Sheep breeding and welfare

According to statistics, sheep are the second most widely farmed animal in the world - the first is cattle. The largest producers of sheep meat are Asia, Africa and Oceania, the largest exporters are New Zealand and Australia. Numbers in Europe have been on a downward trend in recent years - this is influenced by the foot-and-mouth disease, meat prices, a decrease in meat consumption in some countries, the high price of meat in trade networks and the aging of breeders. The largest numbers are in the UK and Spain. The most numerous group of sheep is the combined utility type, then the meat and finally the dairy breeds of sheep.

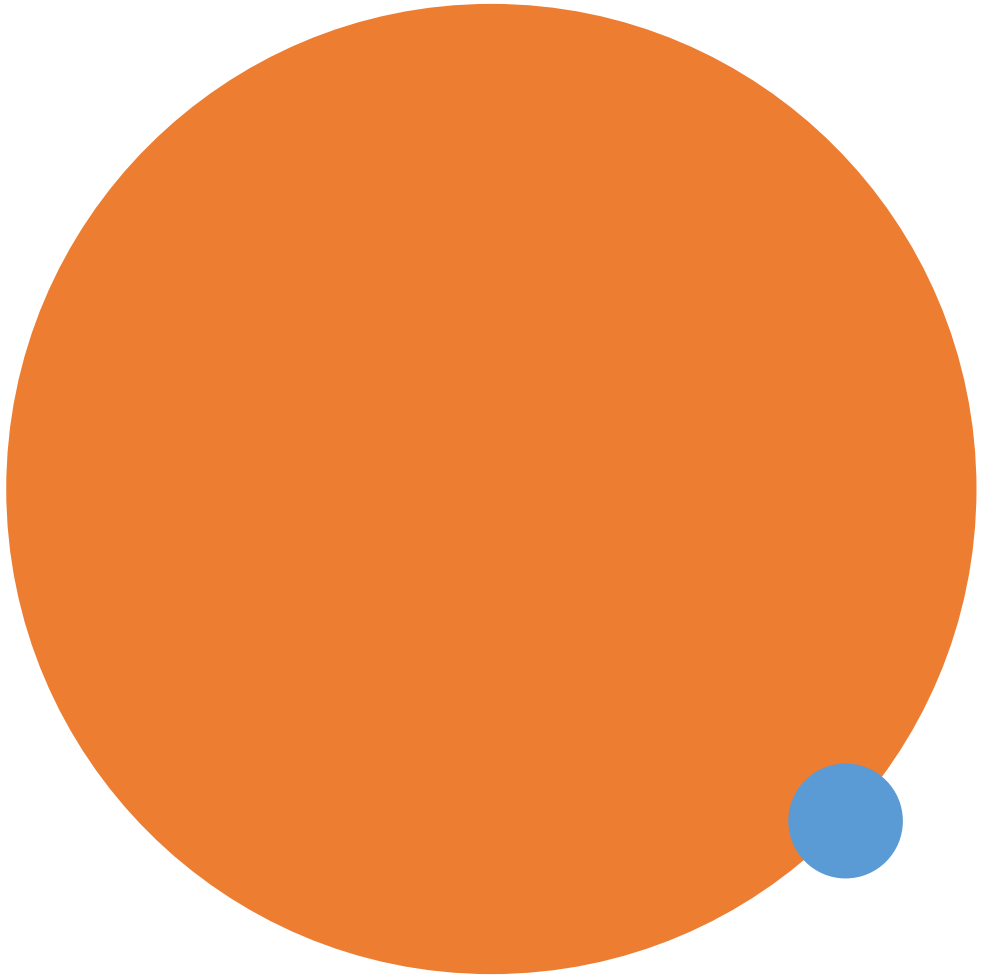
Sheep breeding in today's territory of the Czech Republic dates back to the 9th century. These animals were bred for its universal utility and high resistance to climatic conditions. Together with the goat, sheep belong to the oldest domesticated animals on this planet. The areas of the Carpathians and the Beskydy mountains were, from historical sources, the places where sheep were bread.

Reproduction of sheep

- The reproductive cycle of sheep is characterised by **a period of anestrus**, a period of latency when sexual activity is reduced. Sexual activity also depends on the season, breed, litter order, milking duration, etc.
  The main factor is the length of the daylight hours. In our conditions it is mainly the shortening of the day - photoperiodicity. **The sheep's fertile period is therefore in AUTUMN, SPRING.**
  In breeding, the stimulation of sexual activity is used by means of feed shock - **flushing** (when we slightly reduce the sheep's nutrient intake before the beginning of the fertile period, in order to increase the reduced dose before the estrus period, so as to promote ovulation of as many eggs as possible and, last but not least, so that the manifestations of estrus are more pronounced - 2 to 3 weeks before estrus).

Another method is to use the **so-called ram effect** - where we use rams as sexual activity stimulators. In this way, for example, we can achieve earlier puberty in young lambs, we expose them to ram contact. In ewes before the start of the lambing season, exposure to rams can induce an earlier start of estrus and interrupt the anestrus (i.e. the period of sexual inactivity).

It is important to keep rams **separate from ewes** and let them into the flock, never keep them with ewes all year round, as sheep become addicted to rams. The same principle applies to pig farms!



Sheep mating techniques

Free-range - 15 - 20 ewes per young ram, 25 - 30 ewes per ram over 2 years old. The disadvantage is that the origin of the lambs from the father is unknown, it is not possible to plan for breeding and after 2 years the ram has to be replaced.
Group - 20-25 ewes per young ram, 30-40 ewes per ram over 2 years old. The flock is divided into 2 - 4 groups, selection is applied. In this method of mating, a group of ewes with a certain exterior or performance are assigned a group of rams (2 - 4) with the task of correcting the characteristics of the mothers in the desired direction in the offspring.
Harem- 20 - 30 ewes per young ram, 40 - 50 ewes per ram over 2 years old. Each ram has its own group, this method of breeding is demanding for the care of the animals, the origin of the lambs is known.

Hand mating - this system is the most suitable, the oestrus (heat) is detected by the male, the ewe is placed in another pen, where it is subsequently admitted by a selected ram

Sheep insemination - is the most progressive method of mating, it allows maximum use of the best quality rams. During insemination it is possible to inseminate 500 - 600 ewes. Unfortunately, the method is not widespread in practice.

Sheep breeding

The most critical period for lambs is the first month - they are adapting to the breeding conditions and environment and becoming independent from their mother. After birth - the period of colostrum nutrition, the period of milk and combined nutrition. High-pregnant ewes are reared in groups of up to 25, transferred to an individual box as soon as possible after birth - at least 1.5 m^2 area (3-5 days is ideal). The colostrum is the first source of nutrition for the lamb within 4-7 days.

The success of rearing is largely influenced by the birth weight of the lamb. After birth, the only lambs weigh between 3 and 6 kg depending on breed and gender.

This depends on a number of factors - litter size, sex of the lambs, nutrition of the mother during pregnancy, etc. In the case of twins, the weight is lower at 3-3.5 kg. For triplets it is 2-3.5 kg and for quadruplets 1.5-3 kg. Lambs weighing less than 1.2 kg at birth are usually not reared.

Rearing of lambs

The milk period - milk is the basis of the lamb's nutrition until 10-14 days after birth (from the 2nd week onwards, lambs get used to receiving grazing, hay and grain. This period takes place on pasture or deep bedding.

Combined feeding period - starts with the intake of grazing (foregut developing and rumen microflora activated) - at about 3 weeks of age. In the 8th-9th week the rumen activity is already normal. The lambs are continuously grazing with their mothers, with ad libitum milk intake.

Weaning of lambs

Very early weaning (2-4 days after birth, application of milk feed mixture), abroad often this type of weaning after 6 hours after birth after receiving colostrum, lambs are separated into boxes with deep bedding with feeding machines about 20 pcs

Early weaning (40-60 days, weight about 20 kg and lambs are independent of the mother), system used mainly in dairy breeds. Lambs are housed in nurseries on deep bedding. The nurseries are equipped with ‚gates' which regulate the lambs' access to their mothers. After the colostrum period, the lambs are allowed to go through the gates to their mothers 4 times a day (stay with their mothers for 1 hour). Gradually the stay with the mothers is shortened - 40-60 days the lambs are without access to the mother.

Traditional weaning (80-120 days) - suitable for pasture rearing of lambs. The live weight of lambs at this weaning should be 22 kg.

Fattening of lambs

Dairy fattening - in Central Europe for dairy breeds based on mother milk and milk feed mixtures with supplementary feeds - hay and grain. Lambs fattened to 12-18 kg (8-10 weeks old). Carry out on deep bedding in the sheep farms.
Intensive fattening - a method previously widespread in our country. The principle is fattening ad libitum with grain mixtures and hay up to 30-45 kg at 3-5 months of age. Fattening takes places in groups of 50 lambs according to gender on deep bedding, abroad are also used grids.
Semi-intensive fattening - applied in the form of external grazing with supplementation with grain feed. Fattening period 4-7 months (depending on breed, quality of grazing...)
Pasture fattening - the most widespread method of fattening in our country. The system is based on common grazing of lambs with their mothers with ad libitum milk intake without grain. Fattening period 3,5-5 months. The disadvantage is the overproduction of lambs in August and September - lower market prices, but economically most beneficial in terms of feed costs.

Rearing of ewes

Ideal is rearing on **pasture**, but due to the extreme conditions in mountain and foothill areas - only from April until the end of October, November. In winter, housing on deep bedding in the farms in groups of up to 50 - in a group of approximately the same age ewes. Grazing-based diet and in the second half of pregnancy supplementation with grain feed. Mineral supplementation in the form of lick is essential. In winter, hay, straw, haylage, root crops.
Alternatively, winter rearing on pasture may also be an option.

Breeding rams

They are usually kept year-round in groups (3-6 pcs) in a sheepfold on deep bedding with an enclosure.

Sheep grazing

Most pastures are natural grazing areas. The pasture **should be dry, not wet** (wet pastures are a source of various parasites and diseases). Eventually, these places need to be fenced off. Pastures should be **free of bushes** (pulling out wool, risk of injury), they should not be infested with parasites. it is necessary to ensure **sufficient water** for sheep (1-3 l per ewe), mineral licks if possible on an elevated place. In the case of year-round grazing, a shelter must be built on an elevated, dry and wind-protected place, with non-freezing drinking device.

Fencing is built on the basis of stakes and smooth wire or knotted mesh. Electric fences are used for temporary fencing. An integral part of the grazing area should be shelter - natural and shelters made of natural materials, for feeding different types of feeding devices within the roofed shelter. Handling equipment needs to be built for handling sheep (vaccination, coprological examination, weighing).

Grazing methods

- Free grazing - in the Alps, Pyrenees, Tatras - often selective grazing of certain plants, control of sheep using dogs, the presence of a breeder is necessary, an economically demanding method, therefore the use is rare.

- **Rotational grazing** - this is usually a three-grazing system where the grazing enclosure are stably fenced. It allows the use of individual parts of pastures by different categories of sheep - separate pastures for ewes, ewes and semi-intensive lambs or for joint grazing cattle and meat breeds of sheep. The idea is to rotate the grazing of the individual pastures while ensuring sufficient hay or haylage production. This system is demanding in terms of permanent fencing.
- **Fenced pasture** – the most widespread in our farms. The basis is intensive grazing of larger grazing areas, which are divided into smaller units by individual mobile fences. This system prevents selective grazing and at the same time ensures sufficient hay.

- **Alternative methods** of grazing - rarely in our farms. e.g. in orchards, grazing after harvesting grain and root crops, grazing edges of ponds

mixed grazing system

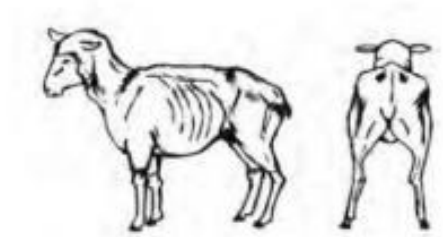
Sheep nutrition

- The advantage of sheep is to use **less valuable feed,** sheep grazing in the foothills is often the only option to keep the landscape in a cultural state. One of the very decisive factors that determines the health of animals and the quality of their breeding is a balanced feed ration. In the spring to autumn months, the basis of the feed ration is **pasture, hay, feed straw, grain feed, while in the winter months the basis of the feed ration is quality meadow hay, feed straw, grain feed, possibly root crops or preserved silage feed.** All categories of sheep should have access to mineral (mineral-vitamin lick) all year round. Water must be available to the sheep whole year.

Nutrition-related health disorders

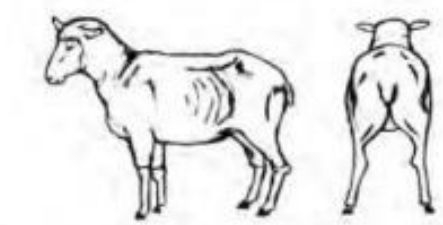
- Urinary Calculi - Primarily a disease of rams and wethers from mineral salts deposited within the urinary organs. Becomes clinical especially when ureters or urethra becomes plugged with mineral deposits causing plugging of urinary passages. Clinical signs - straining to urinate,tail twitching, arched back, stiff standing or walking, ruptured bladder.
- **White Muscle Disease** – Selenium Deficiency - Selenium deficient area with insufficient selenium supplementation. CS - Often triggered by vigorous exercise. Lambs affected by WMD move slowly with arched backs, may be down, as paralyzed and may experience sudden death.
- **Pregnancy Disease Pregnancy toxemia** - Inadequate carbohydrate (concentrate, energy) intake during late pregnancy. Common in both older ewes with poor teeth and ewe lambs carrying twins, Stress, storms, transport, fasting, excessive heat, etc., aggravate the adverse effects of poor nutrition. CS - Affected ewes exhibit signs of impaired nervous function: listlessness, lack of appetite, aimless walking, grinding of teeth, progressing to paralysis, coma and death.
- **Bloat** - Excess gas produced and/or produced in a form that can’t be eructated. Associated with lush pastures; changes in diet. CS -Swelling of upper left paralumbar fossa area.
- **Acidosis** grain overload - Excessive eating of grain above normal amount. Lowers rumen pH to damaging levels. CS - Lethargy, bloat, diarrhea, dehydration, incoordination, collapse, coma, death.

Sheep Body Condition Scores



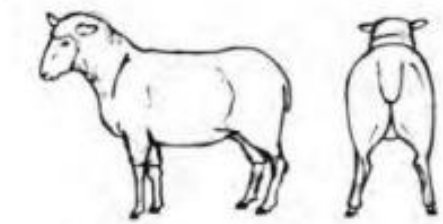
Condition score 1

Appearance angular and narrow
Backbone raised and sharp
Hollow behind ribs
Tail feels bony
Neck bones prominent



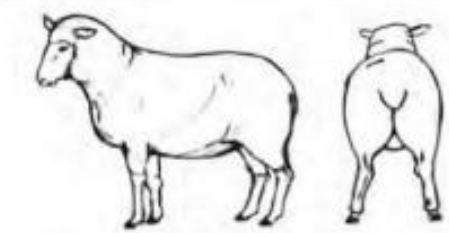
Condition score 2

Backbone raised but smooth
Ribs are easily felt
Tail bone easily detectable
Thin neck



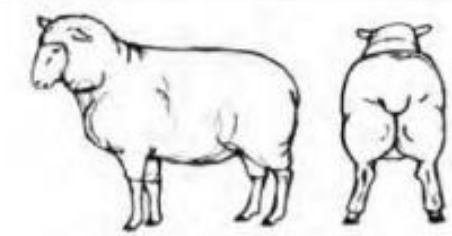
Condition score 3

Backbone slightly raised
Ribs smooth, can just be felt
Tail bones barely detectable



Condition score 4

Appearance well rounded
Backbone can just be felt
Ribs are covered
Tail firm and rounded



Condition score 5

Appearance very well rounded
Backbone barely detectable
Ribs cannot be felt
Tail fat and broad

Health and welfare

- **Lameness**

  Many agents are responsible for lameness, often infectious digital dermatitis in sheep, foreign bodies, injuries, interdigital fibromas, lush grazing can also cause laminitis with painful inflammation.

- **internal parasites** - especially Nematoda, Coccidia
- **ectoparasites** - mites - *Psoroptes ovis* - infestation can lead to self-harm due to scratching, also ticks, myasis lay eggs on feces soiled wool around the tail, larvae can cause extensive ulcers
- **Mastitis** - occurs especially at the beginning of lactation and can be recognised by a lamb that is not growing well.
- **Zoonoses** - salmonellosis, campylobacteriosis, toxoplasmosis, protozoal infection, which can be the cause of abortion. Brucellosis in some areas of the world. Anthrax, SLAK, Bluetongue, Scrapie.

Milking of sheep and goats

Sheep and goats are milked either manually or by machine. In the manual method, milking techniques are:
(a) from behind (most common)
(b) from the side (less hygienic way of obtaining milk).
Hand milking - is mainly used in shepherding. The time required to milk one sheep varies between 2 and 3 minutes. It is important to pay attention to milking hygiene (especially udder treatment before milking).

machine milking - is mainly used in sheep farms and is widespread in dairy breeds. Circular rotary milking parlours are the most widely used. The capacity of a parlour varies between 350 - 600 head per hour depending on its size.

Sheep farms

- **Old but adapted stables** were used, e.g. for dairy cows, young cattle nurseries, but also **newly built buildings**. For **new farms**, it is recommended to build simple wooden buildings, which are less costly and do not disturb the landscape. In the case of milk farms - there is also a technological line for milking, treatment and milk processing. All buildings must respect the welfare of the animals - sufficiently spacious, light, warm, airy - high humidity, high ammonia content, draughts and other emissions are harmful to sheep. New buildings should not be in a windy location, out of frosty, flood-prone areas, preferably in a north-south direction.
  A disinfectant pool (prevention and treatment of contagious hoof disease) placed in front of the entrance to the stable - ideal dimensions 4-5 m long and 0.5-0.6 m wide and up to 15 cm deep.

Housing technology

Basically, only free housing with bedding (also for rams and bucks), which corresponds to natural welfare principles.

Internal equipment of the sheepfold

Feeding equipment (feeders) - mostly use of dosed feed applied by a feed wagon, feeding trolley etc. The number of feeding points must be appropriate to the number of sheep in the flock. In intensive fattening, the number of feeding places should be 2 to 3 times lower due to the higher feeding frequency. The roughage is fed from the feeding equipment (single or double sided).
Watering facilities - sufficient drinking water, buckets, tubs, water troughs and waterers are used. 1 waterer for 10-40 sheep depending on the category. For water troughs 1 m trough for 40-50 sheep.
lindividual boxes – quiet environment for the animals, possibilities for better individual care. Source of water and feeding.
Footbath equipment, fixing cradle for hoof treatment, veterinary procedures, wool sorting table...

Microclimate of the stables

- Optimum temperature - 8-10°C, 10-14°C when giving birth, lambs not less than 8°C.
- Humidity - 60-80%, rearing of lambs up to 75%, near the ceiling humidity should not exceed 85%.
- Maximum gas concentrations - CO_2 up to 0.35%, H_2S up to 0.001% and NH_3 up to 0.0025%.
- Air flow - should not exceed 0.25 m/s in winter.

Procedures in lambs

- The amended Act No. 246/1992 on the protection of animals against cruelty prohibits the castration of males and the tail docking by strangulation of the testicles or part of the tail of farm animals with effect from 1 February 2021. The amendment to the Animal Protection Act entered into force on February 1, 2021.
- Tail docking is a measure that is important for animal hygiene and acts, among other things, as a prevention against parasitic flies, whose larvae develop in the fine wool of sheep and ultimately kill the sheep. Improving the hygiene of the hindquarters of sheep also has a positive effect on getting pregnant and births lambs. Sheep with long tails also have a problem with mating. "The smell of excrement on the tail repels the male who is supposed to mate the sheep. The mentioned risks mainly concern breeds of sheep with fine wool, which naturally cannot effectively get rid of pollution with their feces, to which the long tail helps, and this is precisely why the described risks arise.

Breeding and welfare of goats

Goats are not typically grazing animals. In nature, rather than systematic grazing, they focus on selectively looking for different types of plants and "tasting" them, they especially like the leaves of bushes and trees. They need freedom of movement and the possibility of choosing different types of feed. They are known for their ability to distinguish between bitter, salty, sweet and sour tastes. As one of the few animals, they look for food with a bitter taste (bark, some leaves of trees, branches). In the natural environment, they are definitely not destroyers of vegetation (with a limited area and the possibility of movement in fences, they can be). They are willing to cover considerable distances and climb steep slopes behind certain plants. They are also suitable for grazing with other animals. They reject smelly plants, contaminated with urine and feces. Goats spend a lot of time, up to 11 hours a day, searching for and eating feed.

Breeding methods

- Farming include intensive large-scale farms with year-round housing (200 or more animals) and smaller grazing farms (30-70 animals), where the animals spend the maximum amount of time on pasture. Breeding takes place mostly in adapted agricultural and non-agricultural facilities. Mostly a greater share of manual work. The breeding of dairy and woolly goats has similar requirements as the breeding of meat sheep - provision of winter housing for the period of birth and shearing and free access to grazing areas, which must be properly equipped (shelter, water supply...)

Nutrition of goats

Goats have different criteria for recognizing the taste of feed than sheep or cows, so they also like other plants. The sheep is a so-called "shallow grazer" (it focuses on the lower part of the vegetation), the goat focuses on the middle part of the vegetation, preferring leaves and branches of bushes and trees. Although sheep and especially goats are adapted to use feed with a higher crude fiber content, they cannot be fed only feed with less value in terms of nutrient content. Better quality feed and feed supplements must also be included in their feed ration. Malnutrition or animal health problems will mainly affect the shine and strength of the wool (coat). Compared to other livestock, sheep and goats have longer digestive systems.

Body Condition Scoring Goats

	Score	Spineous process	Rib cage	Loin eye
1	Very thin	Easy to see and feel, sharp	Easy to feel and can feel under	No fat covering
2	Thin	Easy to feel, but smooth	Smooth, slightly rounded, need to use slight pressure to feel	Smooth, even fat cover
3	Good condition	Smooth and rounded	Smooth, even feel	Smooth, even fat cover
4	Fat	Can feel with firm pressure, no points can be felt	Individual ribs cannot be felt, but can still feel indent between ribs	Thick fat
5	Obese	Smooth, no individual vertebra can be felt	Individual ribs cannot be felt. No separation of ribs felt.	Thick fat covering, may be lumpy and "jiggly"

Body condition scoring for goats uses a range from 1.0 to 5.0. Healthy goats should have a body condition scoring between 2.5 to 4.0. Goats with a body condition scoring of 1.0, 1.5 or 2.0 indicate a management or health problem.

Breeding methods

Year-round stables without pasture with a constant feed ration based on corn silage and haylage) or modified feed rations according to the season - green feed, canned or dry. Early weaning after 48 hours, artificial milk nutrition and additional feeding of kids up to 12-15 kg in weight or placement in rearing separately from mothers are applied here. The goats are milked in a stable milking parlor with a milk processing.

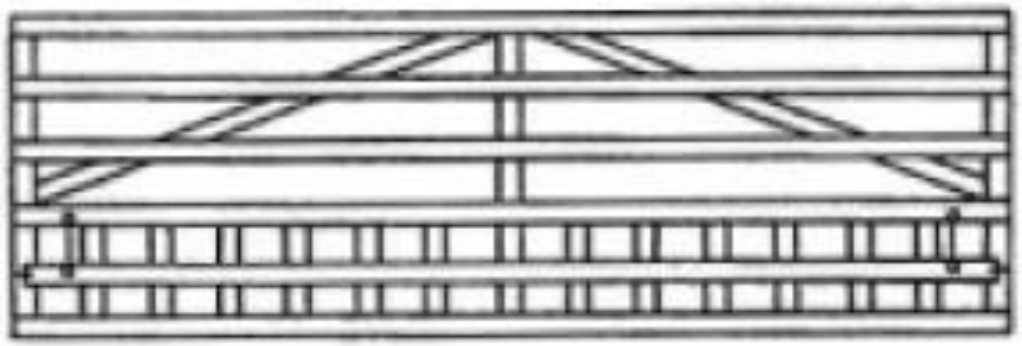
Pasture breeding with additional dry and concentrated feed in the stable. The kids spend 6-8 weeks with their mothers, are reared on pasture and are fed in the stable until slaughter weight or including into the breeding. The goats are mostly in the pasture all day, they are driven out after the morning milking and brought in for the afternoon milking. Animals must have shelter from rain and sun and a source of water in the pasture. Milking on pasture is not practiced - technically demanding.

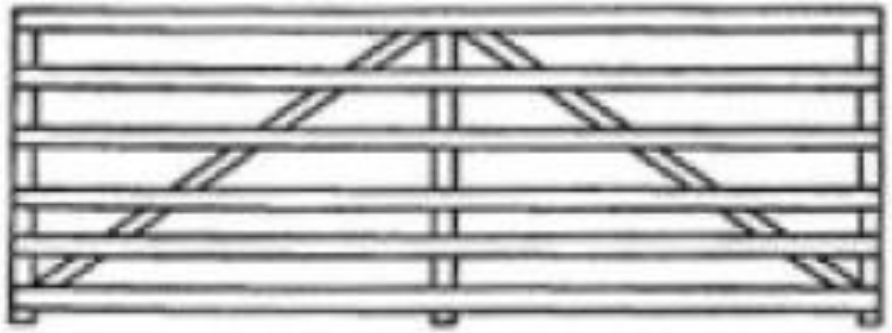
Types of housing

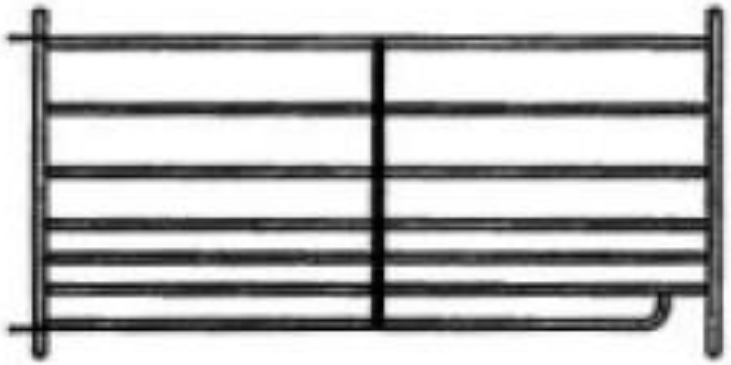
In our case, only free housing comes into consideration - it corresponds to the needs of animals and welfare principles - it is applied in variants according to local conditions. Free housing in individual boxes - for breeding goats, goats with young after birth. Free group housing in pens - all categories. The size of the groups is governed by the phase of the production cycle – insemination, birth period, lactation. The most suitable is deep bedding.

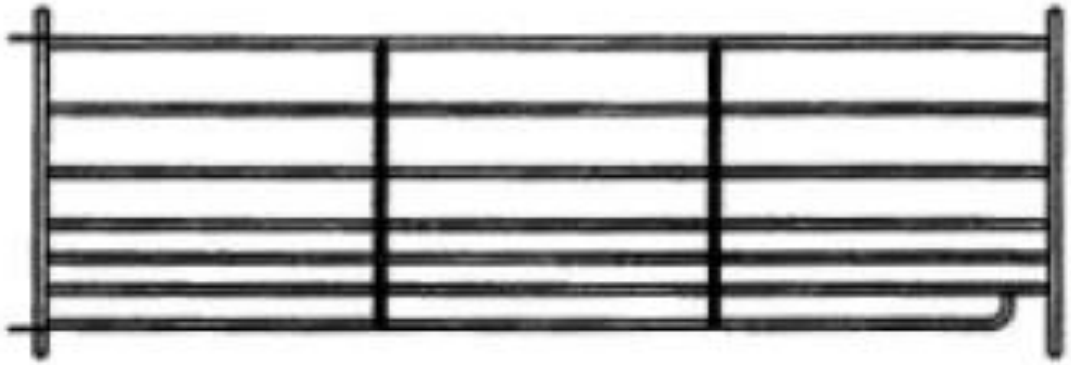
- According to the internal layout of the stables, there are 2 types - one-space and two-spaces stables. One-space stables - they are laid out entirely, without distinguishing places for feeding and lying down. The ratio of housing and feeding places is usually satisfactory - but this method requires plenty of bedding straw. Double-sided feeders or hanging troughs are used for feeding.

- **Two-space stables** - the area is divided into an area without bedding for feeding and the area with bedding for lying down - less litter consumption, no need to handle the animals during adding the bedding and feeding. Feed is placed in troughs or feeding table, supply of waterby drinkers and drinking troughs.
  Slatted housing - only used in some categories. Not suitable for weaned kids (excessive heat dissipation) or dairy animals (potential for teat injury and increased abdominal contamination).









The stable space is divided by a wooden or steel pipe fence into pens, into which animals are grouped according to their needs.
For sheep, the frames of the pen parts are filled with horizontal bars, for goats, vertical bars are preferable because of their tendency to climb and jump. The gaps between the bars must not be wider than 8 cm. Frames with metal mesh (6-8 cm mesh) are suitable for both sheep and goats, but mesh fencing must not be used for horned sheep and goats.

Buck housing - outdoor shelters. In the grazing season, this type is also suitable for other categories.

Welfare and Health

- parasitic diseases
- bacterial and viral diseases
- metabolic diseases
- zoonoses

- **Parasitic Diseases** - Goats are much more susceptible to infection than sheep. When grazing together, goats have many more worms in their body than sheep, and the worms inside goats are also more fertile and produce more eggs. There is also no age resistance in goats and a two-year-old goat can be full of worms such as a kid.
- **Gastrointestinal worms** are a serious problem in small ruminants.
  They adversely affect milk production, reproduction, cause weight loss, reduce coat quality and overall immunity. The young are particularly susceptible and parasites can cause mortality.
  The greatest problems occur during intensive grazing. Sheep and goats, unlike cattle, graze grass closer to the ground, where the parasite larvae are concentrated. Interestingly, goats have historically not been forced to graze as intensively as sheep, so they are not as adapted to coexisting with parasites and the effects of infestations are more severe.

- Bacterial diseases - tetanus, botulism, of the clostridial diseases *Clostridium perfringens* is the most common in goats and causes enterotoxaemia in adults , then paratuberculosis caused by *Mycobacterium paratuberculosis* - initially diarrhoea, rapid loss of condition, reduced milk yield. Furthermore, lentivirus causes encephalitis and arthritis in goats, mastitis.
  Metabolic diseases - rarely occur, only ketosis in fat goats.
  Zoonoses - toxoplasmosis, trichophytosis, anthrax, listeriosis, brucellosis, leptospirosis.

AWIN sheep protocol

Welfare principles	Welfare criteria	Welfare indicators
Good Feeding	Appropriate nutrition	Body Condition
		Score lamb mortality
	Absence of prolonged thirst	Water availability
Good Housing	Comfort around resting	Fleece cleanliness
	Thermal comfort	Panting
		Access to shade/shelter (outdoors only)
	Ease of movement	Stocking density (housed animals only)
		Hoof overgrowth (housed animals only)
Good Health	Absence of injuries	Body and head lesions
		Leg injuries
	Absence of disease	Lameness
		Faecal soiling
		Mucosa colour
		Ocular discharge
		Mastitis and udder lesions (lactating ewes onl
		Respiratory quality
		Fleece quality
	Absence of pain and pain induced by management procedures	Tail length
Appropriate Behaviour	Expression of social behaviour	Social withdrawal
	Expression of other behaviours	Stereotypy
		Excessive itching
	Good humant animal relationship	Familiar human approach test_
	Positive emotional state	Qualitative Behaviour Assessment

AWIN goat protocol

Welfare Principles	Welfare Criteria	Welfare indicators
Good Feeding	Appropriate nutrition	Body Condition Score Hair coat condition Queuing at feeding
	Absence of prolonged thirst	Queuing at drinking
Good Housing	Comfort around resting	Bedding
	Thermal comfort	Thermal stress
	Ease of movement	Kneeling at the feeding rack
Good Health	Absence of injuries	Severe lameness
	Absence of disease	Abscesses Body Condition Score Faecal soiling Hair coat condition Nasal discharge Oblivion Ocular discharge Overgrown claws Udder asymmetry
	Absence of pain and pain induced by management procedures	Improper disbudding Severe lameness
Appropriate Behaviour	Expression of social behaviour	Queuing at drinking Queuing at feeding
	Expression of other behaviours	Oblivion
	Good human-animal relationship	Latency to the first contact test
	Positive emotional state	Qualitative Behaviour Assessment