Organic Sheep and Goat Farming

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1 Introduction

Organic sheep and goat farming is on the rise in Germany and the EU. Many consumers see organic farms as an example of the "intact world" of farming and rural living. Agri-environmental schemes support conversion from conventional towards organic farming. Only few know how difficult organic sheep and goat farming is from animal welfare, ecological and economic perspective. Newcomers particularly overestimate the production and marketing potential of the field, and underestimate the associated husbandry (e.g., health) and labour problems. It usually takes years to learn how to operate a sheep and goat farm and make it profitable. In addition to patience, good animal handling skills, and marketing ability, qualified professional and veterinary advice is crucial for successful, sustainable development. Many veterinarians do not know enough about organic sheep and goat farming. This paper will give some key information.

Organic sheep and goat farming is based on established and monitored production and processing guidelines. In 1999, EU-directive 1804/99EU on the legally binding minimum standards of organic animal husbandry was passed and has been in force since 24th August 2000. This was relevant for sheep and goats as well. It describes exactly the production processes to be adhered to, before advertising organic or eco-production. Higher standards than those demanded by the EU-organic-regulation are laid down by the agricultural associations of organic farming. Usually the standards are not very different.

Guidelines alone, however, do not make an environmentally friendly, economic, organic sheep and goat keeping centring on animal welfare. A high degree of knowledge as well as practical skill are necessary to keep live stock in accordance with animal welfare and in an environmentally friendly way, and at the same time to earn sufficient income. Here, the regulations offer little help. However, the experience made by organic sheep and goat farmers having practiced for a longer duration of time, show that, in time, these difficulties can be mastered.

2 History and recent performance of sheep and goat keeping

Domesticated sheep originate from the European wild sheep, the Mouflon (*Ovis ammon musimon)*. The wild Bezoar goats (*Capra hircus aegagrus*) and the Markhor goat (*Capra falconeri*) are the ancestors of the modern domesticated goats. Both sheep and goats are closely related and belong to the subfamily *Caprinae* or “goat antelopes”. Although both have different numbers of Chromosomes (goats = 60, sheep = 54), crosses between both have been documented. Wild goats and sheep live in small herds of 20 – 50 animals in mountainous and enriched regions of Euro-Asia. About 10,000 years ago, wild sheep and goats were domesticated in Mesopotamia (e.g., Iraq, Iran) and joined humans in the transition from nomadism to settlement (farmer).

Today, there are more than one billion sheep and 750 million goats kept throughout the world. Both are found nearly in every country and climate and are used for several purposes. Hundreds of adapted breeds exist. The FAO (2004) found 783 different sheep and 313 different goat breeds, with trend declining. Wool is in many countries the most important product, followed by lamb and milk. About 90% of all goats are kept in developing countries. Goats are considered as “cows of the poor”.

6,000 years ago, goats and sheep came with the nomadic movements of prehistoric tribes from Asia via south-east Europe to northern Europe. Today 100 million sheep and 12 million goats are kept in the EU. Both were able to survive in the shrub and wood dominated environment, and helped to open the wilderness towards agricultural land. The thousands of years of joint development of man and small ruminants have created very diverse husbandry systems. Today there are many regions and landscapes created and still preserved by sheep and goat keeping throughout Europe and other parts of the world.

3 Sheep and goat husbandry

3.1 Goats

Goats are ruminants. They have horizontal slit-shaped pupils and consume, on average, 2 kg of dry matter per 50 kg of body weight per day.

In some climates goats, like humans, are able to breed at any time of the year. In northern climates and among the Swiss breeds, the breeding season commences as the day length shortens, and ends in early spring. Does of any breed come into heat every 21 days for 2 to 48 hours. A doe in heat typically flags her tail often, stays near the buck if one is present, becomes more vocal, and may also show a decrease in appetite and milk production for the duration of the heat.

Bucks (intact males) of Swiss and northern breeds come into rut in the fall as with the doe's heat cycles. Rut is characterized by a decrease in appetite, obsessive interest in the does, a strong heat.

In addition to live breeding, artificial insemination has gained popularity among goat breeders, as it allows for rapid improvement because of breeder access to a wide variety of bloodlines.

Gestation length is approximately 150 days. Twins are the usual result, with single and triplet births also common. Less frequent are litters of quadruplet, quintuplet, and even sextuplet kids. Birthing, known as kidding, generally occurs uneventfully with few complications. The mother often eats the placenta, which, with its oxytocin, gives her much needed nutrients, helps staunch her bleeding, and is believed by some to reduce the lure of the birth scent to predators.

Freshening (coming into milk production) occurs at kidding. Milk production varies with the breed, age, quality, and diet of the doe; dairy goats generally produce between 660 to 1,000 L of milk per 305 day lactation. On average, a good quality dairy doe will give at least 2 to 3 L of milk per day while she is in milk, although a first time milker may produce less. Meat, fiber, and pet breeds are not usually milked and simply produce enough for the kids until weaning.

Goats are reputed to be willing to eat almost anything. The digestive systems of a goat allow nearly any organic substance to be broken down and used as nutrients.

Contrary to this reputation, they are quite fastidious in their habits, preferring to browse on the tips of woody shrubs and trees, as well as the occasional broad leaved plant. It can fairly be said that goats will eat almost anything in the botanical world. Their plant diet is extremely varied and includes some species which are toxic or detrimental to cattle and sheep. This makes them valuable for controlling noxious weeds and clearing brush and undergrowth. They will seldom eat soiled food or water unless facing starvation. This is one of the reasons why goat rearing is most often free ranging since stall-fed goat rearing involves extensive upkeep and is seldom commercially viable.

The taste of goat meat is similar to that of lamb meat. However, some feel that it has a similar taste to veal or venison, depending on the age and condition of the goat. It can be prepared in a variety of ways including stewed, baked, grilled, barbecued, minced, canned, or made into sausage. Nutritionally, it is healthier than mutton as it is lower in fat and cholesterol, and comparable to chicken. It also has more minerals than chicken, and is lower in total and saturated fats than other meats.

Some goats are bred for milk which can be drunk fresh, although pasteurization is recommended to reduce naturally occuring S. aureus and E. coli. Goat milk is commonly processed into cheese, and small commercial operations offer goat butter and ice cream. If the strong-smelling buck is not separated from the does, his scent will affect the milk.

Goats' milk contains less lactose, so is less likely to trigger lactose intolerance. The milk is naturally homogenized since it lacks the protein agglutinin. The curd is much smaller. The milk also has a more similar makeup (percentage of fats, etc.) to human milk than cows milk. For these reasons, goats' milk may be recommended for infants and people who have difficulty digesting cows' milk.

Some goats are bred for the fiber from their coats. Most goats have softer insulating hairs nearer the skin, and longer guard hairs on the surface. The desirable fiber for the textile industry is the former, and it goes by several names (mohair, fleece, goat wool, cashmere, etc., explained below). The coarse guard hairs are worthless as they cannot be spun or dyed. The proportion and texture varies between breeds, and has been a target of selective breeding for millennia.

3.2 Sheep

Sheep are not very different from goats. They are kept in flocks — in pens, in a barn or on pasture. Sheep are active grazers where such feed is available at ground or low levels. They are usually given feed twice a day from troughs or they are allowed to graze in a pasture. Sheep need fresh water from troughs or ponds, except that in some countries, such as New Zealand, there is enough moisture in the grass to satisfy them much of the time. Upon being weaned from ewe's milk, they eat hay, grains and grasses. The lambs are weaned due to increasing competition between the lamb and ewe for food. Sheep are most comfortable when the temperature is moderate.

Sheep breeders look for such traits in their flocks as high wool quality, consistent muscle development, quick conception rate (for females), multiple births and quick physical development.

Sheep may be kept in a fenced-in field or paddock. The farmer must ensure that the fences are maintained in order to prevent the sheep from wandering onto roads or neighbours' property. Alternatively, they may be "hefted" (trained to stay in a certain area without the need for fences). The hardy Herdwick breed is particularly known for

its affinity for being hefted. A shepherd and a sheep dog may be employed for protection of the flock. On large farms, dogs or riders on horseback or motorcycles may herd sheep.

Marking of sheep for identification purposes is often done by means of sheep tags - a type of ear tag. In some areas sheep are still identified through the use of notches cut in the ear known as ear marking, using either specially designed tools (ear marking pliers) or other cutting implements.

Ewes are pregnant for just under five months before they lamb, and may have anywhere from one to three lambs per birth. Some ewes can have seven or eight lambs. Twin and single lambs are most common, triplets less common. A ewe may lamb once or twice a year. Lambs are weaned at three months. Sheep are full grown at one year weighing between 70 and 125 kilograms. Sheep can live to eleven or twelve years of age. As ewes sometimes fail to bond with newborn lambs, especially after delivering twins or triplets, it is important to minimize disturbances during this period.

Often, to more closely manage the births, vaccinate lambs, and protect them from predators shepherds will have the ewes give birth in "lambing sheds"; essentially a barn (sometimes a temporary structure erected in the pasture) with individual pens for each ewe and her offspring.

4 Why organic farming?

Society´s attitude towards farming and animal husbandry animal has changed dramatically during the past decades. It no longer only counts, what and how much is being produced, but also how it is being produced. The protection of the environment, improved animal welfare and sustainable rural development has become more important since 1992, the Reform of the CAP (Common Agricultural Policy) of the EU (Rahmann, 2000).

In organic farming, one objective is to achieve animals´ wellbeing through animal welfare oriented husbandry and appropriate use. A complete exploitation of the performance potential, entirely possible by neglecting these limits, is consciously rejected. Curtailing freedom of movement (keeping animals tied inside the stable, keeping animals in stables throughout the year), sensory deprivation (environmental stimuli such as light, weather), and unsocial ways of husbandry, not allowing any contact with animals of the same species, or forcing too close a contact, are not permitted in organic farming. Furthermore, animals are not adapted to husbandry conditions by removal of horns, shortening of beaks docking of tails, or cutting of teeth. Instead, husbandry conditions are adapted to the animals.

5 Organic principles (IFOAM 2005)

In order to be able to assess and understand the standards and guidelines of organic sheep and goat farming, some fundamental knowledge is required on the developments and mis-developments in organic animal husbandry, as well as on the function of animals within the organism of a farm. These form the basis for the guidelines having been laid down for organic animal husbandry.

“The Principles of Organic Agriculture serve to inspire the organic movement in its full diversity. They guide IFOAMs development of positions, programs and standards. Furthermore, they are presented with a vision of their world-wide adoption. Each

principle is articulated through a statement followed by an explanation. The principles are to be used as a whole. They are composed as ethical principles to inspire action.

The Principle of Health: Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible. This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems - healthy soils produce healthy crops that foster the health of animals and people. Health is the wholeness and integrity of living systems. It is not simply the absence of illness, but the maintenance of physical, mental, social and ecological well-being. Immunity, resilience and regeneration are key characteristics of health. The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings. In particular, organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and well-being. In view of this it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects.

The Principle of Ecology: Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them. This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment. For example, in the case of crops this is the living soil; for animals it is the farm ecosystem; for fish and marine organisms, the aquatic environment. Organic farming, pastoral and wild harvest systems should fit the cycles and ecological balances in nature. These cycles are universal but their operation is site-specific. Organic management must be adapted to local conditions, ecology, culture and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to maintain and improve environmental quality and conserve resources. Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

The Principle of Fairness: Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities. Fairness is characterized by equity, respect, justice and stewardship of the shared world; both among people and in their relations to other living beings. This principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties – farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved with a good quality of life, and contribute to food sovereignty and reduction of poverty. It aims to produce a sufficient supply of good quality food and other products. This principle insists that animals should be provided with the conditions and opportunities of life that accord with their physiology, natural behavior and well-being. Natural and environmental resources that are used for production and consumption should be managed in a way that is socially and ecologically just and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

The Principle of Care: Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment. Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk of jeopardizing health and well-being. Consequently, new technologies need to be assessed and existing methods reviewed. Given the incomplete understanding of ecosystems and agriculture, care must be taken. This principle states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture. Science is necessary to ensure that organic agriculture is healthy, safe and ecologically sound. However, scientific knowledge alone is not sufficient. Practical experience, accumulated wisdom and traditional and indigenous knowledge offer valid solutions, tested by time. Organic agriculture should prevent significant risks by adopting appropriate technologies and rejecting unpredictable ones, such as genetic engineering. Decisions should reflect the values and needs of all who might be affected, through transparent and participatory processes."

The IFOAM principles are the base for norms for organic production and processing. Most of the national (NOP, JOA etc.) and international (Codex alimentarius, EU2092/91) regulations have incorporated these norms (Rahmann, 2004).

6 EU-Standards for organic sheep and goat farming

1991 the EU-regulation 2092/91/EEC[1] was one of the first international standards for organic farming with the formal status of a law, valid for all EU countries as well as for imported goods. It covered only crop production. Comparable to organic crop production, organic animal husbandry had to be defined, regulated, certified and monitored on state level. The EU filled this missing link with the regulation 1804/99/EC, which was negotiated over a period of 6 years. The regulation became valid on August 24, 2000 and became part of the regulation 2092/91/EEC.

Most of the animal related regulations and annexes in 2092/91/EEC are valid for all livestock on organic farms, without specification of the species. Cattle, sheep and goats are not equally considered. While cattle are well described, sheep and goats received only scant attention.

The organic farming regulations are process claims. Therefore, there are clear process qualities but this is no warranty for product qualities (Tab. 1). Multinational formal regulations like 2092/91/EEC or 1804/99/EC are compromises because they have to take into consideration the different conditions of the partner countries.

Tab. 1. Differences between conventional and organic animal husbandry (Rahmann, 2004)

	Conventional	Organic (2092/91/EEC)
Breeds, origin	Highly performing special breeds and cross-breeds according to product aimed for	Only animals reared on organic farms, diversity of breeds, sometimes rare breeds of working animals
Keeping	Animal protection laws	Special requirements for keeping

[1] EU-regulation 2092/91/EWG in internet: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991R2092:EN:HTML.

	Conventional	Organic (2092/91/EEC)
(buildings and free runs)	(requirements for keeping of animals according to species)	of animals orientated towards animal welfare (occupation-density, size of buildings, keeping tied inside the stable forbidden, etc.)
Feeding	According to current food stuffs legislation (permitted food additives such as enzymes, synthetic amino acids, etc.)	Food stuffs produced as much as possible on site, feeding rations according to animal welfare (e.g., minimum use/parts of roughage) only specifically permitted additives, no synthetic amino acids, no genetically modified organisms
Management and treatment	Managed breeding, if necessary stable-wide prophylaxis, legally required waiting periods according to drug prescription law	No prophylaxis (exception: legally required inoculations), only two allopathical treatments per year, double the waiting period after use of drugs. Restricted interfering with the animals´ integrity (removal of horns, shortening of beaks, shortening of teeth, docking of tails etc.)
Transport	Animal-transport regulation	Animal-transport regulation, short transport ways aimed for

Not all regulations are useful for all farm conditions and systems throughout the EU, and some important aspects are overlooked. In such cases, higher private and common standards of organic farming or regulations for specific animal species (aquaculture, rabbits, deer etc.) on the national level are valid, as long as they do not contradict the regulations in 2092/91/ (Article 1 (2)). This can lead to inter(agri)cultural misunderstandings and disagreements between different national standards (e.g. important for intra-EC-trade). Therefore the EU commission and the member states have agreed to amend and modify the EU-organic standards in June, 2007. In 2009 a new EU-organic regulation will be the base for organic production. After 18 months of negotiations the commission has promised the continuation of the recent organic standards and norms.

Farmland-related animal husbandry

Livestock plays an important role on organic farms (Annex I B 1.1.), e.g. in nutrient cycling (Annex I B 1.3.). Landless animal husbandry is not organic and thus prohibited (Annex I B 1.2.). The limited livestock density does not exceed 170 kg nitrogen per hectare an year (Annex I B 7.1.) and is measured in livestock units (LU; Annex I B 7.2. and Annex VII). 13,3 sheep and/or goats are the maximum number per ha and year.

Conversion

It is possible to convert just one branch of the farm towards organic production, e.g. only the sheep and goat farming, but not the crop production, or extensive sheep keeping for lamb production and landscape management but not dairy goat keeping (Annex I B 1.5.). If there is a clear spatial separation (farm land, feed and dung storage

as well as stables), the same animal species can be kept organically and conventionally by one farmer (Annex I B 1.6.). A clear separation is needed to avoid contamination (e.g. prohibited disinfectants or feedstuffs/feed materials which are not in 1804/99/EC Annex II) and mixing of inputs (e.g. feeds and dung).

Comparable to crop production (Annex I A), the conversion period for pastures for ruminants is 24 months (Annex I B 2.1.1). The conversion period starts with seeding of annual crops and for permanent plants (pastures, shrubs, trees) after the last conventional utilisation (grazing, moving). After 12 months without prohibited treatments, grass and shrubs are considered as "in-conversion feedstuffs/feed materials" (Article 1, paragraph 5, definition 24). After 24 months, grassland has withstood the converting period and is considered an organic feedstuff (Tab. 2).

Tab. 2: Conversion periods for ruminant pastures and their products (Source: 1804/99/EC Annex I B 2.1.1. and 2.2.1.)

Animal species and use	Conversion period
Pastures for ruminants and horses	24 months (like crop production)
Milk (cows, sheep and goats)	6 months
Small ruminants	6 months

To avoid problems (and the negative image of organic products) animal products should originate only from animals which are born and reared under the regulations. The regulations allows purchasing livestock only from organic farms (Annex I B 3.2.) is directed at avoiding any possible contamination originating from conventional farming. Three exceptions: the conversion period of the production unit (Annex I B 3.3.); the herd establishment (Annex I B 3.4.); restocking after epidemics (e.g. Foot and Mouth Disease epidemic in the UK in 2001) and natural calamities (e.g. earthquake) (Annex I B 3.6.). If young stock has to be purchased from conventional farms (Annex I B 3.4.), the maximum age at time of purchase is 45 days for lambs and kids (just after weaning).

The fourth exception (Annex I B 3.8.) allows that every year 20% of female breeding stock of small ruminants can be purchased from conventional farms if they are not available from organic farms and before first delivery; pregnancy is possible). Male breeding stock borrowed from conventional farms can be used if the regulations are followed. The acceptance of the certifying body is required.

Feeding

The definition of farmland-related animal husbandry with kg nitrogen per hectare and year does not fix the origin of the feedstuff (see above). The statement that livestock has to be fed 'predominantly' with self-produced feedstuff is not specific enough. Organic feeds can be purchased from other organic farms (Annex I B 7.4. on a contract basis). A maximum of 30% DM of "in-conversion feedstuff" (after 12 months of conversion; see above) can be fed to organic livestock respectively when products are to be sold under the organic label. If the feed is produced on the own farm, a maximum of 60% DM is allowed (Annex I B 4.4.).

Recently, processed and mixed feeds were not considered in 1804/99/EC Annex II (positive lists) of the regulation. Single components are the basis for certification (Article 1 (1) a-c) as long as there are no declaration and certification standards described for mixed feeds. The problem is the insufficient declaration of components used in mixed animal feeds.

A long discussion in the design of the regulation was the feeding of young stock. On many organic farms, lambs and kids received only colostral milk and subsequently powdered milk. The young stock did not suckle or receive natural milk because the organic milk is very valuable (especially milk from small ruminants; Rahmann, 2001) and therefore expensive as young stock feeds. Sour milk from powdered milk is easy to handle and prevents calf diarrhoea. Nevertheless, it was agreed that animal welfare is more important than economic considerations. In 1804/99/EC Annex I B 4.5., the feeding of young stock is defined: lambs and kids have to be fed for 45 days, with "natural milk, preferably maternal milk". But, it was not defined what "on the basis of natural milk" means. It is not established that "natural milk" must originate from the same species, only the physiological needs have to be fulfilled. That could be interpreted, that cow milk can be feed to kids but not to lambs (the fat content is too low). In practice, 1804/99/EC Annex I B 4.5. is interpreted that even skimmed powdered milk can be used – as long it has an organic label. Powdered organic milk is rarely available on the market.

In organic farming it is not permissible to use anything produced using GMOs (genetically modified organisms) or derivatives (definition conform to 220/90/EEC and 1804/99/EC Article 4 No 12 and 13 as well as Article 5). This includes feed for livestock (conforming to definition of animal feeds in 471/82/EEC) and is already valid since September 24, 1999; 1804/99/EC Annex I B 4.18.). It is now, and will become even more difficult in the future, to control the general prohibition of GMOs or derivatives and warrant GMO-free products.

Conventionally produced supplements and fermentation-supports for silage-making are allowed as long as they do not contribute to the animal nutrition (1804/99/EC Annex I B 4.12. and Annex II D 1.5. and 3.1.). Listed in Annex II D 1.2., there are permissible minerals, vitamins and pro-vitamins for animal feed. Artificially produced vitamins may not be used for ruminants, but are allowed for monogastric animals. Only vitamins derived from raw materials occurring naturally in feedstuffs are allowed for herbivores (70/524/EEC).

A supplementary feeding of Vitamin D and artificially produced Vitamin A and E are prohibited for ruminants. Normally ruminants do not need extra vitamins in their diet, if they are adapted to the local environment conditions. In the winter period there can be a deficiency of Vitamin A, D and E because the natural conditions (sunlight) and the feed stuff (low quantities of roughage in winter) are not available to fulfil the needs of high yielding livestock (e.g., lactating cows). Vitamin A and E are components of roughage, but not Vitamin D. These synthetic vitamins can be feed to high yielding goats and sheep (dairy animals) with a veterinarian approval of necessity and acceptance of the inspection body.

Animal health and veterinary treatments

Animal welfare plays an important role in organic farming. There are detailed descriptions of animal keeping in the regulation 1804/99/EC particularly for cattle, pigs and fowl, but less for sheep and goats. Apart from animal welfare, high animal husbandry standards are the major factors for good animal health and high production yields. Organic animal husbandry standards are defined in Annex I B 5: health management, Annex I B 6.: livestock management including transport and slaughtering and Annex I B 8.: housing and stocking rates (indoor and outdoor keeping).

The principle of animal health is preventing and not curing/treating (Annex I B 5.1.). Robust, adapted and disease tolerant livestock ensure fit and healthy animals (Annex I

B 3.1.). Local breeds are considered to fulfil these targets. These are breeds typical of a specific region and adapted to the local environmental conditions and keeping patterns. Although the use of local breeds in organic farming makes sense, there are several problems. First, if a farm does convert to organic farming, the existing breeds on the farm will be converted. These are often high yielding breeds. Secondly, it is difficult to obtain organic livestock in the local surroundings as required under Annex I B 3.2. (lack of organic farms). Thirdly, very often adapted local breeds (whether organic nor conventional) do not exist or have low production yields (often endangered breeds).

To support animal health, feeding is required to meet the physiological needs of the animals with the emphasis on animal welfare and not on maximising production. Under these conditions it is assumed that animal health can be maintained by prevention (Annex I B 5.2.). The prevention shall aim to enhance the immunity of the body. Preventive treatments with "chemically-synthesised allopathic veterinary medicinal products" or antibiotics as well as oestrus synchronisation, or antibacterial feeding additives (growth promoters) are strictly forbidden (Annex I B 5.5.). Vaccinations are allowed even when the vaccine is produced with the use of GMOs ("white genetic engineering"). Treatment of parasites and vaccinations are not considered as "chemically-synthesised allopathic veterinary medicinal products". De-worming can be done after a veterinarian has recommended that a heavy infection requires treatment (no allowed under NOP). With such a recommendation the whole flock of small ruminants can be de-wormed. Particularly in small ruminant keeping, endo-parasites are endemic and a regular treatment is common (every six weeks is done on some farms). This is not a good farming practice. There is a need to design management strategies to avoid such immense use of chemical allopathic drugs without leave animals suffer when treatment is needed.

If an animal is sick, an immediate veterinary treatment is necessary (Annex I B 5.3.). This has to be proven and carried out by a veterinarian. Natural methods of disease treatment are to be preferred as long as they help the animal (Annex I B 5.4.). If these natural treatments do not help, chemical-synthesised allopathic treatments are allowed (even antibiotics). The treated animals have to be marked: large animals on individual level, small stock on group level. All health related data have to be noted in a herd book and be presented to the certification body (Annex I B 5.6.). The withholding period is twice as long (minimum of 48 hours) as requested for the applied drugs (Annex I B 5.7.). If a large animal or a group of small stock, respectively, has been treated more than three times with chemical allopathic drugs, the products can not be sold under the "organic" label. Only one chemical allopathic treatment is allowed for livestock for which the production period is less than one year (lamb, kid meat) (Annex I B 5.8.). There is still no positive list of chemical allopathic drugs. There is a urgent need to create positive lists in the regulations for livestock keeping.

Husbandry management practices, transport and slaughtering

The breeding of small ruminants should be done by natural mating (Annex I B 6.1.1.). Artificial insemination is allowed, but not embryo transfer, oestrus synchronisation, etc.. Male breeding stock has to be kept on the farm, requiring extra farm resources (space, labour and feeds). In natural mating, the breeding progress is reduced and diseases can be transmitted by intercourse (IBR, Brucellosis, etc.). An on-farm health control of these transmittable diseases is necessary. It is permissible to use conventionally kept male breeding stock (Annex I B 3.11.).

Under conventional conditions tested bucks or rather semen, do not always fulfil the expectations of organic breeding: lactation curve and milk composition, growth, meat quality parameters, double purpose, roughage dominated feeding or fitness under the regulations etc..

Animal cruelty of any kind is prohibited. The systematic shortening of sheep tails, dehorning and other such husbandry practices are not allowed (Annex I B 6.1.2.). This is even valid for purchased livestock from conventionally managed farms. Only under special circumstances may these treatments be performed, regulated by the certification authorities (e.g. hygiene, animal welfare or bio-security aspects). Castration of male stock is allowed to keep traditional animal husbandry practices (Annex I B 6.1.3.). The castration should be done at a very young age (<1 month), or under anaesthesia by a veterinarian. Breeding management is difficult in mixed flocks of male and female animals (sheep and goats in Mediterranean areas) without castration.

A feeding system which leads to anaemic conditions is prohibited and considered as animal cruelty (Annex I B 6.1.8.). Ruminants have to be kept in groups to meet their social needs (for calves Annex I B 8.3.7. and 629/91/EEC). It is not defined how social needs can be fulfilled via farm conditions.

The transport of livestock is not clearly defined (Annex I B 6.2.), but a stress-reduced loading, transporting and unloading of livestock without the use of allopathic tranquilliser, electrical shockers or similar tools is aimed. These regulations can create difficulties for organic livestock transports: e.g., in Germany the transport should not last longer than four hours. The animals have to be slaughtered in abattoirs which fulfil the regulations of organic farming and are certified (certification B). Those abattoirs are rare and not equally spread over the country. Sometimes the driving distance is more than four hours.

Housing and stocking rates

The tethering of livestock is prohibited (Annex I B 6.1.4.). This was a crucial aspect of disputes between the different countries. For example in Austria and other regions the tethering of dairy goats in winter periods in-door as well as sheep in summer periods on pasture is often practiced. In Annex I B 6.1.5., a tethering is allowed as long as the stables were built before August 24, 1999 (Annex I B 8.5.1.) and the tethered animals can move freely on a regular basis (twice a week; Annex I B 6.1.6.) and if the animals get soft laying surface (agreement with the certification body). It is difficult to monitor such a regular free movement of tethered livestock. The exceptions for tethering will end on December 31, 2010, but not for small farms. A clear definition of “small farm” or small herds is not given and has to be done by the certification body. The certification body can also authorise the limited and reasonable tethering of single animals (e.g. sick animals).

Tab. 3: Minimum space for organic sheep and goat keeping (Source: 1804/99/EC Annex VIII 1.)

Indoor (stable) (m^2 / animal)	Outdoor runs[1] (m^2 / animal)
1.5 per ewe / goat 0.35 lamb / kid	2.5 per ewe / goat 0.5 per lamb / kid

[1] Does not comprise grazing area

It is not obligatory but recommended that ruminants should graze on pastures ("free-range") and not be fed in stables as long as the animal, weather and pasture conditions are suitable (Annex I B 8.3.1.). Many stables do not have direct access to pastures. Therefore the animals have to be brought to the pastures. This is time-intensive and sometimes not possible when the milking equipment is in the stable and the pastures too far away. If grazing is not possible, a permanently accessible open-air run is obligatory. Free moving stables with permanent access to open-air runs are the principle of ruminant keeping (Annex I B 8.1.2.). Only with permanent summer pasture grazing an outdoor run is not necessary (Annex I B 8.3.2.), as long as the animals are not tethered. Final fattening of lambs and beef cattle in stables is possible if this period is less than one fifth of the animal's life and a maximum of three months of the fattening animal's life (Annex I B 8.3.4.). Such exceptions in animal welfare are difficult to communicate to consumers, who expect organic animal husbandry without exceptions (Rahmann et al., 2004).

New stables for ruminants do not separate indoor and outdoor areas. Sheltered space alternates with non-sheltered space without walls in between. It can happen that the sheltered space is smaller than required in the regulation but better for animal welfare. The sum of indoor and outdoor net space has to be considered to conform with the regulations (Rahmann, 2004). A maximum of 50% of the stable surface can be slatted or of gridded construction, the rest has to be a flat and non-slippery surface (Annex I B 8.3.5.). All indoor and outdoor net spaces for the animals are considered for this regulation. This means that the stable surface can be slatted or of gridded construction and the outdoor run without. This is not useful from an animal welfare point of view, because the space is not equally used by the animals. In sheep and goat keeping slatted or gridded flours are used in arctic regions where straw is scarce. The boxes have to be strewed-in with organic materials (defined in Annex II, part A; e.g. straw or wood chips; peat is difficult by environmental issues). There has to be enough space for fodder intake and resting (one place per animal) and the stable construction has to avoid harm to the animal by other animals or the stable equipment and cruelty to the animals while at the same time ensuring animal welfare (social contacts, playing, etc.). For disinfection and cleaning of stables and equipment, only the means and remedies in Annex II, part E are allowed (Annex I B 8.2.5.). The disinfection of permanently accessible outdoor runs is difficult and can lead to environmental contamination (water, air).

Mixing of organic and conventional stock

Conventionally kept livestock from extensive grazing systems (950/97/EC) can graze on organic pastures as long as no organic livestock is present (Annex I B 1.7.). For this grazing period non-organic livestock must follow the rules of organic livestock keeping. This grazing has to be accepted and approved by the certification body.

Converseley, organic livestock can graze on pastures which are not under the certification of organic farming (Annex I B 1.8.). This is possible on communal grazing areas where flocks of organic and non-organic livestock are mixed. In that case, the grazing areas may not be contaminated with prohibited treatments (those not in the positive lists of Annex II) in the last three years, the non-organic livestock is kept in extensive farming systems (Annex 950/97/EC) and the products of the organic livestock are not sold under an organic label. The label "organic" is allowed only if the certification body can prove the separation of organic and non-organic livestock on communal pastures. The approval and certification of the organic farm has to be done

during the period of grazing communal pastures. The monitoring of such systems is very difficult, particularly with small ruminants (identification of individual animals, mixing of stock). Collaboration on an written contract basis between the organic and conventional farms is possible. The fulfilment will be inspected.

Nevertheless there are significant difficulties in mixed grazing with organic and non-organic livestock on the same pastures. For example, environmentally transmitted diseases like foot rot or drug-resistant endo-parasites can be transmitted between the flocks even when they do not graze together. This should not be ignored by organic livestock keepers because prevention and treatments of such diseases are difficult, time-consuming and costly.

7 Recent performance of organic sheep and goat farming

In 2002, there were about 1.6 mio organic sheep and goats in the EU15. Italy, Great Britain, Germany and France were the countries with the most sheep. In Denmark, Finland, Sweden and Austria, more than 20% of all sheep were kept under organic standards. In Greece, France, Ireland, Luxemburg, Netherlands and Great Britain only less than 2 percent are kept as organic sheep. Germany's population is in between these groups (EUROSTAT, 2005).

Several studies show the great difference in the performance and economic of organic sheep and goat farming.

Tab. 4. Economic calculation of typical organic sheep husbandry systems in Germany (Rahmann, 2007)

System	Lamb production in paddock systems	Lamb production in traditional herding systems	Sheep keeping and landscape management	Milk production without cheese making
Breed	Schwarzköpfiges Fleischschaf	Merino-Landschaf	Moorschnucke	Ostfriesisches Milchschaf
Number of sheep (ewe)	150	500	700	100
Remonte	0.17	0.17	0.20	0.20
Weaned lambs per ewe and year	1.53	1.44	1.00	1.70
space (ha pasture/ewe)	0.15[3]	0.15[3]	0.3[3]	0.15[3]
Sold lambs / ewe	1.36	1.27	0.80	1.50
Sold milk (kg/ewe)				320
Carcass weight lambs (kg SW)	23	23	15	24
Sold lamb (€/kg SW)	7.05	5.00	5.00	7.05
Sold old ewe (€/kg SW)	1.86	1.24	1.24	1.86
Weight old ewe (kg)	35	35	22	35
Wool (kg/ewe)	4.5	4.8	2.0	4.2
Sold wool (€/kg)	0.70	1.10		0.70
Sold skins (€/fir)	28.46			28.46
Nutrition (MJ ME/ewe/y)	9,089	8,916	8,177	12,893
- therefore roughage	8,343	8,188	8,177	11,674
Concentrate feedstuff (kg/ewe/y)	68.3	66.7	0.0	111.7
Returns	**€/ewe**	**€/ewe**	**€/ewe**	**€/ewe**
Milk (1.20 €/kg milk)				384.00
Lambs	221.06	146.43	60.00	253.80
Old sheep	10.85	7.23	5.46	13.02
Wool and skin	18.67	5.23		0.02
Subsidies and premiums	28.00	28.00	28.00	23.80
Subsidies old breed			17.00	
Premium biotope management			40.00	

Sum returns (€/ewe)	278.58	186.89	150.46	674.64
Lamb skimmed milk				97.92
Concentrate, minerals (25€/dt)	17.12	16.70		27.99
Veterinary costs, hygiene	6.35	4.95	3.85	6.20
Ram	5.00	5.00	5.00	5.00
Disease fund	1.20	1.20	1.20	1.20
Processing, marketing	45.90	4.50	3.50	51.00
Fence and equipment	4.80	1.97	1.10	7.13
energy, water	4.64	3.11	2.07	1.61
Shearing	2.20	1.80	1.80	2.00
Dog		1.83	0.94	0.00
Sum direct costs (€/ewe)	87.21	41.06	19.46	200.05
Turn over (€/ewe)	191.38	145.84	131.00	474.59
Roughage	42.51	41.78	5.00	40.00
Labour	181.49	91.83	10.00	180.00
Depreciation machine, building	33.67	33.67	10.00	70.00
variable machine costs	3.58	3.23	1.07	6.00
Misc. costs	13.75	12.77	4.03	8.00
Sum other costs (€/ewe)	275.00	183.28	30.07	304.00
income (€/ewe)	-83.62	-37.44	100.93	350.59
Sum family labour (h/ewe/y)	9.6	6.0	6.0	22.2
income family labour (€/h)	-8.71	-6.24	16.82	15.79

Tab. 5: Economic calculation of typical organic goat husbandry systems in Germany (Rahmann, 2007)

Systems	Milk production, milk sold to dairy	Milk production with own cheese processing	Mutton production in paddock system	Landscape management
breeds	German Alpine	German Alpine	Boer goat	Boer goat
heads	100	100	100	100
Remonte	0.2	0.2	0.2	0.2
Kids/goat	1.7	1.7	1.7	1.7
space (ha pasture/goat)	0.15	0.15	0.15	0.3
Sold kids (kids/goat)	1.5	1.5	1.5	1.5
Sold milk (kg/goat)	550			
Sold cheese (kg/goat)		55		
Carcass weight kids (kg SW)	8	8	20	15
Sold kids (€/kg SW)	7	7	5	5
Carcass old goat (kg SW)	25	25	30	25
Nutrition (MJ ME/goat/y)	12,500	12,500	8,000	8,000
- therefore roughage	10,000	10,000	7,500	7,500
concentrates (kg/goat/y)	150	150	60	30
Returns	**€/MZ**	**€/MZ**	**€/MZ**	**€/MZ**
Milk (0.70 €/kg)	385			
Cheese (15.00 €/kg)		825		
Kids sold (1.5 kids/goat)	84	84	150	112
Old goat (2.00 €/kg SW)	10	10	12	10
Subsidies and premium	27	27	27	54
Biotope management (250€/ha)				35
Sum returns	506	946	189	211
Skimmed milk (0.60 €/kg)	60	60		
Concentrates, minerals (25 €/dt)	70	70	12	12
Veterinary	10	10	5	5

Buck	5	5	5	5
Health insurance	1	1	1	1
Processing, marketing	20	100	20	10
Fence and equipment	5	5	5	7
Energy, water	5	5	2	2
Sum direct costs	176	256	50	42
Returns (DB I)	330	690	139	169
Roughage costs	43	43	43	28
Labour costs	80	100	40	10
Depreciation machines, building	30	35	15	10
variable machine costs	6	9	1	1
Misc. Costs	8	8	4	4
Sum other costs	169	195	103	53
income (€/goat)	163	495	36	116
Sum family labour (h/goat/y)	20	35	9	11
Income family labour (€/h)	8.15	14.14	4.00	10.55

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