with natural or artificial light, thermally insulated and force ventilated. It may also be constructed with open side walls covered with mesh screens and located so that they are exposed to a natural stream of air. Additional ventilation fans may be fitted for use during hot weather. The birds are kept on litter e.g. chopped straw, wood shavings, shredded paper, spread over the entire floor area. Manure (BROILER LITTER) is removed at the end of each growing period.
PERFORATED FLOOR	This normally refers to a type of non-CAGE systems for housing BROILERS or LAYING HENS in which there is a double floor. The upper floor has perforations so that MANURE and litter can be dried by air flowing up through the floor.
NIPPLE DRINKERS	Small projections usually made of a combination of plastic and steel that are fitted beneath the water supply pipe. Often used in automatic watering systems designed to provide water on demand to BROILERS or to LAYING HENS.
ROUND DRINKERS	Small, circular plastic containers of differing design that provides water, usually for BROILERS.
WATER TROUGHS	Containers providing water e.g. for BROILERS, that are placed on or below the water supply pipe. Cups are either filled with water all the time or filled when a metal strip is touched by a bird.
TURKEY HOUSE	This is very similar to a BROILER HOUSE used for rearing turkeys for meat. Variations in design include: <ul style="list-style-type: none"> <li>• <i>Closed house.</i> The DEEP LITTER MANURE is removed at the end of the rotation, as for broiler. In special low emission systems the DEEP LITTER is removed from time to time (e.g. about nine times per rotation) and replaced with fresh LITTER.</li> <li>• <i>House with open side walls.</i> Especially for male animals; manure removal like in closed houses.</li> <li>• <i>Partially ventilated littered floor.</i> About 75% of the floor area is solid and 25% is a raised platform with a SLATTED FLOOR covered with nylon cloth. Litter (wood shavings) is spread over both floor areas and air is blown through the slatted area to dry the MANURE. The system gives lower AMMONIA EMISSIONS than conventional systems.</li> </ul>

DUCK HOUSE	This is very similar to a BROILER HOUSE and used for rearing ducks for meat. Variations include: <ul style="list-style-type: none"> <li>• DEEP LITTER</li> <li>• PARTLY SLATTED/partly _ floor</li> <li>• FULLY SLATTED FLOOR.</li> </ul>
FREE RANGE POULTRY	Production system for POULTRY (LAYING HENS, PULLETS, TURKEY etc.) where the animals have free access to an outside area during daytime. Especially common on organic farms or in special animal welfare programs.
VERANDA	Covered areas with open side walls along the side of POULTRY houses that allow animals access to outside climate for animal welfare reasons. It is eventually equipped with a base plate covered with some type of litter (scratching area) or ground covering. VERANDA is often combined with FREE RANGE POULTRY systems.

### Hardstandings

HARDSTANDING	A general term for any outdoor, normally unroofed area with a hard surface usually of concrete. Include: <ul style="list-style-type: none"> <li>• COLLECTING YARDS, where dairy cows assemble before milking.</li> <li>• FEEDING or LOAFING YARDS, where cattle or pigs are fed or simply provided with access to the outside of houses for animal welfare reasons.</li> <li>• WALKWAYS or PASSAGEWAYS, providing access for animals to different areas of the farm.</li> <li>• SHEEP HANDLING YARDS.</li> <li>• FARMYARD MANURE storage area.</li> <li>• <i>Crop storage areas, machinery storage (not relevant in the context of manure management).</i></li> </ul>
YARD	HARDSTANDING
UNSTRUCTURED YARD	A YARD with no distinction between different areas.
STRUCTURED YARD	A YARD with different areas for different uses e.g. LIVESTOCK feeding or dunging. For poultry this comprises structured outdoor area with trees and installations providing shade and protection for the birds.
COVERED YARD	A YARD with a roof to exclude rain.
COLLECTING YARD	A HARDSTANDING where DAIRY COWS are gathered prior to milking. May be in or outside the building.
FEEDING YARD	A HARDSTANDING where LIVESTOCK, usually CATTLE, are

	fed often outside the house.
LOAFING YARD	A HARDSTANDING where housed LIVESTOCK, usually CATTLE, are provided access for exercise, often outdoors.
EXERCISE YARD	LOAFING YARD
PASSAGEWAY	Usually an area with a hard surface to provide LIVESTOCK (and farm staff and machinery) access to different parts of the building or between buildings.
WALKWAY	PASSAGEWAY
SHEEP HANDLING YARD	An area (usually a HARDSTANDING) where SHEEP are gathered e.g. prior to shearing, dipping, veterinary treatment, etc.

## MANURE STORAGE

### Liquid manure stores

MANURE PIT	A below-ground store with watertight floor and walls and a solid or gridded lid commonly used for short-term storage of LIQUID MANURE, SLURRY, DIRTY WATER etc. May be inside or outside a LIVESTOCK building.
MANURE BAG	Large, prefabricated bags made from flexible, reinforced plastic sheet for storing LIQUID MANURE, SLURRY etc. The bag is sealed but ventilation is provided to prevent build up of gases.
RECEPTION PIT	A PIT that is used for short-term storage of LIQUID MANURE, SLURRY, DIRTY WATER etc. from a livestock house prior to transferring to a main store.
TANK	A vessel for holding LIQUID MANURE, SLURRY, DIRTY WATER.
EFFLUENT TANK	A TANK usually used only for storing SILAGE EFFLUENT.
SETTLEMENT TANK	Usually a below-ground, rectangular vessel divided longitudinally into 2-3 compartments and used, for example, to aid settlement of solid material in DIRTY WATER prior to IRRIGATION. Can be a part of a TREATMENT design to separate SLUDGE and SUPERNATANT by gravity. The latter is sometimes used for irrigation or for flushing PASSAGEWAYS in houses or CHANNELS under SLATTED FLOORS.
ABOVE GROUND CIRCULAR TANK, SLURRY SILO	A large, normally open-top, circular vessel made from pre-fabricated vitreous enamelled steel, concrete or wood panels used for storing LIQUID MANURE, SLURRY, DIRTY WATER etc. Filled and emptied from RECEPTION PIT using a pump.
LAGOON	Normally a large rectangular or square shaped structure with sloping earth bank walls (EARTH BANKED LAGOON) with large surface area to depth ratio. May be lined with water impermeable material. Used for storing LIQUID MANURES, SLURRY. Emptied with a pump or by mechanised digger. In the USA, and in other warm climates, LAGOONS are designed for biological TREATMENT and not just for storage. It can be AEROBIC, ANAEROBIC or facultative depending on design, loading rate and type of MICROORGANISM present.
MANURE STORAGE POND	LAGOON (not designed for MANURE TREATMENT in USA).
EARTH BANKED LAGOON	LAGOON

EARTHEN STORAGE BASIN	EARTH BANKED LAGOON (in USA) not designed for treatment.
STRAINER BOX	<p>A strong, coarse sieve fitted in LAGOONS that holds back solid material whilst allowing liquids (LIQUID FRACTION) to pass through. Liquid is pumped from the box at intervals leaving SOLID MANURE in the LAGOON that can be dug out.</p> <p>The strainer box can be a welded steel mesh cage or a box made from timber railway sleepers with horizontal slots. Mainly used in the UK.</p>
SLURRY COMPOUND	A rectangular or square-shaped structure often with a concrete floor and walls manufactured from timber railway sleepers or concrete staves etc. It may be filled by scraping SLURRY up a ramp. A LIQUID FRACTION seeps through small, horizontal gaps in the walls and is collected in a gutter draining to a separate pit. Mainly used in the UK.
SLURRY STORE COVER	<p>A structure fitted to a SLURRY or LIQUID MANURE store mainly to reduce AMMONIA EMISSION and exclude rainfall. Also reduces ODOUR. There are several main types:</p> <ul style="list-style-type: none"> <li>• RIGID COVER.</li> <li>• TENT COVER.</li> <li>• FLOATING COVER.</li> <li>• A floating layer of SOLID MANURE or natural crust.</li> </ul>
RIGID COVER	A tight fitting cover made from inflexible material such as concrete, fibreglass panels or wood etc.
TENT COVER	A cover made from flexible or pliant sheet material such as reinforced plastic sheet or strong canvas that is stretched taut over the store. For ABOVE GROUND CIRCULAR TANKS, material is usually attached to the rim and supported by a central pole.
FLOATING COVER	A cover comprising a substance or material that rests on the surface of the SLURRY. Includes straw, peat, rapeseed oil, plastic pellets and LECA. Also includes FLOATING SHEETS.
FLOATING SHEETS	Are made from flexible plastic sheet or similar that is attached to the rim of the store or designed to float freely on the surface.
LECA	Light expanded clay aggregate.
ARTIFICIAL CRUST	A floating layer on the surface of stored SLURRY or LIQUID MANURE produced by the addition of a suitable material such as straw, balls of light expanded clay aggregate LECA, peat, oil, wool etc. Artificial crusts are produced to reduce AMMONIA EMISSIONS from the store.

CRUST	A fibrous floating layer that forms on the surface of stored slurry, especially CATTLE SLURRY. CRUST formation can be facilitated by adding chopped STRAW or other fibrous material.
NATURAL CRUST	CRUST that develops at the surface of stored SLURRY without special measures to support it.
SLURRY BAG	A large, prefabricated bag made from reinforced plastic sheet for storing SLURRY or LIQUID MANURE. The bag is sealed but has vents to prevent build up of gases.
FLEXIBLE BAG	SLURRY BAG
POSITIVE DISPLACEMENT PUMP	A pumping mechanism that seals liquid in a chamber, then forces it out by reducing the volume of the chamber. Examples: piston, diaphragm, helical rotor, vane. Used for low volume and high lift. Contrast with centrifugal. Includes volumetric pump and force pump.
CENTRIFUGAL PUMP	A pumping mechanism that spins liquid in order to push it out by means of centrifugal force.
CHOPPER PUMP	A pump with the added feature of a cutting or shredding action to reduce suspended trash to pumpable size.
SUBMERSIBLE PUMP	A motor/pump combination designed to be placed entirely below the surface of the liquid to be pumped.
VACUUM PUMP	A pump that removes air from a container to create a vacuum. Force pumps of many types are used for vacuum pumps including rotary pumps and piston pumps.
AGITATION	<p>The process of MIXING the contents of a SLURRY (or LIQUID MANURE) store to break up a hard CRUST and stir in any sediment to obtain a more homogeneous material. This is often done prior to pumping out the store and spreading on land. This can be done by:</p> <ul style="list-style-type: none"> <li>• <i>Pump</i>. SLURRY is recycled through the RECEPTION PIT and above ground store by means of a suitable pump. The pump is sometimes also used to force a stream of slurry through a nozzle on to the surface of the stored SLURRY to help to break up the CRUST. Alternatively, smaller stores may be mixed by a submersible CHOPPER PUMP.</li> <li>• Propeller or ROTATING IMPELLER AGITATOR.</li> <li>• BUBBLER.</li> </ul>
AGITATOR	A device for MIXING e.g. SLURRY usually by mechanical stirring.
MIXING	The process of manipulating a heterogeneous material e.g. SLURRY to make it more homogeneous.



ROTATING IMPELLER AGITATOR	AGITATOR that may be a) permanently fixed in the wall of an above ground store or, b), mobile. Both types may be powered by an electric motor or by the power take off (PTO) of a tractor. Mobile types are usually mounted on long shafts to give access to SLURRY in a high-sided store or a LAGOON.
BUBBLER	An air compressor is used to force air through perforations or nozzles in pipes fixed to the floor of above ground stores. The streams of large bubbles that are generated serve to mix the contents of the store.
SEPARATION TECHNOLOGIES	Technologies that divide SLURRY into one or more LIQUID and one or more SOLID FRACTIONS. Examples include MECHANICAL SEPARATORS, gravity SEDIMENTATION and reverse OSMOSIS.

### **Solid manure stores**

SOLID MANURE STORE	Normally a three sided, rectangular or square structure with a concrete floor and reinforced concrete or timber walls. The floor slopes towards the open side where seepage/drainage (LIQUID FRACTION) from the stacked SOLID MANURE is collected in a gutter and stored separately. In some countries, e.g. Alpine countries, SOLID MANURE stores are very common on farms with TIED HOUSING and daily removal of SOLID MANURE. These stores normally do not have any walls and are mostly not sloped.
FIELD HEAP	A heap or stack of SOLID MANURE stored in a field prior to spreading.
MIDDEN	A colloquial term for a MANURE heap, usually SOLID MANURE.
MANURE PAD	An area with a suitably tough surface e.g. concrete on which SOLID MANURE is stacked for storage or COMPOSTING.
MANURE CELLAR	A compartment for storage of MANURE underneath a livestock house. Steeply sloping terrain e.g. as in Norway provides suitable conditions for constructing this type of store. Ventilation is provided to prevent gases from entering the livestock house.
MANURE BUNKER	A high-sided container for storing dried LAYER MANURE.
WEEPING WALL STORE	A rectangular or square shaped structure made from specially designed concrete panels with vertical slots between them to allow liquid (LIQUID FRACTION) to seep out to a gutter draining to a pit. SOLID MANURE is left in the store and is dug out by removing a section of the wall. Only suitable for SLURRY containing straw or SEMI-SOLID MANURE. Mainly used in the UK.

FORE-END LOADER	A large shovel or bucket mounted on loading arms at the front of a tractor used for handling SOLID MANURE. The bucket may have a few short spikes with a back plate or may consist of many long spikes with a back plate.
FRONT LOADER	FORE-END LOADER means the same in context of glossary.
FORE-END FORK	An array of large spikes mounted on arms at the front of a tractor used for handling SOLID MANURE.

## MANURE TREATMENT

### General terms on manure treatment

TREATMENT	A controlled biological, chemical or physical process that changes the properties of MANURES. Many types of treatment (e.g. AEROBIC TREATMENT and ANAEROBIC DIGESTION) require investment in plant, machinery and operating costs. The benefits depend upon the type of treatment and the parameters (e.g. temperature) under which it is operated and controlled.
PROCESSING	TREATMENT
BIOLOGICAL TREATMENT	TREATMENT in which MICROORGANISMS are used to breakdown organic constituents in e.g. MANURE, WASTEWATER, etc.
CO-PROCESSING	Processing, especially by ANAEROBIC DIGESTION of SLURRY, for example, with other organic materials to increase the efficiency of the process etc.
AEROBIC	Containing free oxygen or requiring free oxygen e.g. aerobic bacteria.
ANAEROBIC	Containing no free oxygen (or not requiring free oxygen such as anaerobic bacteria) or chemically bound oxygen such as nitrates (NO <sub>3</sub> ).
ANOXIC	Containing no free oxygen but possibly chemically bound oxygen such as nitrates (NO <sub>3</sub> ).
PSYCROPHILIC	Process operated at low temperature (below 20° C).
MESOPHILIC	Process operated in a temperature range of 20 to 40° C.
THERMOPHILIC	Process operated above 40° C.
REACTOR	A vessel in which TREATMENT or PROCESSING occurs.
CONTINUOUS REACTOR	A REACTOR that receives a more or less continuous flow of substrate (e.g. SLURRY) for TREATMENT.
BATCH REACTOR	A reactor that receives a discontinuous flow of substrate (e.g. SLURRY) for TREATMENT. (BATCH PROCESS)
RETENTION TIME	The time for which a substrate e.g. SLURRY is retained in a treatment vessel or REACTOR.
RESIDENCE TIME	RETENTION TIME
DETENTION TIME	RETENTION TIME for ANAEROBIC DIGESTION.

SANITATION	Action by which pathogenic micro-organisms are killed by heating and/or addition of chemicals or irradiation.
HYGIENISATION	SANITATION
PASTEURISATION	Partial sterilisation by heating at a specified temperature, normally 70° C, for a specified time.
CONTINUOUS PROCESS	Raw waste is fed regularly into a treatment vessel e.g. a DIGESTER, displacing an equal volume of treated material.
BATCH PROCESS	A treatment vessel, e.g. a DIGESTER, is filled with raw waste then emptied. After TREATMENT the process is repeated.
ADDITIVES	<p>Manufactured or naturally occurring products or substances that are added to MANURES to modify their biological, chemical or physical properties. Many additives are commercially available but most have not been subjected to independent testing so their effectiveness is uncertain. They include:</p> <ul style="list-style-type: none"> <li>• BACTERIAL ENZYME PREPARATIONS.</li> <li>• PLANT EXTRACT.</li> <li>• OXIDISING AGENTS.</li> <li>• DISINFECTANTS.</li> <li>• UREASE INHIBITORS.</li> <li>• MASKING AGENTS.</li> <li>• ACID, ACIDIFYING COMPOUNDS.</li> <li>• ADSORBENTS.</li> </ul>
BACTERIAL ENZYME PREPARATIONS	Type of ADDITIVE. Many claims are made concerning their effectiveness including breakdown of NATURAL CRUSTS, ODOUR reduction and stabilisation of LIQUID MANURE.
PLANT EXTRACTS	Type of ADDITIVE. Some are claimed to reduce ODOUR and AMMONIA EMISSIONS.
OXIDISING AGENTS	Type of ADDITIVE. These are intended to have a similar effect as AEROBIC TREATMENT.
DISINFECTANTS	Type of ADDITIVE. These are intended to have a SANITATION effect for LIQUID MANURE.
UREASE INHIBITORS	Type of ADDITIVE. These block the transformation of UREA that is contained in the URINE of livestock, to AMMONIUM compounds. The latter breakdown to release AMMONIA gas, so UREASE INHIBITORS have potential for reducing AMMONIA EMISSION from MANURES.
NITRIFICATION INHIBITORS	Substances that stop or delay the process of NITRIFICATION, the transformation of ammonium nitrogen to nitrates.

<b>MASKING AGENTS</b>	Type of ADDITIVE. These are intended to reduce offensive ODOUR by replacing, or masking, them with a more pleasant ODOUR.
<b>ACID</b>	Type of ADDITIVE. Under acidic conditions (pH 4-5), AMMONIUM nitrogen remains in solution rather than being released into the air as AMMONIA gas. Hence, reducing the pH of LIQUID MANURE by adding acid can reduce the potential for AMMONIA EMISSION.
<b>ACIDIFYING COMPOUNDS</b>	Type of ADDITIVE. ACID or chemical compounds that decrease the pH of e.g. LIQUID MANURES.
<b>ADSORBENTS</b>	Type of ADDITIVE. These include substances such as peat and clay minerals (e.g. ZEOLITE) that depend upon physical adsorption (e.g. of odorous compounds, AMMONIA) for their effect.
<b>ZEOLITE</b>	A clay mineral with a high adsorptive capacity used as an ADDITIVE.
<b>RETROFIT</b>	The addition of new technology or feature to older or existing systems or structures.
<b>END OF PIPE TECHNIQUES</b>	Methods used to remove already formed contaminants or pollutants from an air, water or waste stream e.g. from a building or treatment system. So called because they are normally implemented as the last stage of a process.

### **Liquid manure treatment**

<b>AEROBIC TREATMENT</b>	<p>The breakdown of organic matter in the presence of free oxygen. Treatment involves dissolving sufficient oxygen in LIQUID MANURES (through AERATION) to stimulate growth of aerobic bacteria. The potential benefits include:</p> <ul style="list-style-type: none"> <li>• Stabilisation of the manure and reduction in BIOLOGICAL OXYGEN DEMAND (BOD) and CHEMICAL OXYGEN DEMAND (COD).</li> <li>• Decrease in PATHOGENS.</li> <li>• Reduction in ODOUR.</li> <li>• More homogeneous MANURE that is easier to pump.</li> </ul> <p>COMPOSTING of SOLID MANURES is a type of AEROBIC TREATMENT.</p>
<b>AERATION</b>	The process of incorporating air into LIQUID (or SOLID MANURE) in order to achieve AEROBIC TREATMENT. There is a range of methods available including AERATORS, specially designed LAGOONS for LIQUID MANURE and mechanically turning or mixing SOLID MANURE.

LIQUID COMPOSTING	Sometimes refers to AEROBIC TREATMENT of LIQUID MANURE designed and operated to generate and recover heat.
ACTIVATED SLUDGE PROCESS	LIQUID MANURE or ORGANIC WASTE is agitated and AERATION and the solids separated by sedimentation. The mass of settled solids is termed <i>active sludge</i> .
OXYGEN TRANSFER EFFICIENCY	The efficiency with which oxygen is transferred into a liquid e.g. SLURRY by an AERATOR. Normally measured as kilograms of oxygen per absorbed kilowatt hour of power (kg O <sub>2</sub> /kWh) by the AERATOR.
OVERALL SPECIFIC OXYGEN INPUT (OSOI)	OXYGEN TRANSFER EFFICIENCY.
AERATOR	A mechanical device used for transferring and diffusing oxygen (AERATION) into a liquid e.g. SLURRY. There are many different types of AERATOR that vary in cost, OXYGEN TRANSFER EFFICIENCY, application and reliability. They include: <ul style="list-style-type: none"> <li>• <i>Surface aerators.</i></li> <li>• <i>Air injection systems.</i></li> <li>• <i>Pump based systems.</i></li> </ul>
AEROBIC LAGOON	LAGOONS containing LIQUID MANURE that are either mechanically aerated with an AERATOR or designed to be shallow and naturally AEROBIC.
OXIDATION DITCH	An artificial open CHANNEL for partial TREATMENT of LIQUID MANURE or wastes in which the liquid is circulated and aerated by a mechanical device.
ANAEROBIC DIGESTION	The breakdown of organic matter by microorganisms in the absence of free oxygen. It is a process that occurs naturally in surface waters, soils, LAGOONS and in closed slurry tanks, for example, when no oxygen is present. The process can be used for the TREATMENT of LIQUID MANURES and for organic wastes such as municipal sewage and food industry wastes. The efficiency of the process is very dependent upon operating temperature. Most industrial and farm DIGESTERS are operated in the MESOPHILIC range where significant investment in machinery, plant and operating cost is required. The benefits of the process include: <ul style="list-style-type: none"> <li>• Stabilisation of manure and reduction in BOD and COD.</li> <li>• Reduction in ODOUR.</li> <li>• SANITATION of MANURE and decrease in PATHOGENS.</li> <li>• More homogeneous manure that is easier to manage and</li> </ul>

	<p>pump.</p> <ul style="list-style-type: none"> <li>• Production of BIOGAS.</li> </ul>
PSYCROPHILIC DIGESTION	Slow ANAEROBIC DIGESTION of LIQUID MANURE such as SLURRY in a LAGOON under ambient temperature conditions. The LAGOON may be covered to retain heat and collect BIOGAS. Most suitable to areas with a warmer climate.
MESOPHILIC DIGESTION	ANAEROBIC DIGESTION operated at a temperature of, typically, about 35° C. LIQUID MANURE or SLURRY is mixed and heated in an air-tight, insulated REACTOR or DIGESTER with a RETENTION TIME of 10-20 days. BIOGAS is collected and may be burnt in a boiler to provide hot water, e.g. for heating the DIGESTER, an engine or COMBINED HEAT AND POWER UNIT (CHP).
BIOGAS	A mixture of the gases METHANE and carbon dioxide, with smaller concentrations of other gases, produced from the ANAEROBIC DIGESTION of LIQUID MANURES etc.
DIGESTER	A vessel or REACTOR in which LIQUID MANURE etc. undergoes ANAEROBIC DIGESTION.
COMBINED HEAT AND POWER UNIT (CHP)	An internal combustion engine coupled to an electricity generator. Modified to run on BIOGAS, a CHP yields heat, through recovery from the engine cooling system, and electricity.
CO-GENERATION UNIT	COMBINED HEAT AND POWER UNIT.
CO-DIGESTION	ANAEROBIC DIGESTION of more than one type of organic substrate in the same DIGESTER.
CENTRALISED DIGESTER	An ANAEROBIC DIGESTION plant designed to receive organic substrates from several sources (e.g. SLURRIES from neighbouring farms, wastes from abattoirs, food processing factories etc.), so offering economies of scale in investment and operating costs. Also, BIOGAS production can be improved compared to digesting only SLURRY.
CAD PLANT	CENTRALISED DIGESTER
ANAEROBIC LAGOON	A TREATMENT, mainly in warmer climates, in which LIQUID MANURE is stored in LAGOONS at least 2m deep for 30 – 200 days and undergoes ANAEROBIC DIGESTION and, in warmer climates, yields BIOGAS.
METHANISATION	The conversion of VOLATILE FATTY ACIDS contained in, for example LIQUID MANURES, to METHANE and carbon dioxide gases by bacteria during ANAEROBIC DIGESTION.

FERMENTATION	The breakdown of organic substances under ANAEROBIC conditions by the action of ENZYMES secreted by living organisms such as bacteria and yeasts. The processes involved in SILAGE making and in ANAEROBIC DIGESTION are examples of FERMENTATION.
AMMONIA STRIPPING	A method for lowering the AMMONIA content of e.g. WASTEWATER. Adding lime or caustic soda increases the pH so that AMMONIA is released as a gas that is then dissolved in an acidic solution to ammonium salts.
SEDIMENTATION	A process by which suspended matter in e.g. WASTEWATER is settled out, with or without the use of chemicals, by gravity.
SEDIMENT	The material that settles to the bottom of a liquid.
CLARIFICATION	The process of removing suspended matter from e.g. WASTEWATER by SEDIMENTATION or FILTRATION.
FILTRATION	A process for separating liquids from solids by interposing a medium or filter through which only the liquid can pass
FLOCCULATION	Part of a TREATMENT process where addition of chemicals (Flocculents) and mixing causes small suspended particles to aggregate into clumps, or Floccs that can be removed by sedimentation, filtration or floatation.
CHEMICAL PRECIPITATION	A process where chemicals are added to, e.g. WASTEWATER, to form solid particles that settle out so removing a range of mainly inorganic contaminants. The treated water is decanted off the settled SLUDGE prior to appropriate disposal or re-use.
OSMOSIS	A physical process where a solvent e.g. water passes through a semi-permeable membrane from a dilute solution e.g. of salts, to a more concentrated solution.
REVERSE OSMOSIS	A physical process where a solvent e.g. water is forced through a semi-permeable membrane from a concentrated solution to a more dilute solution by increasing the pressure on the more concentrated solution. Used in partial purification of WASTEWATER and EFFLUENT.
OLIGOLYSIS	A small electric current is passed between two electrodes in stored LIQUID MANURE so releasing ions, usually copper, into the manure. The process is claimed to have a bactericidal effect, to reduce CRUST, SEDIMENT and ODOUR formation. With copper electrodes, it can significantly increase the copper content of the LIQUID MANURE.



MECHANICAL SEPARATION	The mechanical separation of coarse, fibrous material from LIQUID MANURE, especially SLURRY, to produce a more free-flowing LIQUID FRACTION and a stackable SOLID FRACTION. The products are easier to manage than SLURRY. The LIQUID FRACTION requires less power for pumping through pipes, for mixing and for AERATION and is less likely to form a CRUST or sediment during storage. There is also an improvement in FERTILISER VALUE. The SOLID FRACTION can be COMPOSTED and managed as SOLID MANURE.
MECHANICAL SEPARATOR	A machine for the MECHANICAL SEPARATION of SLURRY. There are several different types of machine with different principles of operation that produce LIQUID and SOLID FRACTIONS in different proportions and with different DRY MATTER contents. They include: <ul style="list-style-type: none"> <li>• ROTARY SCREEN.</li> <li>• ROLLER PRESS.</li> <li>• BELT SEPARATOR.</li> <li>• RUN-DOWN SCREEN or INCLINED SCREEN.</li> <li>• VIBRATING SCREEN.</li> <li>• CENTRIFUGE.</li> <li>• SCREW PRESS or PRESS AUGER.</li> </ul>
ROTARY SCREEN	MECHANICAL SEPARATOR in which SLURRY is squeezed through a large perforated metal cylinder by a pair of rollers.
ROLLER PRESS	MECHANICAL SEPARATOR in which SLURRY is squeezed through a pair of curved perforated screens by rotating rollers and brushes.
BELT SEPARATOR	MECHANICAL SEPARATOR in which SLURRY is fed onto a perforated, moving belt and squeezed between rollers.
INCLINED SCREEN	MECHANICAL SEPARATOR in which SLURRY flows down a sloping wedge-wire screen designed so that a LIQUID FRACTION drains through. Mainly for PIG SLURRY.
RUN-DOWN SCREEN	INCLINED SCREEN
CENTRIFUGE	MECHANICAL SEPARATOR which relies on rapid rotation creating sufficient centrifugal force to separate out a LIQUID FRACTION from SLURRY.
VIBRATING SCREEN	MECHANICAL SEPARATOR in which SLURRY is fed onto a mechanically vibrated, perforated screen so that a LIQUID FRACTION drains through. Mainly for PIG SLURRY.

SCREW PRESS	MECHANICAL SEPARATOR in which a screw or AUGER with a continuous flight rotates inside a cylindrical metal tube so squeezing out a LIQUID FRACTION and discharging a SOLID FRACTION at the end of the tube.
PRESS AUGER	SCREW PRESS
SOIL TREATMENT	The treatment (e.g. removal of BOD and some PLANT NUTRIENTS) by percolation of liquid through a suitable free-draining soil (e.g. <i>Solepur Process</i> ), or by OVERLAND FLOW on more impermeable soils.
CONSTRUCTED WETLANDS	A constructed, semi-natural area of land typically comprising beds of specialised plant such as reeds ( <i>Phragmites spp</i> ) and gravel filled channels. They have potential for the treatment (e.g. removal of BIOLOGICAL OXYGEN DEMAND (BOD) and PLANT NUTRIENTS) from dilute farm EFFLUENTS such as PARLOUR WASHINGS.

### Solid manure treatment

COMPOSTING	<p>This normally refers to the breakdown of SOLID MANURES in the presence of free oxygen i.e. under AEROBIC conditions. This can be achieved by mechanically turning or mixing a heap or pile with a tractor FORE-END LOADER, for example, to incorporate air or by more specialised equipment. The potential benefits of COMPOSTING are:</p> <ul style="list-style-type: none"> <li>• Reduction in mass of MANURE.</li> <li>• Improved friability and handling characteristics.</li> <li>• Kill of weed seeds and decrease in PATHOGENS through generation of heat.</li> <li>• Reduction in ODOUR.</li> <li>• Concentration of PLANT NUTRIENTS.</li> </ul> <p>During COMPOSTING, inorganic nitrogen is converted to organic forms and some is lost through VOLATILISATION.</p> <p>The term COMPOSTING should not be used for organic material that has not undergone aerobic processing.</p>
VOLATILISATION	The process by which a dissolved substance is vaporized or converted to a gas
COMPOST	SOLID MANURE after COMPOSTING. The term is also used to denote mixtures of e.g. peat, soil etc for growing plants or the product from COMPOSTING other vegetable or plant residues or ORGANIC WASTES.
WINDROW	A long heap (typically 1 to 3 metres high, 2 to 5 metres wide and of indeterminate length) of SOLID MANURE, usually undergoing COMPOSTING.

TURNING MACHINE	A machine designed to turn and mix SOLID MANURE to encourage COMPOSTING often used in WINDROWS.
IN-VESSEL COMPOSTING	COMPOSTING in a COMPOST REACTOR as opposed to a WINDROW.
CO-COMPOSTING	The COMPOSTING of a mixture of different organic substrates together.
FORCED AERATION	COMPOSTING through the use of perforated pipes or a porous floor to force air into the SOLID MANURE or other organic material.
AERATED STATIC PILE	FORCED or PASSIVE AERATION.
PASSIVE AERATION	COMPOSTING through the use of open-ended perforated pipes or a porous floor at the base of the composting material for convective movement of air into the SOLID MANURE or other organic material.
COMPOST REACTOR	A closed, aerated vessel for rapidly COMPOSTING organic substrates such as SOLID MANURES and producing a high quality COMPOST.
THERMAL PROCESSING, DRYING	This process involves heating SOLID MANURE to drive off moisture so yielding a lower volume or weigh of dried, stable and sterilised MANURE. Running costs can be very high, and the process is most suitable for MANURES with an initially high dry matter content such as POULTRY manure and by recycling warm exhaust air from ANIMAL HOUSES.
VERMICOMPOSTING	The process by which SOLID MANURES or ORGANIC WASTES are broken down through the action of earthworms, a slower, lower temperature process than THERMOPHILIC COMPOSTING.
VERMICULTURE	VERMICOMPOSTING
PELLETISATION	A process by which BIOSOLIDS are stabilised, then completely dried before being pressed into small balls or pellets and used, for example, as fertiliser.

## Air treatment

SCRUBBER	An end of pipe installation for removing chemical or microbial pollutants from the exhaust air of a FORCE VENTILATED animal building e.g. from a POULTRY or PIG building. A CHEMICAL SCRUBBER may, for example, use a spray of acid solution to trap and remove ammonia. A BIOSCRUBBER may, for example, use water containing MICROORGANISM to trap and breakdown organic compounds responsible for ODOUR. Also termed AIR PURIFYING SYSTEM or AIR TREATMENT SYSTEM.
BIOFILTER	An installation that uses living material to remove chemical and microbial pollutants from the exhaust air e.g. from a FORCED VENTILATION POULTRY or PIG building. The air flows through a large packed bed e.g. of wood bark, moss, etc. that is coated with a biologically active film that traps and breaks down the pollutants e.g. organic compounds responsible for ODOUR.
BIOSCRUBBER	BIOFILTER
ACID SCRUBBER	A trickling filter in which the pH of the washing liquid is kept at low levels (less than 5) by addition of acid (usually sulphuric) to remove ammonia from the contaminated air. The ammonium salt produced is removed from the system with the discharge water.
BIOTRICKLING FILTER	A trickling filter for the removal of dust, ammonia or odour by means of absorption of the contaminants in the liquid and breakdown by microorganisms on the filter.
CHEMICAL SCRUBBER	A trickling filter for the removal pollutants from liquids by means of chemical binding to a liquid with specific chemical properties (e.g. pH value obtained by addition of an acid or a base).
AIR PURIFYING SYSTEM, AIR TREATMENT SYSTEM	An installation or equipment for cleaning air i.e. removing pollutants, contaminants or odour.
MULTI-STAGE CLEANING SYSTEM	Systems installed to clean exhaust air from FORCED VENTILATION LIVESTOCK BUILDINGS that usually comprise two or three stages that work on different principles e.g. ACID SCRUBBER to remove ammonia and a BIOFILTER to remove odour.
PHYSICAL AIR CLEANER	Installations where ODORANTS are broken down by the action of UV radiation, ozone or plasma reaction technology. These techniques are still being developed and their effectiveness is not proven.
DENITRIFICATION UNIT	An installation for removal by DENITRIFICATION of oxidised ammonia originating from polluted air.

## APPLICATION TO LAND

### General terms on manure application

APPLICATION	The distribution of MANURE on to land by any method.
SPREADING	The distribution of MANURE over a surface, normally as BROADCAST, using e.g. a MANURE or SLURRY SPREADER.
SPREADER	Device for SPREADING SLURRY or MANURE
LANDSPREADING	The distribution of MANURE on to land.
PLACEMENT	In the context of LANDSPREADING, this refers to the positioning of SLURRY, for example, in parallel bands (BAND SPREADING) or in slots cut in the soil (SHALLOW INJECTION).
APPLICATION RATE	Normally refers to the mass (tonnes, t) or volume (cubic metres, m <sup>3</sup> ) of MANURE applied per unit area (e.g. hectare, ha) of land.
APPLICATION TIME	Normally refers to the season or month of application to land.
APPLICATOR	A device for distributing MANURE or FERTILISER on to land.
BROADCAST	MANURE is spread over the whole surface of an area of land or crop. Often considered as the reference system in comparing the efficiency of spreading systems or machines for reducing AMMONIA EMISSION (compare with PLACEMENT, BAND SPREADING).
TRAJECTORY	The pathway described by MANURE discharged from a SPREADER or IRRIGATOR. Low trajectory machines discharge at a relatively low angle to the land surface compared with high trajectory machines that often throw MANURE high into the air.
SPREADING WIDTH	The width of spread by one pass of a LIQUID or SOLID MANURE SPREADER.
WORKING WIDTH	The distance between the centres of two adjacent SPREADING WIDTHS.
BOUT WIDTH	WORKING WIDTH
INCORPORATION	A means of reducing AMMONIA EMISSION and ODOUR from MANURE spread onto land. After BROADCAST spreading, MANURE is mixed into the soil or buried using appropriate cultivation machinery e.g. plough, tines, rotavator, discs.

## Application of liquid manure

SLURRY TANKER	A vessel, most commonly of metal, normally cylindrical with a circular or elliptical cross-section, mounted on wheels for transporting or spreading LIQUID MANURE.
TANKER	SLURRY TANKER
TRACTOR-DRAWN TANKER	A TANKER with no independent motor unit but with a tow-bar for towing by a tractor. Most commonly used in the application of LIQUID MANURE to land.
TOWED TANKER	TRACTOR-DRAWN TANKER
SELF-PROPELLED TANKER	A TANKER with a built-in tractor unit. May be designed to transport over relatively short distances and spread LIQUID MANURE on land.
ROAD TANKER	A TANKER built on a chassis complete with engine and cab suitable for transporting LIQUID MANURE on public roads, possibly over relatively long distances.
VACUUM TANKER	A TANKER equipped with a VACUUM PUMP used to evacuate air from the tanker to create a vacuum to suck in LIQUID MANURE. The tanker is pressurised by the pump to force the manure out, commonly onto a SPLASH PLATE.
PUMPED TANKER	LIQUID MANURE is pumped into and out of the tanker using a built-in POSITIVE DISPLACEMENT PUMP. Some TANKERS fitted with a CENTRIFUGAL PUMP only pump manure out and must be filled with a separate pump.
SPLASH PLATE	A spreading device for LIQUID MANURE in which the MANURE is forced under pressure through a nozzle on to an inclined plate to increase the area over which it is distributed in "fan" fashion (see BROADCAST). Often mounted at the rear of TANKERS.
UMBILICAL SYSTEM	LIQUID MANURE is fed through a long hose to an APPLICATOR fitted directly on the rear of a tractor. The hose is supplied with LIQUID MANURE direct from the store or from a NURSE TANK or BUFFER TANK or store in the field by a pump.
UMBILICAL HOSE SYSTEM	UMBILICAL SYSTEM
NURSE TANK	A vessel for short-term storage of LIQUID MANURE prior to APPLICATION to land. Often sited in a field close to where LIQUID MANURE is to be applied.
BUFFER TANK	NURSE TANK

IRRIGATION	The APPLICATION of liquid through pipes, commonly underground, leading to a length of flexible pipe on the surface connected to an IRRIGATOR.
IRRIGATOR	Device for the APPLICATION of e.g. LIQUID MANURE to land by IRRIGATION. There are STATIC IRRIGATORS and MOBILE or TRAVELLING IRRIGATORS.  For both types, the liquid is forced through nozzles that are designed to rotate or oscillate to distribute the liquid as relatively small droplets over a wide area. Travelling systems can be equipped with a specifically designed application boom. IRRIGATION is suitable only for MANURES that can be pumped through long lengths of pipe and discharged through small nozzles without causing blockages, e.g. water, dilute SLURRY, LIQUID FRACTION, DIRTY WATER.
STATIC IRRIGATOR	SPRINKLER or RAINGUN that have to be moved manually to slurry different parts of the field.
MOBILE IRRIGATOR	IRRIGATOR that is self-propelled and normally travels in pre-set lines across the field.
TRAVELLING IRRIGATOR	MOBILE IRRIGATOR
SPRINKLER	A device, usually fed by a hose, for applying IRRIGATION water (or sometimes DIRTY WATER) to crops at low pressures and flow rates.
RAINGUN	A device, usually fed by a hose, for applying DIRTY WATER or IRRIGATION water to crops at very high pressures to shoot the liquid over relatively long distances.
FERTIGATION	The application to crops of mineral fertiliser, soil amendments or reclaimed water from food processing or WASTEWATER TREATMENT.
BAND SPREADING	The APPLICATION of LIQUID MANURE to the land surface in parallel bands with no MANURE between the bands using a BAND SPREADING. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
BAND SPREADER	A machine for the APPLICATION of LIQUID MANURE to the land surface in parallel bands with no MANURE between the bands. BAND SPREADERS may be mounted at the rear of a TANKER or at the rear of a tractor (UMBILICAL SYSTEM). LIQUID MANURE is fed to a rotary distributor that serves to chop and homogenise the MANURE and proportion it evenly to a series of hoses for distribution on to the ground. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.

TRAILING HOSES	A type of BAND SPREADER. It may, for example, comprise a boom that supports a number of hoses that distribute LIQUID MANURE close to the ground e.g. between the rows of a growing crop. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
TRAILING SHOES	A type of BAND SPREADER comprising an array of TRAILING SHOE units mounted on a boom. The foot- or shoe-shaped units are designed to part crop or grass leaves and stems and place LIQUID MANURE in bands on the soil surface. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR. An added advantage is the ability to apply to relatively tall grass (e.g. to be cut for SILAGE) with much reduced contamination of crop or herbage by LIQUID MANURE or SLURRY.
TRAILING FOOT (FEET)	TRAILING SHOE
SLEIGH FOOT (FEET)	TRAILING SHOE
INJECTION	The APPLICATION of LIQUID MANURE by placement in slots cut into the soil to various depths depending on the type of injector. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
SHALLOW INJECTION	The APPLICATION of LIQUID MANURE by placement in shallow, vertical slots, typically about 50 mm deep, cut into the soil by a tine or disc. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR. Suitable for use on relatively short grass e.g. after cutting or grazing.
DEEP INJECTION	The APPLICATION of LIQUID MANURE by placement in deep, vertical slots, typically about 150 mm deep, cut into the soil by specially designed tines. DEEP INJECTION tines are often fitted with lateral wings to increase the lateral dispersion of MANURE into the soil. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
SOD INJECTION	The APPLICATION of LIQUID MANURE by placement in bands with a slit cut into the soil beneath the bands. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
ARABLE INJECTION	The APPLICATION of LIQUID MANURE on arable land using an INJECTOR, mainly to reduce AMMONIA EMISSIONS.
GRASSLAND INJECTION	The APPLICATION of LIQUID MANURE into grassland using an INJECTOR, mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.



INJECTOR	A machine for the INJECTION of LIQUID MANURE into soil. These normally comprise an array of injector units mounted on a TANKER or at the rear of a tractor (UMBILICAL SYSTEM). LIQUID MANURE is normally fed from the TANKER or UMBILICAL HOSE SYSTEM to a rotary distributor that serves to chop and homogenize the MANURE and to proportion it evenly to hoses attached to each INJECTION unit. May be for SHALLOW INJECTION or DEEP INJECTION etc. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
ARABLE INJECTOR	A machine comprising spring or rigid tines with pipes attached and mounted on a tractor or TANKER for INJECTION of LIQUID MANURE into cultivated land. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
OPEN-SLOT INJECTOR	A type of INJECTOR where the slots cut in the soil are left open after filling with LIQUID MANURE. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
CLOSED-SLOT INJECTOR	A type of INJECTOR where the slots cut in the soil are closed up after filling with LIQUID MANURE e.g. by press wheels. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.
PRESSURISED INJECTOR	A type of INJECTOR where LIQUID MANURE is forced into the soil under pressure e.g. of 5-8 bar. Used mainly to reduce AMMONIA EMISSIONS. Also reduces ODOUR.

### **Application of solid manure**

SOLID MANURE SPREADER	A machine for the APPLICATION of SOLID MANURE to land.
SIDE-DISCHARGE SPREADER	A machine for the APPLICATION of SOLID MANURE and designed to throw the manure out from the side of the machine. This may be achieved by: <ul style="list-style-type: none"> <li>• An open-top machine with rotating impellers or blades to which manure is delivered by AUGER or CONVEYOR.</li> <li>• ROTASPREADER.</li> </ul>
REAR-DISCHARGE SPREADER	A machine for the APPLICATION of SOLID MANURE to land designed to throw manure out from the rear of the machine. This may be achieved by: <ul style="list-style-type: none"> <li>• Beaters that rotate horizontally or vertically.</li> <li>• Spinning discs (SPINNING DISC SPREADER).</li> <li>• A combination of beaters and spinning discs.</li> </ul> <p>Manure is delivered to the beaters or spinning discs at the rear of the machine by CONVEYOR (or moving floor) or AUGER at the base of the machine.</p>

ROTASREADER	An open-sided machine with spinning flails or chains mounted on a rotating shaft running along its length.
SPINNING DISC SPREADER	REAR-DISCHARGE SPREADER with spinning discs.
DUAL PURPOSE SPREADER	MANURE SPREADER that can be adjusted, usually through varying the aperture of the outlet adjacent to the distributor mechanism, to spread either SOLID or LIQUID MANURE.

## FERTILISER, CROP AND LAND USE TERMS

### Fertilisers

FERTILISER	Any natural or manufactured material applied to the soil in order to supply one or more PLANT NUTRIENTS. The term is generally applied largely to inorganic materials that are available commercially.
MINERAL FERTILISER	FERTILISER manufactured by a chemical process or mined as opposed to organic material that contains carbon.
CHEMICAL FERTILISER	MINERAL FERTILISER
ARTIFICIAL FERTILISER	MINERAL FERTILISER
INORGANIC FERTILISER	MINERAL FERTILISER
BAG FERTILISER	Colloquial term for MINERAL FERTILISER.
PURCHASED FERTILISER	Any fertiliser that is bought. Usually refers to MINERAL FERTILISER.
COMMERCIAL FERTILISER	PURCHASED FERTILISER
COMPOUND FERTILISER	A FERTILISER containing a mixture of two or three of the major PLANT NUTRIENTS (nitrogen, phosphorus and potassium), usually in proportions to suit particular crop requirements.
MULTI-NUTRIENT FERTILISER	COMPOUND FERTILISER
STRAIGHT FERTILISER	A FERTILISER containing only one chemical ingredient, usually providing one, but sometimes two, of the major PLANT NUTRIENTS (nitrogen, phosphorus or potassium).
ORGANIC FERTILISER	A FERTILISER derived from organic origin such as animal products (e.g. LIVESTOCK MANURE, dried blood, hoof and bone meal), plant residues or human origin (e.g. SEWAGE SLUDGE).
ORGANIC MINERAL FERTILISER	A FERTILISER containing PLANT NUTRIENTS in both organic and inorganic form.
ORGANO-MINERAL	ORGANIC MINERAL FERTILISER

## FERTILISER

**Chemical terms and manure composition**

DRY MATTER (DM)	The residue remaining following heating under standard conditions (usually around 105° C to constant weight) to drive off water. Often expressed as a percentage of the weight of original material.
FRESH MATTER (FM)	Unmodified, wet, undried material.
ORGANIC MATTER (OM)	Residues derived from plants, animals and micro-organisms in various stages of decomposition.
PLANT NUTRIENTS	Elements needed for normal plant growth. Usually divided into macronutrients (nitrogen, phosphorus, potassium, magnesium, calcium, sulphur) and MICRONUTRIENTS (e.g. copper, zinc, manganese, etc.)
MACRONUTRIENT	Chemical element needed by crops in relatively large amounts. Usually refers to nitrogen (N), phosphorous (P), potassium (K) and sulphur (S).
TRACE ELEMENT	A chemical element that is required in very small quantities by plants or animals for normal functioning, growth and health. Include iron, zinc, boron, copper, manganese, cobalt and molybdenum.
MICRONUTRIENTS	TRACE ELEMENT
HEAVY METALS	A group of metallic elements that include lead, cadmium, zinc, copper, mercury and nickel. Can be found in considerable concentrations in SEWAGE SLUDGE and several other waste materials but also contained in smaller concentrations in any MANURE (especially pig and poultry manure). High concentrations in the soil can lead to toxic effects in plants, animals and humans ingesting plants or soil particles.
TOTAL KJELDAHL NITROGEN (TKN)	Total amount of organic and reduced forms of nitrogen contained in e.g. LIVESTOCK MANURES, excluding Nitrates (NO <sub>3</sub> )
TOTAL NITROGEN	TOTAL KJELDAHL NITROGEN
TOTAL AMMONIACAL NITROGEN (TAN)	The total amount of ammonium and AMMONIA nitrogen contained in e.g. LIVESTOCK MANURES.
NH <sub>3</sub>	AMMONIA
NH <sub>4</sub> <sup>+</sup>	AMMONIUM

NO <sub>3</sub>	NITRATE
N <sub>2</sub> O	NITROUS OXIDE
NO	NITRIC OXIDE
NO <sub>x</sub>	Nitrogen oxides, usually N <sub>2</sub> O, NO.
P <sub>2</sub> O <sub>5</sub>	Phosphate. Often used to express amount or concentration of P in FERTILISER.
K <sub>2</sub> O	Potash, oxide of potassium (K). Often used to express amount or concentration of K in FERTILISER.
O <sub>2</sub>	Oxygen gas
N <sub>2</sub>	Nitrogen gas
CO <sub>2</sub>	Carbon dioxide
CH <sub>4</sub>	Methane
AMMONIUM	NH <sub>4</sub> <sup>+</sup>
NITRATE	NO <sub>3</sub>
NITRIC OXIDE	NO
UREA	The main end product of mammalian protein metabolism and main nitrogen compound in the URINE of mammals.
URIC ACID	The main end product of the protein metabolism of birds (POULTRY).
C:N RATIO	The amount of total carbon divided by the amount of total nitrogen contained e.g. in LIVESTOCK MANURE, etc. MANURES with a high C:N RATIO such as FARMYARD MANURE usually take longer to break down, or MINERALISE, in the soil than those such as SLURRY with a lower C:N RATIO.
pH	A measure of the hydrogen ion concentration of a solution and an indication of its acidity or alkalinity. Expressed on a scale from 0 to 14, 7 is neutral, higher values alkaline, lower values more acid.
TOTAL SOLIDS (TS)	DRY MATTER
TOTAL SUSPENDED SOLIDS (TSS)	Total suspended matter in liquid, which is commonly expressed as a concentration in terms of milligrams per unit volume or weight. Normally determined by collection of solids on a filter paper.

SUSPENDED SOLIDS (SS)	Suspended matter in liquid.
TOTAL VOLATILE SOLIDS (TVS)	The weight loss after a sample of TOTAL SOLIDS is ignited in a furnace (heated to dryness at 550° C).
VOLATILE SOLIDS	TOTAL VOLATILE SOLIDS (TVS)
VOLATILE SUSPENDED SOLIDS (VSS)	The weight loss after a sample of SUSPENDED SOLIDS is ignited in a furnace (heated to dryness at 550° C).
ASH	Product remaining after incineration in laboratory combustion.
VOLATILE ORGANIC COMPOUND (VOC)	Organic chemicals that have a high vapour pressure and easily form vapours at normal temperature and pressure.
VOLATILE FATTY ACID (VFA)	Short chain fatty acids containing two to five carbon atoms that are produced as end products of microbial FERMENTATION in the digestive tract.
VISCOSITY	Resistance of a fluid to a change in shape, or movement of neighbouring portions relative to one another. Viscosity denotes opposition to flow. The reciprocal of the viscosity is called the FLUIDITY.
FLUIDITY	Measure of the ease of flow of a fluid e.g. SLURRY using special apparatus.
BULK DENSITY	Mass per unit volume for soil or MANURE or other substances.
BIOLOGICAL OXYGEN DEMAND (BOD)	Together with the COD, BOD is the measure of the pollution potential in water bodies and of organic wastes. A laboratory test is used to measure the amount of dissolved oxygen consumed by chemical and biological action when a sample is incubated at 20° C for a given number of days.
BIOCHEMICAL OXYGEN DEMAND	BIOLOGICAL OXYGEN DEMAND (BOD)
CHEMICAL OXYGEN DEMAND (COD)	A measure of the amount of oxygen consumed in the microbial oxidation of decomposable and inert organic matter and the oxidation of reduced substances in water. The COD is always higher than the BOD, but measurements can be made in a few hours while BOD measurements take five days.
RAPID ANALYSIS TECHNIQUE	This normally refers to methods for analysing manures, most commonly for nitrogen content, on farms without the need for a laboratory or laboratory apparatus.

## ON-FARM ANALYSIS TECHNIQUE

## RAPID ANALYSIS TECHNIQUE

**REPRESENTATIVE SAMPLE** A sample (e.g. of LIQUID or SOLID MANURE) that is selected in such a way that its characteristics and properties are representative, or typical, of the bulk of material from which it was taken.

**PERSISTENT ORGANIC POLLUTANTS (POPS)** Organic compounds that are not materially broken down over a reasonable period of time, usually decades. Of most concern are those that build up in the environment or accumulate in the food chain, e.g. some pesticides.

## Agronomy

**FERTILISER EQUIVALENT** This is a comparison between the crop yield obtained from a PLANT NUTRIENT applied in MANURE compared with that applied as INORGANIC FERTILISER. For example, if 100 kg/ha of TOTAL NITROGEN was needed to obtain the same yield as 50 kg/ha INORGANIC FERTILISER nitrogen under the same conditions, then the FERTILISER EQUIVALENT of the manure nitrogen would be 50%. It takes into account the facts that

- a) only a proportion of the nutrients contained in MANURES are in forms available for PLANT UPTAKE.
- b) proportions of the nutrients in MANURES, especially nitrogen, may be lost (e.g. through AMMONIA VOLATILISATION or LEACHING) from the plant/soil system.

**RESIDUAL EFFECTS** The increase in yield, or nutrient content, of a second or subsequent crop after the application of ORGANIC FERTILISER (e.g. LIVESTOCK MANURE) that can be attributed to the initial application of organic fertiliser.

**CROP RESPONSE** The increase in the yield of a crop arising from application of PLANT NUTRIENTS e.g. in FERTILISER or MANURE.

**PLANT UPTAKE** The absorption of PLANT NUTRIENTS through the roots, or sometimes the leaves, of plants.

**FERTILISER REQUIREMENT** The amounts of PLANT NUTRIENTS needed, in addition to those already contained in the soil, to obtain a desired, optimum crop yield.

**TOTAL NUTRIENT** The total amount of a PLANT NUTRIENT contained in e.g. LIVESTOCK MANURE in both inorganic and organic forms.

**PLANT AVAILABLE NUTRIENT** The amount of a PLANT NUTRIENT contained in e.g. LIVESTOCK MANURE in chemical forms that can potentially be taken up by plants. For Nitrogen under consideration of inevitable losses e.g. through AMMONIA VOLATILISATION or

LEACHING.

AVAILABLE  
NUTRIENT

PLANT AVAILABLE NUTRIENT

FERTILISER  
VALUE

The value or worth of MANURE etc. (e.g. Euros/m<sup>3</sup>) based on the cost of providing the same quantities of PLANT NUTRIENTS that it contains as INORGANIC FERTILISER. It should be stated whether this is based on AVAILABLE NUTRIENT or AVAILABLE NUTRIENT content.

### Land use

INTENSIVE  
PRODUCTION

Farming characterised by high inputs of capital and resources etc. that aims to make best use of the genetic potential of crops and LIVESTOCK to achieve high outputs.

EXTENSIVE  
PRODUCTION

Farming characterised by relatively low inputs (of capital and resources) and low outputs (of crop and animal products).

Often considered to have less impact on the environment than INTENSIVE PRODUCTION

ARABLE LAND

Land that is cultivated and sown to temporary crops (cereals, vegetables, root or oil crops, etc.), temporary grass for cutting or grazing, or is temporarily fallow.

GRASSLAND

Land covered by herbaceous vegetation that is dominated by grass.

NATURAL  
GRASSLAND

GRASSLAND that has not been improved for agricultural use or amenity (fertiliser use, cultivation, herbicide/pesticide use etc) so contains a wide range of native grasses and other plants together with associated animal life.

PERMANENT  
GRASSLAND

GRASSLAND that has not been ploughed or reseeded for a relatively long period (usually for at least 5 years).

MEADOW

GRASSLAND, either in its natural state or used as PASTURE or for making HAY. May also be cut and fed fresh to LIVESTOCK kept in BARNS etc.

PASTURE

An area of grassland used for grazing rather than cutting for HAY or SILAGE.

PADDOCK

A relatively small, enclosed area of land, usually GRASSLAND.

LEY

Land temporarily sown to grass and then ploughed.

CEREAL

Cultivated members of the grass family that are grown for their seed or grain that is used for human consumption or animal FEED etc.



STUBBLE	The part of the crop left in the field, i.e. roots and uncut part of plants above ground after harvesting e.g. CEREALS.
CROP RESIDUES	Organic residues remaining after the harvesting above and below ground and processing of a crop.
TRAMLIN	Accurately spaced, narrow pathways left in e.g. a CEREAL crop to provide wheel guide marks for tractors and machinery used in subsequent operations e.g. spraying, FERTILISER APPLICATION.

## ENVIRONMENT

### Nutrient balance and pollution

NUTRIENT BALANCE	<p>A comparison between PLANT NUTRIENT input and nutrient output or uptake. The nutrient balance can be expressed as:</p> <ul style="list-style-type: none"> <li>• an import/export balance comparing the nutrients imported on to and exported from the farm (FARM GATE BALANCE)</li> <li>• a supply/demand balance comparing the amount of nutrients entering crop and grassland production in form of MANURE or FERTILISERS and nutrients removed in products (including products not leaving the farm) or the standard nutrient requirement of the crop.</li> </ul>
FARM GATE BALANCE	An import/export balance comparing the nutrients imported on to and exported from the farm
NUTRIENT SUPPLUS	The amount of PLANT NUTRIENTS exceeding the amount required or taken up by crops, thus resulting in a positive NUTRIENT BALANCE.
DIFFUSE POLLUTION	Pollution of water, air or soil that cannot be attributed to a stationary source of pollution (e.g. LEACHING, RUN-OFF or AMMONIA EMISSION from a field).
POINT SOURCE POLLUTION	Pollution or emission from a stationary source that can be clearly localised (livestock housing or manure store).
MICROORGANISM	Living organisms of microscopic or sub-microscopic size. Include bacteria, algae, fungi and viruses, although the latter are not considered as living organisms.
PATHOGENS	MICROORGANISMS that can cause disease in humans, animals and plants. Pathogens include bacteria, viruses and parasites and, in agriculture, can be found in MANURE, SEWAGE SLUDGE, etc.
COLIFORM BACTERIA	A group of long-living bacteria mainly living in the intestine of warm blooded animals but also found in soils. Coliforms of faecal origin (e.g. <i>Escherichia coli</i> ) are often used as an indicator of contamination or of the potential presence of pathogenic organisms.

## Processes

EMISSION	The transfer, or release, of a gas (e.g. AMMONIA from a terrestrial source, such as MANURE SPREADING, LIVESTOCK HOUSES etc.) or ODOUR and dust to the atmosphere.
EMISSION FACTOR	The rate of transfer, or release, of ODOUR or a gas e.g. AMMONIA from a specified source to the atmosphere e.g. $\text{kg/m}^3$ MANURE applied to land or in storage. May also be expressed as a percentage e.g. % TOTAL AMMONIACAL NITROGEN or TOTAL NITROGEN or integrated over time e.g. $\text{kg/animal/year}$ . ODOUR emission may be expressed as ODOUR units per LIVESTOCK UNIT ( $\text{OU}^{-1} \text{LU}^{-1}$ ).
IMMOBILISATION	Process whereby PLANT NUTRIENTS in inorganic form are converted to organic forms by incorporation into micro-organisms. These nutrients are then temporarily unavailable for PLANT UPTAKE.
MINERALISATION	The transformation by microorganisms of organic compounds to inorganic compounds e.g. in soils, stored MANURES.
DENITRIFICATION	The transformation, most commonly by bacteria, of NITRATES to NITROUS OXIDE and nitrogen gas. An ANAEROBIC process that occurs in soils and in MANURE stores and in some TREATMENT methods, after a NITRIFICATION period.
NITRIFICATION	The transformation by bacteria of AMMONIUM nitrogen to nitrite and then to NITRATE. An AEROBIC process that may occur in soils and during AERATION of LIQUID MANURES.
AMMONIFICATION	Process by which some soil organisms, "ammonifiers", convert organic nitrogen, e.g. in soils or MANURES, to ammonium ions.
ACIDIFICATION	The process by which soil or surface waters become increasingly acid (lower pH) e.g. through DEPOSITION of AMMONIA, $\text{NO}_x$ or sulphur dioxide.
EUTROPHICATION	Process of NUTRIENT ENRICHMENT in water or, soil, resulting in oxygen depletion in aquatic ecosystems, in loss of biodiversity, etc. Especially refers to impact of ammonia and $\text{NO}_x$ emissions on terrestrial ecosystems over large parts of Europe.
NUTRIENT ENRICHMENT	An excess of nutrient input into an ecosystem, which in sensitive ecosystems results in EUTROPHICATION.
RUN-OFF	The flow of rainfall, irrigation water, liquid manure etc. over land. RUN-OFF can cause pollution by transporting pollutants, pathogens, etc. e.g. in MANURES to surface waters.

OVERLAND FLOW	RUN-OFF
LEACHING	The loss of soluble elements and compounds from soil in drainage water to the aqueous environment including GROUND WATER. This applies especially to NITRATE LEACHING.
AMMONIA VOLATILISATION	The process by which AMMONIA gas is released from a solution.
DEPOSITION	The transfer of a pollutant e.g. AMMONIA from the atmosphere to a terrestrial sink such as land, water or plants. This can be as DRY DEPOSITION or WET DEPOSITION.
DRY DEPOSITION	DEPOSITION as a gas or particles.
WET DEPOSITION	DEPOSITION in precipitation (rainfall, snow).
<b>Soil</b>	
SOIL FERTILITY	Ability of the soil to store nutrients and supply them to plants according to their needs, to provide optimal soil, water and air conditions for plant growth and support optimal root growth and turn-over of organic substance through a high level of biological activity.
SOIL POROSITY	Measure of the amount of open space between soil and rock particles.
SOIL TEXTURE	Soil classification based on the type and proportion of particles (sand, silt, clay) that it contains.
SOIL COMPACTION	An increase in bulk density (mass per unit volume) and a decrease in SOIL POROSITY resulting from applied loads, vibration, or pressure. Soil compaction decreases the water holding capacity of the soil and the soil air content, it can impede plant growth and increases the risk of RUN-OFF and erosion.
SOIL EROSION	Wearing away and loss of topsoil, principally by wind and running water. Important pathway of phosphorus loss from land to surface water.
FIELD CAPACITY	The condition of the soil at which it holds maximum moisture against gravitational pull and any further water addition results in drainage.
SOIL MOISTURE DEFICIT	The amount of water that a soil requires to be added to return to FIELD CAPACITY.
WATTERLOGGED SOIL	A soil that is saturated with water so that the pores are completely filled with water.

LAND DRAINAGE, FIELD DRAINAGE	The construction of drains in or under the field to remove surplus water from the land to a ditch.
ACCUMULATION OF NUTRIENTS AND HEAVY METALS	The build-up of PLANT NUTRIENTS or HEAVY METALS in soil to excessively high concentrations.
PHOSPHORUS (P) SATURATED SOILS	Soils in which the retention capacity of phosphorus is exceeded, resulting in the potential for LEACHING of phosphorus.
BUFFER STRIP	A strip of grassland or other vegetation located between cultivated areas or fields to minimise RUN-OFF and soil erosion. Also used between fields and watercourses.
<b>Water</b>	
GROUND WATER	Water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table.
SURFACE WATER	Water that flows in streams and rivers and in natural lakes, in wetlands, and in reservoirs constructed by humans.
CATCHMENT	The area that drains the rainwater falling on it, via streams and rivers, eventually to the sea or into a lake. Separated from the adjacent catchment area by a ridge of high land or WATERSHED.
WATERSHED	The ridge of high ground or imaginary border line separating the CATCHMENT areas of two distinct river systems.
GROUND WATER TABLE	Water level of an unconfined aquifer, below which the pore spaces are generally saturated.
NITRATE LEACHING	Transport of NITRATES (NO <sub>3</sub> ) from soil in soil drainage water to the aqueous environment.
DISCHARGE STANDARD	Legal limit to be met when introducing an EFFLUENT into water.
NITRATE VULNERABLE ZONE	Land areas designated according to the EU nitrate directive 1991, in which nitrate pollution (from agricultural sources) exceeds, or is likely to exceed, the legal limit of 50 mg NO <sub>3</sub> /litre.
NITROGEN ENRICHMENT	The addition of nutrients to surface water (lakes, ponds, rivers, etc.) e.g. via RUN-OFF from MANURE, WASTEWATER that can greatly increase the potential for undesirable algal growth.

## Atmosphere

AMMONIA	NH <sub>3</sub> . A gas derived from urea excreted by LIVESTOCK (uric acid for POULTRY) excreted by LIVESTOCK and implicated in ACIDIFICATION, EUTROPHICATION and NITROGEN ENRICHMENT of sensitive ecosystems.
GREENHOUSE GASES (GHG)	Gases that contribute to the “green house effect” and global warming. Include carbon dioxide, METHANE and NITROUS OXIDE.
NITROUS OXIDE	N <sub>2</sub> O. A GREENHOUSE GAS derived mainly from the DENITRIFICATION process.
METHANE	CH <sub>4</sub> . A GREENHOUSE GAS produced during ANAEROBIC FERMENTATION of ORGANIC MATTER, especially from enteric FERMENTATION in RUMINANTS and storage of LIQUID MANURE. A constituent of BIOGAS.
ODOUR	Pleasant or unpleasant smell.
ODOUR CONCENTRATION	This is expressed in European Odour Units per cubic metre of air and measured using an OLFACTOMETER in accordance with the European CEN standard (EN 13725)
ODORANT	A chemical or gas that causes ODOUR.
OLFACTORY	Pertaining to ODOUR.
OLFACTOMETER	Apparatus for measuring ODOUR, usually with a panel of people to determine ODOUR THRESHOLD.
ODOUR THRESHOLD	Minimum concentration of an ODOUR that 50% of a panel of people can smell.
PARTICULAR MATTER (PM)	Also called dust. Any airborne, finely divided solid or liquid matter with an aerodynamic diameter less than or equal to 100 micrometers.
PM10	Airborne particles with an aerodynamic diameter of 10 micrometres or less. Because they are so small, such particles can get into human and animal lungs/air passages and cause health problems. Also cause visibility problems (fogs) in the atmosphere.
DUST	Small, solid particles that may remain suspended in the air for some time but settle out under their own weight.
AEROSOL	Airborne solid particles or liquid droplets.
BIOAEROSOL	AEROSOL containing biological organisms such as fungi, bacteria, viruses, mycotoxins.

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