GIZ 192
Kurzreise Saudi Arabien

Leistungsnachweis KZE Prof. Gerold Rahmann zur Beratung/Fortbildung in der ökologischen Tierhaltung im Rahmen des GTZ/MoA Organic Farming Development Project, Riyadh, Saudi Arabien August/September 2007

Ziele des Einsatzes:

Ein Konzept für die Einführung einer angepassten, ökologischen Tierproduktion für die zukünftige Tierzucht u. -ernährung im R&D Qassim Center ist erstellt mit den Schwerpunkten:

- Zuchtkriterien in der ökol. Tierzucht: Definition was Zucht u. Leistung ist, Zucht auf Lebensleistung, Beispiele aus der Praxis.
- Auswahl von Art und Umfang, Rasse, Herkunft und Nutzungsmöglichkeiten der Tiere.
- Einsatz geeigneter Methoden der Tierhaltung und -zucht.
- Aufstallung:
  - Charakterisierung geeigneter Aufstallungsformen unter Berücksichtigung lokaler Bedingungen wie Klimaeinfluss, Auslauf, Fütterungsmethoden etc.
  - Material
- Ökol. Tierernährung:
  - Anforderungen an die ökol. Tierernährung nach EU-Richtlinie 2092/91
  - einheimische und neue mögliche Futterkomponenten,
  - Nährstoffbedarf in der verschiedenen Leistungsstufen (Erhaltungs- u. Leistungsbedarf),
  - Futterrationberechnung,
  - Spezifizierung eigenbetrieblicher sowie externer Futterkomponenten
  - KF in der ökol. Tierernährung: Quellen, Einsatz und Möglichkeiten.
- Weide in der ökol. Tierhaltung, -ernährung:
  - Beweidungssysteme- u. Nutzungsmöglichkeiten in KSA.
  - Angepasste Beweidungssysteme und ihre mögliche Nutzung in der R&D Station.
- Vorratshaltung und Lagerung von Futtermitteln unter Berücksichtigung der lokalen Bedingungen in KSA:
- Das Naturschutzgebiet im R&D Center. Naturschutz und Nutzungsmöglichkeiten.
- Ökol. Tierhygiene:
  - Definition,
  - Das Prinzip der Prophylaxe,
  - Einfluss der Ernährung, Tierhaltung und Klima auf die Krankheiten
  - Möglichkeiten und Bedingungen der kurativen Behandlung

Das Personal des R&D Centers hat Grundkenntnisse über die verschiedenen Aspekte der standortangepassten ökologischen Tierzucht, -ernährung und -hygiene erworben und ist in der Lage, das vorgeschlagene Konzept zur Einführung der ökologischen Tierhaltung schrittweise umzusetzen.

3. Ausgewählte Farmer haben Grundkenntnisse über die verschiedenen Aspekte der standortangepassten ökologischen Tierzucht, -ernährung und -hygiene erworben und sind in der Lage, diese in die Praxis umzusetzen.

Aktivitäten

Folgende Aktivitäten sind gemäß Plan durchgeführt worden:

1. Geplant: Schulung ausgewählter Betriebsleiter und Mitarbeiter des R&D Centers in Form von 2 eintägigen Workshops mit den Schwerpunkten ökol Tierzucht, -haltung und –hygiene.

   Erledigt: Erfolgte am 2. und 3. September am R&D Center sowie am 4. und 5. September mit Betriebsleitern auf einem Mitgliedsbetrieb.

2. Geplant: Erstellung eines Konzeptes für die Einführung ökologischer Tierzucht und –haltung im R&D Center

   Erledigt: Siehe Annex 1

3. Mitwirkung bei der Anpassung des Entwurfes der KSA Bio-Verordnung an die hiesigen Verhältnisse in Bezug auf die ökol. Tierzucht.

   Erledigt: Erfolgte im Rahmen der Diskussionen vor Ort (die saudische Verordnung liegt mir bislang nicht vor). Empfehlungen werden in Annex 2 aufgeführt.

4. Erstellung eines Leaflets zu Tierzucht, -ernährung und -hygiene, im Ökolandbau

   Erledigt: Siehe Annex 3

Annex 1: Concept of Organic Animal Husbandry at the R&D Center in Quassim

General background:
The R&D Center and the experimental station in Quassim have a tradition, structure and experience on plant production (dates, orchards, arable crops, vegetables). Till today no livestock is kept and the scientific and technical stuff has no experience in animal husbandry. The target is to convert the R&D Center and the experimental station towards organic farming.

Integration of livestock:
Livestock has to be integrated at the R&D Center and the experimental station in Quassim to produce manure for the plant production research carefully and slowly. At the first stage of integration animal products are co-products. After several years of gaining experience with organic livestock keeping, organic animal products can get more importance (meat, milk, wool, breeding stock). Therefore the stock should be small at the beginning and increase slowly by offsprings to a specific target.

The starting stock should be integrated at the research station BEFORE conversion towards organic starts and documented in the first inspection protocol.

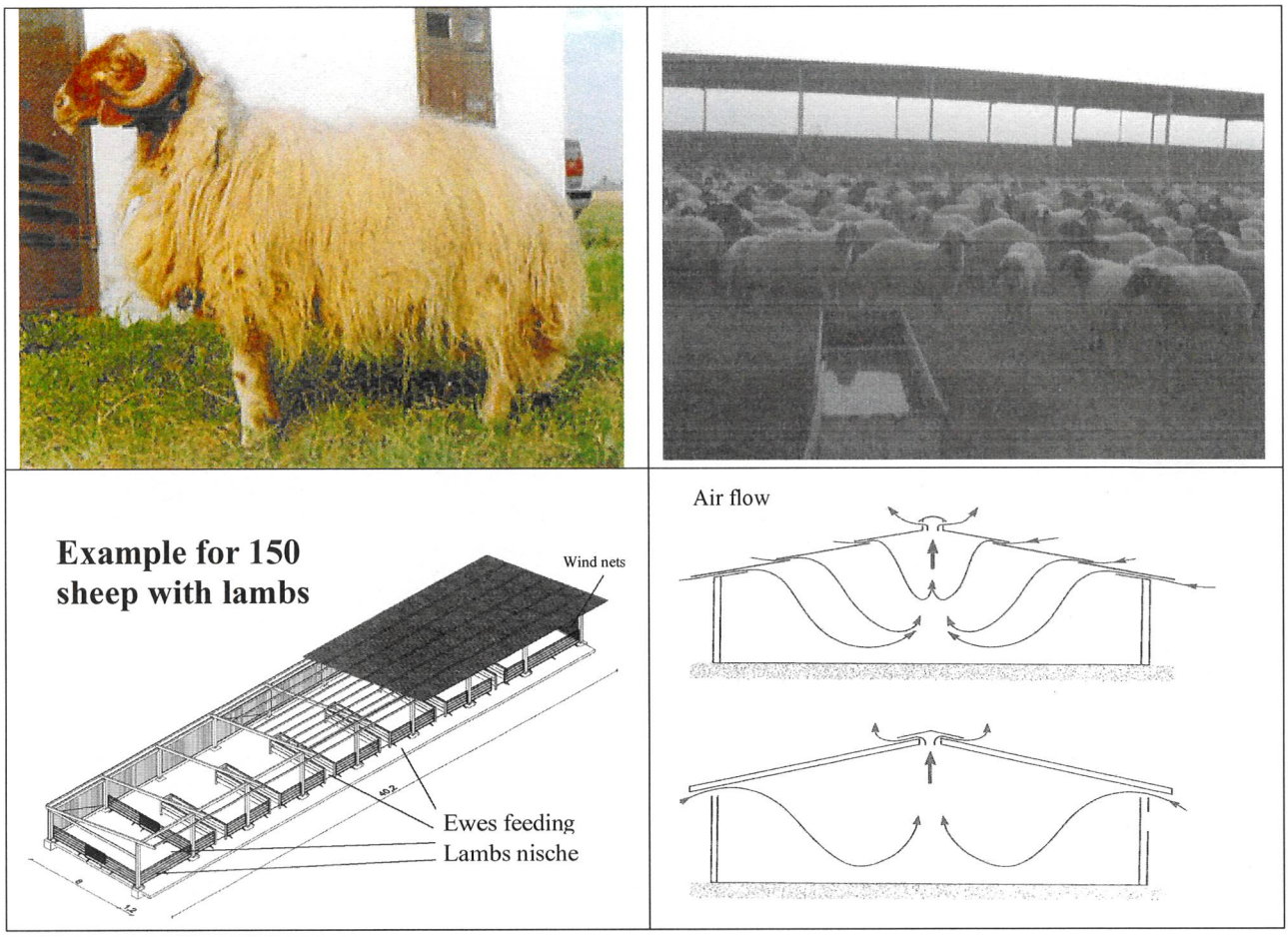
Tab. 1: Average nutrient content of manure (fresh, no straw etc.) in % under European conditions (Rahmann, 2004)

	cattle	horses	sheep/goats	chicken
Water	77,3	71,3	64,3	56,0
Organic matter (OM)	20,3	25,4	31,8	0,30
Nitrogen (N)	0,40	0,60	0,80	1,70
Phosphorous (P_2O_5)	0,20	0,28	0,23	1,60
Potassium (K_2O)	0,50	0,53	0,67	0,90
Calcium (CaO)	0,45	0,25	0,33	2,00
Magnesia (MgO)	0,10	0,14	0,18	0,20
C : N	25	21	20	0,1

Sheep:

- Breed: Awassi sheep
- Flock: starting with 100 ewes and 5 rams; target: 500 ewes, 500 lambs and 25 rams
- Organic farm land for sheep (13.3 animals/ha/a): start: 10 ha; target: 50 ha
- Feeding: 1/2 Alfalfa and 1/2 grass (recommendation of KZE Legel)[1]
- Stable and out-door run minimum: 2,525 m^2

[1] Crop rotation recommendation:
alfalfa – alfalfa – wheat – sesame – soy beans/peas/beans – triticale – grass/maize/sorghum.



Fotos: Awassi sheep: breeding animal and flock seen in Saudi-Arabia September 2007

The fat-tailed Awassi is a sheep breed from Syria. It is adapted to the harsh environmental conditions and it is distributed in Saudi-Arabia in several herds. The Awassi evolved as a nomadic sheep breed through centuries of natural and selective breeding and became the best triple-purpose breed (lamb, milk, wool) in the Middle East. The breed has the advantage of natural hardiness and grazing ability. The breed is well suited to a grazing production system as well as a confinement operation.

The Awassi has a brown face and legs with the fleece varying in colour from brown to white. Individuals can also be found with black, white, grey or spotted faces. The males are horned and the females are usually polled. The fleece is mostly carpet type with a varying degree of hair.

Breeding: At the R&D center the primary breeding target should be good body confirmation, health and weight gain under roughage regime and without or very limited concentrate feeding. A core breeding group of 25 Awassi ewes should be selected every season and mated with a high performance ram. The remaining breeding herd should grow annually to the target of 500 ewes and be bred with good local Awassi rams (20 ewes per ram). A herd book should be a target. This needs the documentation of productivity, weight gain and performance of any individual animal (ewes, lambs, rams). Individual ear-tags are necessary. Rams are permanently in the flock, except in February - April to avoid lambing in hot summer July-September.

Feeding: Due to the organic standards, 13.3 sheep are allowed per hectare, 50 ha of organic farming land have to be available for the herd. The feed stuff should be predominantly from

Alfalfa and grass[2] and grown organically on the experimental station. Every adult Awassi sheep needs about 2 kg of roughage per day (dry matter). The roughage should have best quality (as fresh as possible, no sand, tasty, good ration of energy and protein due to demand), "a human should like to eat it"). There is no need to make a seasonal feeding plan for the conditions on the experimental station. Every animal must have always access to feed stuff, at least to produce enough and good manure and to perform well (body condition). Permanent access to high quality water (human consumption quality) is necessary. The animals are kept in the compound together. They should be kept as much as possible in the compound or on arable crop land (post-harvest grain fields) to produce enough manure, which can be collected and used as fertilizer.

Housing: Due to the organic standards, the minimum in-door keeping space (sheltered area) is 1.5 m^2 are for ewes, 0.35 m^2 per lamb and 1.5 m^2 per ram. The out-door run should have at least 2.5 m^2 per ewe, 0.5 m^2 per lamb and 2.5 m^2 per ram. In-door and out-door can be one compound (see picture). Together about 2,525 m^2 space for stable and out-door run are needed for 500 ewes, 425 m^2 for 500 lambs and 100 m^2 for 25 rams. The in-door area does just need a sun shelter for the animals. The floor can be out of sand. The easy and clean collection of manure must be possible. Disinfections must be possible.

Equipment: There is no expensive equipment necessary. 100 m long both-sides feeding troughs for ewes, 50 m long both sided feeding troughs for lambs (separated from mothers with a permanent lamb sized outgoing quality for feeding best feed stuff). The manure must be removed regularly with suitable equipment and storage facilities (containers). Composting of manure should only be done if necessary (e.g. sterilising against weed seed or parasites, nutrient demand for compost). Fresh or stored manure should be used for greenhouse cultures, if it is clean and not contaminated with weed seeds etc.. It can be used for orchards (date etc.) as well as mulching or fertilizer.

Health management: The most important problems are endo- and ecto-parasites. Prevention should be in the middle of action (grazing on post-harvest grain fields, no mixing with other herds) but remedies can be used if necessary. Vaccinations against major and ubiquity diseases are possible. If an animal gets sick, the veterinarian can give medicine. Double withhold periods are necessary.

Goats:

- Breed: Damascene goats
- Flock: starting with 100 does and 5 bucks; target: 500 does, 500 kids and 25 bucks
- Organic farm land for sheep (max. 13.3 animals/ha/a): start: 10 ha; target: 50 ha
- Feeding: 1/2 Alfalfa and 1/2 grass (recommendation of KZE Legel)
- Stable and out-door run minimum: 2,525 m^2

Additionally to the sheep a flock of goats is interesting, because they can digest the tannine rich leafs of shrubs and dates better than sheep. Therefore they can produce manure from plants, which can not be used by other ruminants. The Damascene goat is a breed raised in the region of Syria and Lebanon, primarily for milk production. They are of the Nubian type and are usually red or brown but can also be seen in pied or grey. The animals can be either horned or polled and are long haired.

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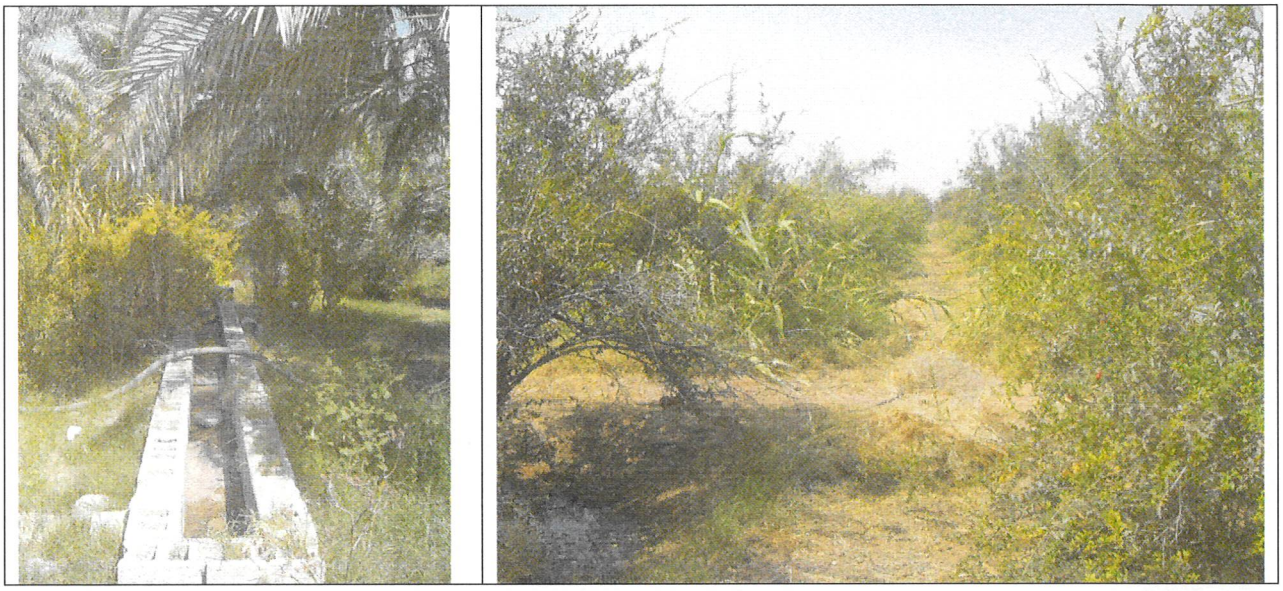
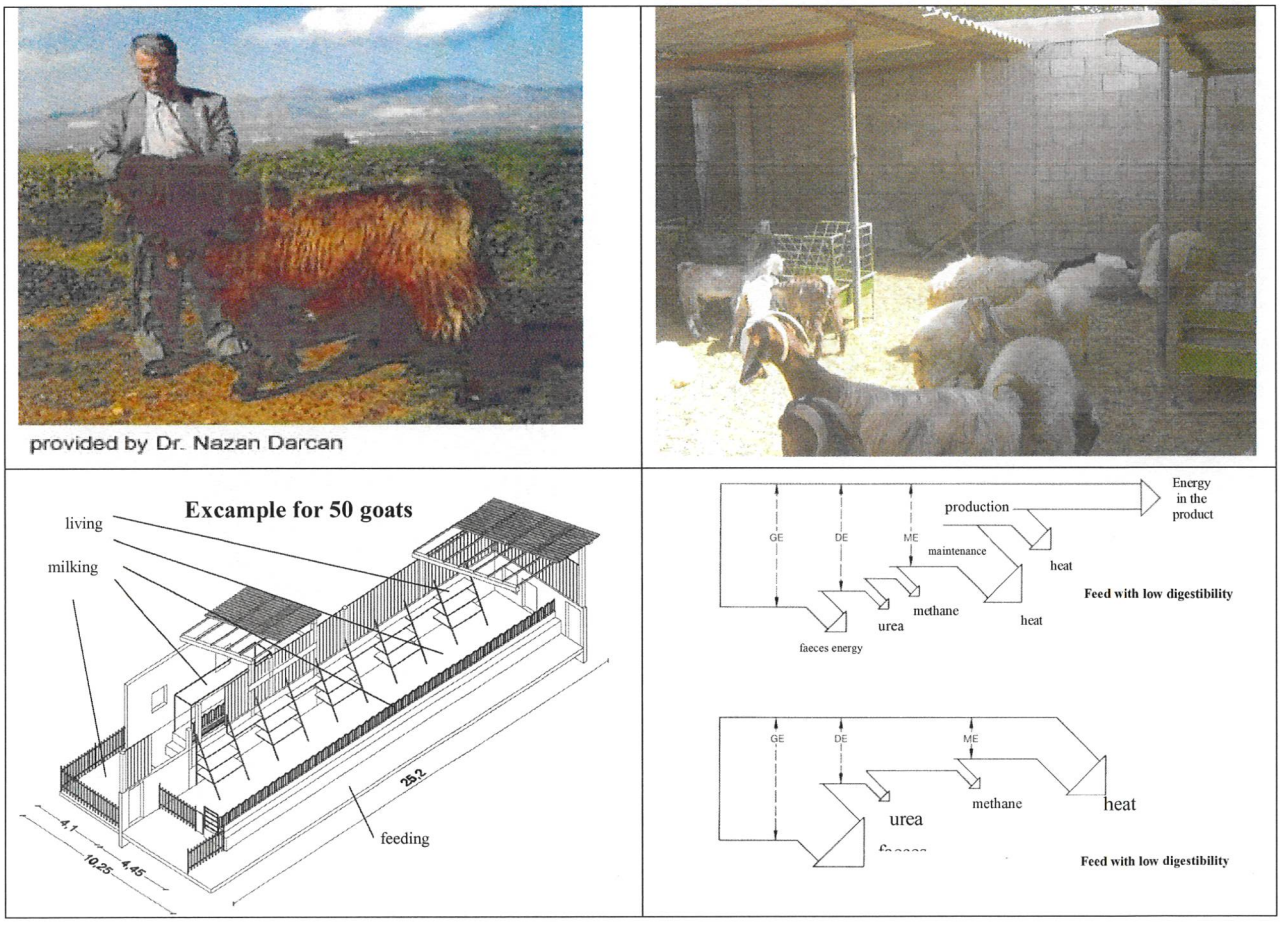
[2] Alfalfa and grass can be grown together (grass will disappear after first cutting). That means the first cut is for animal feeding. Grass and Alfalfa can be sown separately as well on the same field.



Fotos: By-products for goat feeding at the Quassim experimental station and on a farm in Saudi-Arabia



Fotos: Damascene goat: breeding animal and flock seen in Saudi-Arabia September 2007

Breeding, feeding and housing are similar to sheep. Sheep and goats should kept separately to avoid cross-parasitism, feeding competition etc..

Chicken:

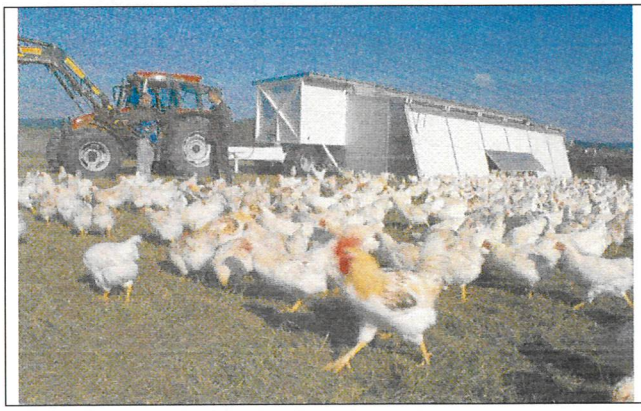
- Breed: Hybrids (annually purchased, no beak trimming)
- Flock: 1,000 chicken and 20 cocks
- Organic farm land for chicken: (230 layers/ha/a: min. 4,4 ha)
- Feeding: Alfalfa-out-door run and 140 g feed/layer/d: 32 tons grain, 18 tons pulses
- Stable: mobile chicken stable for 1,000 layers

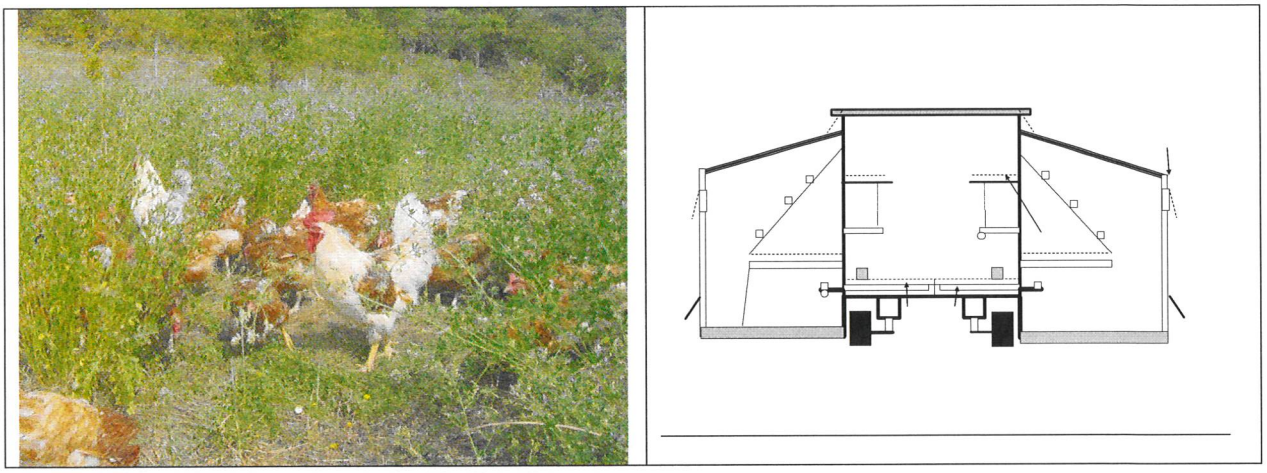
The manure from chicken is different from sheep and goats. Nutrients and particularly phosphor are more, organic matter is less. To make trails with different fertilizer, chicken manure is important to analyse. Therefore a flock of layers should be kept.

Breeding: Local chicken breeds are not productive enough. It is normal, that hybrid layers are used in organic farming. The common hybrids on the Saudi-Arabian market have to be bought annually from a breeder. Layers should be ordered without beak trimming and raised as much as possible in an environment comparable to the farm conditions.

Feeding: Permanent access to feed stuff and water is important to guarantee high productivity and good health. Best feeding rations are needed. They have to be produced organically. This has to be done on the farm, because the organic market in Saudi-Arabia does not have this available for farmers. About 4 ha grain and pulses are needed to feed the chicken. Additionally, grassing on Alfalfa-crop land is recommended to fulfil essential amino acid (methionine etc.) demand of the layers. A layer needs about 140 g feed stuff per day. For 1,000 layers are about 50 tons needed per year (including 10% losses). 65% (32 tons) are grain and 18 tons are pulses (peas, soy beans, beans) and minerals due to the nutritional demand of the animals (see tables).

Housing: Because the layers should grass on an out-door run and recent stables are not available and experience with chicken are not given, the best solution for organic layer keeping should be found. Mobile housing systems for organic layers are developed. They fulfil all standards and can be used for grazing on Alfalfa crop land (see pictures).





Fotos: Mobile layer house on Alfalfa pasture

Equipment:
The manure must be removed regularly with suitable equipment and storage facilities (containers). Composting of manure is recommended to avoid the manure burning to plants when it is applied fresh. The compost made from chicken manure should be used in greenhouse cultures, together with fresh or stored ruminant manure (sheep, goat, camel, cattle).

Health management:
Vaccinations can be made without restrictions. Preventive medication is prohibited but drugs can be used (double withhold period), if a veterinarian does recommend (and document) this in the case of diseases in the herd. Most important problem is feather pecking. Good management and feeding can reduce this problem. The roaming on Alfalfa crop land does support this.

Camels:

- Breed: local breed for meat
- Flock: 20 female and 1 male
- Organic farm land for camel: nature reserve area, extensive grazing
- Feeding: natural vegetation, no concentrate
- Stable: easy fenced area for the night (min. 210 m^2)

Camels do not have standards till now. It can be one function of the experimental station to define organic standards for camels. I recommend using the standards which are relevant for cattle. The manure of camels can be explored as fertilizer in date cultivations.

Foto: Natural vegetation at the experimental station in Quassim, Camels in Saudi-Arabia

Breeding: Producing organic camels for farms could be interesting. Local measures of breeding can be done.

Feeding: Natural vegetation of the experimental station should be used (no Alfalfa and concentrates). Parts of the nature reserve of the experimental station can be fenced for permanent grazing of the camels (15 ha/camel/a). Enclosures should be included to see the grazing effect.

Housing: An easy fenced space for the nights can be used to house the animals (mobile). I recommend using the organic standards for cattle likewise for camel. It should be possible to collect camels manure to make fertilizing experiments.

Equipment: Mobile fence and coral. Equipment for manure collecting and storaging.

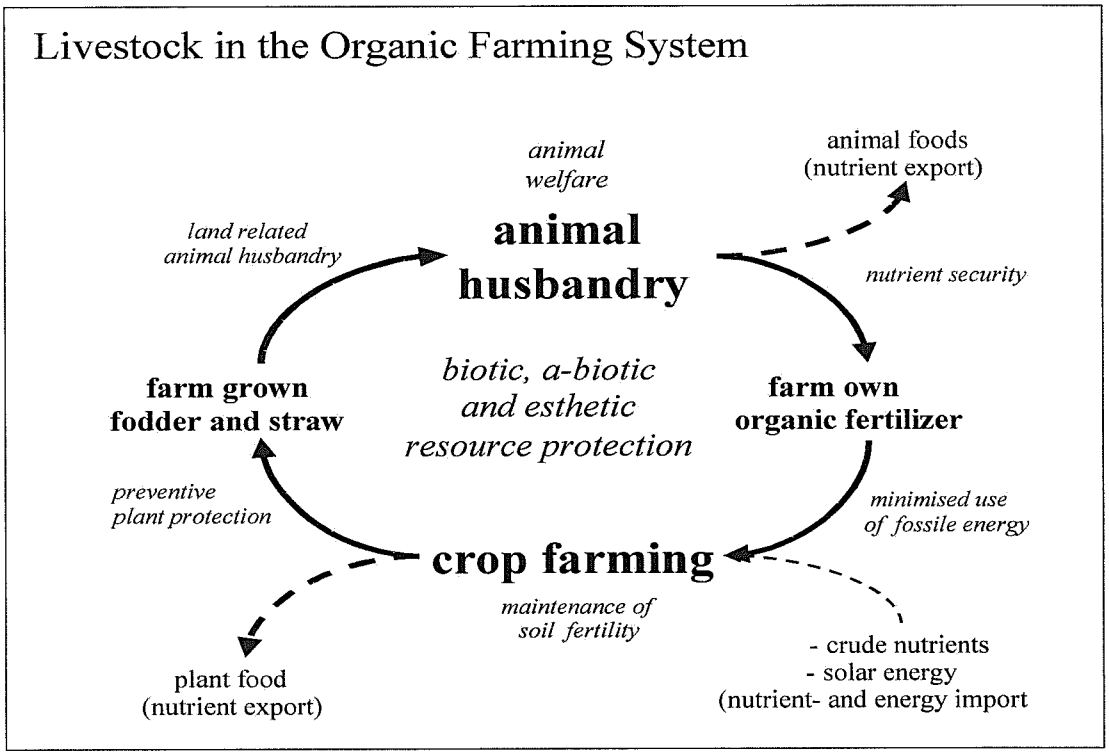
Annex 2: Recommendations for the Organic Animal Husbandry Standards in Saudi-Arabia

I have not seen the organic standards of Saudi-Arabia till now but know that they are comparable to the EU 2092/91 standards. This is acceptable. Some adjustments have to be made to cope with the hot and dry climate as well as with very extensive animal husbandry measures (mobile systems, transhumance). Because the EU 2092/91 has no standards for camels, they have to be developed. I recommend the same standards like for cattle in EU 2092/91.

Annex 3: Contribution for a leaflet about organic animal breeding, feeding and health keeping

Introduction

Organic agriculture is considered as an environmentally sound and socially acceptable land use system with "natural feed" production (FAO, 2007). It is based on independently certified and controlled specific standards of production which are described by the International Federation of Organic Agricultural Movement (IFOAM, 2005) and taken from international bodies like the Codex Alimentarius Commission of the FAO/WHO. Animal husbandry plays a central role in organic farming. It supplies feed, raw materials, non-material and farm-internal products and services, and contributes as much as possible to complete feed cycles and energy flows.



IFOAM and EU-standards and norms of organic animal husbandry

Organic animal husbandry is based on principles, established and monitored production, and processing norms. They describe exactly the production norms which have to be fulfilled before the products can be claimed as organic.

Tab. 2 **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 (buildings and free runs)	Animal protection laws (requirements for keeping of animals according to species)	Special requirements for keeping of animals oriented toward animal welfare (occupation-density, size of buildingstethering prohibited, etc.)
Feeding	According to current feed stuffs legislation (permitted feed additives such as enzymes, synthetic amino acids, etc.)	Feed 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 interference with the

	Conventional	Organic (2092/91/EEC)
		animals´ integrity (removal of horns, shortening of beaks, shortening of teeth, docking of tails etc.)
Transportation	Animal-transport regulation	Animal-transport regulation, short transports

General Standards of Organic Animal Husbandry (EEC/2092/91)

Livestock production forms an integral part of many agricultural holdings practising organic farming. Livestock production must contribute to the equilibrium of agricultural production systems by providing for the nutrient requirements of crops and by improving the soil's organic matter. It can thus help establish and maintain soil-plant, plant-animal and animal-soil interdependence.
By utilising renewable natural resources (livestock manure, legumes and fodder crops), the cropping/stock farming system and the pasturage systems allow soil fertility to be maintained and improved in the long term and contributes to the development of sustainable agriculture.
Organic stock farming is a land-related activity. Livestock must have access to a free-range area, and the number of animals per unit of area must be limited to ensure integrated management of livestock and crop production on the production unit, so minimising any form of pollution, in particular of the soil and of surface and ground water. The number of livestock must be closely related to the area available in order to avoid problems of over-grazing and erosion and to allow for the spreading of livestock manure so that any adverse effects on the environment can be avoided.
The farmer should:

a. provide adequate quantities of good quality organically grown feedstuffs;
b. maintain appropriate stocking rates, flock or herd sizes, and rotations to allow for natural behaviour patterns and to maintain natural resources and environmental quality;
c. practice methods of animal management that reduce stress, promote animal health and welfare, prevent disease and parasitism, and avoid the use of chemical allopathic veterinary drugs;
d. apply management practices that promote sustainable land and water use.

The farmer shall ensure that the environment, the facilities, stocking density and flock/herd size provides for the behavioural needs of the animals and provides for:

a. sufficient free movement and opportunity to express normal patterns of behaviour;
b. sufficient fresh air, water, feed and natural daylight to satisfy the needs of the animals;
c. access to resting areas, shelter and protection from sunlight, temperature, rain, mud and wind adequate to reduce animal stress;
d. the maintenance of social structures by ensuring that herd animals are not kept in isolation from other animals of the same species;
e. construction materials and production equipment that do not significantly harm human or animal health.

Housing conditions shall ensure:

a. ample access to fresh water and feed according to the needs of the animals;

b. that animals have sufficient space to stand naturally, lie down easily, turn around, groom themselves and assume all natural postures and movements such as stretching and wing flapping;

c. where animals require bedding, adequate natural materials are provided;

d. that construction provides for insulation, heating, cooling and ventilation of the building, that permits air circulation, dust levels, temperature, relative air humidity, and gas concentrations to within levels that are not harmful to the livestock;

e. that poultry shall not be kept in cages;

f. that animals are protected from predation by wild and feral animals.

Landless animal husbandry systems are prohibited. All animals shall have access to a pasture or an open-air exercise area or run, whenever the physiological condition of the animal, the weather and the state of the ground permit. Such areas may be partially covered.
Animals may be temporarily confined because of inclement weather or absences of pasture due to temporary or seasonal conditions. Such animals shall still have access to an outdoor run.
Animals may be fed with carried fresh fodder where this is a more sustainable way to use land resources than grazing. Animal welfare shall not be compromised. The maximum hours of artificial light used to prolong natural day length shall not exceed a maximum that respects the natural behaviour, geographical conditions and general health of the animals.

Conversion Period

The establishment of organic animal husbandry requires an interim period, the conversion period. Animal husbandry systems that change from conventional to organic production require a conversion period to develop natural behaviour, immunity and metabolic functions. All livestock on an organic farm should be converted to organic production. Conversion should be accomplished over a period of time. Replacement poultry should be brought onto the holding at the start of the production cycle.
Animal products may be sold as "products of organic agriculture" only after the land and animals have all met the appropriate established conversion requirements. Land and animals may be converted simultaneously subject to the requirements for all other land and animal conversion periods.

Animals Sources/Origin

Organic animals are born and raised on organic holdings. Organic animal husbandry should not be dependent on conventional raising systems. Livestock obtained from off the farm should be from organic farms or as part of an established co-operative program between specific farms to improve herd health and fitness.
Animals shall be raised organically from birth. When organic livestock is not available conventional animals may be brought in according to the following age limits:

- 2 day old chickens for meat production;
- 18 week old hens for egg production;
- 2 weeks for any other poultry;
- dairy calves up to 4 weeks old that have received colostrum and are fed a diet consisting mainly of whole milk.

Breeds and Breeding

Breeds are adapted to local conditions. Breeding goals should encourage and maintain the good health and welfare of the animals consistent with their natural behaviour. Breeding practices should include methods that do not depend on high technologies invasive to natural behaviour and capital intensive methods. Animals should be bred by natural reproduction techniques. Breeding systems shall be based on breeds that can reproduce successfully under natural conditions without human involvement. Artificial insemination is permitted. Embryo transfer techniques and cloning are prohibited. Hormones are prohibited to induce ovulation and birth unless applied to individual animals for medical reasons and under veterinary supervision. Organic farming respects the animal's distinctive characteristics. Farmers should select species and breeds that do not require mutilation. Exceptions for mutilations should only be made when suffering can be kept to the minimum. Surgical treatments should only be used for reasons of safety, mitigation of suffering and the health and welfare of the livestock. Mutilations are prohibited. The following exceptions may be used only if animal suffering is minimized and anaesthetics are used where appropriate:

a. castrations;
b. tail docking of lambs;
c. dehorning;
d. ringing;
e. mulesing only for breeds that require mulesing.

Animal Nutrition

Organic animals receive their nutritional needs from organic forage and feed of good quality. Farmers should offer a balanced diet that provides all of the nutritional needs of the animals in a form allowing them to exhibit their natural feeding and digestive behaviour. Organic animals should be fed by-products from the organic feed processing industry not suitable for human use. Ruminants should receive a balanced diet according to their specific nutritional needs and should not be fed a diet that consists entirely of silage and concentrates. All feed should come from the farm itself or be produced within the region. Colouring agents in feed should not be used in organic livestock production. All animals should have daily access to roughage. Animals shall be fed organic feed. The following substances are prohibited in the diet:

a. farm animal by-products (e.g., abattoir waste) to ruminants;
b. slaughter products of the same species;
c. all types of excrements including droppings, dung or other manure;
d. feed subjected to solvent extraction (e.g., hexane) or the addition of other chemical agents;
e. amino-acid isolates;
f. urea and other synthetic nitrogen compounds;
g. synthetic growth promoters or stimulants;
h. synthetic appetizers;
i. preservatives, except when used as a processing aid;
j. artificial colouring agents.

Synthetic chemical fodder preservatives such as acetic, formic and propionic acid and vitamins and minerals are permitted in severe weather conditions. Young stock from mammals shall be provided maternal milk or organic milk from their own species and shall be weaned only after a minimum time that takes into account the natural behaviour of the relevant animal species. Farmers may provide non-organic milk when organic milk is not available. Farmers may provide milk replacers or other substitutes only in emergencies provided that they do not contain antibiotics, synthetic additives or slaughter products.

Veterinary Medicine

Organic management practices promote and maintain the health and well-being of animals through balanced organic nutrition, stress-free living conditions and breed selection for resistance to diseases, parasites and infections. Farmers should maintain animal health and practice disease prevention through the following techniques:

a. selection of appropriate breeds or strains of animals;

b. adoption of animal husbandry practices appropriate to the requirements of each species, such as regular exercise and access to pasture and/or open-air runs, to encourage the natural immunological defense of animal to stimulate natural immunity and tolerance to diseases;

c. provision of good quality organic feed;

d. appropriate stocking densities;

e. grazing rotation and management.

Farmers should use natural medicines and treatments, including homeopathy, Ayurvedic medicine and acupuncture whenever appropriate. When illness does occur, a farmer should determine the cause and prevent future outbreaks by adopting appropriate management practices. The farmer shall take all practical measures to ensure the health and well-being of the animals through preventative animal husbandry practices. If an animal becomes sick or injured despite preventative measures, that animal shall be treated promptly and adequately, if necessary in isolation and in suitable housing. Producers shall not withhold medication where it will result in unnecessary suffering of the livestock, even if the use of such medication will cause the animal to lose its organic status. A farmer may use chemical allopathic veterinary drugs or antibiotics only if:

a. preventive and alternative practices are unlikely to be effective to cure sickness or injury;

b. they are used under the supervision of a veterinarian, and

c. withholding periods are not less than double of that required by legislation, or a minimum of 48 hours, whichever is longer.

Substances of synthetic origin used to stimulate production or suppress of natural growth are prohibited. Vaccinations are allowed with the following limitations:

a. when an endemic disease is known or expected to be a problem in the region of the farm and where this disease cannot be controlled by other management techniques, or

b. when a vaccination is legally required, and

c. the vaccine is not genetically engineered.

Basic Knowledge of Organic Animal Husbandry

Guidelines alone, however, do not make for environmentally friendly, economic, organic animal husbandry. Knowledge and skill are necessary to keep livestock in accordance with animal productivity and welfare as an integral part of the entire organic farming system. Here, the norms offer little help. When converting from conventional to organic farming, it can take years before the organism of a farm recaptures its balance. Thus, the first years of organic farming are beset by many problems concerning conversion and adaptation: sick animals, low productivity and higher labour demand are well known. However, the experience made by organic farmers who have practiced for a longer period of time, shows that, in time, these difficulties can be mastered. For these reasons, organic animal husbandry is a permanent challenge. Good advice and continued education can help to avoid unnecessary mistakes in organic animal husbandry:
Good, professional practice in organic animal husbandry goes beyond the standards of conventional animal husbandry. Thus, certain methods of keeping the animals, certain kinds of fodder and additives, certain means of production and ways of breeding which are allowed in conventional animal husbandry, are consciously rejected. Ways of keeping the animals, which maintain animal health and welfare, are preferred over conditions which promote maximum performance. Comparatively lower performances and a higher cost and labour intensiveness are accepted.

Feedstuff and water

Feedstuff

Elementary to the health and productivity of the animals are sufficient quantities of high quality feed meeting the requirements of a species, , as well as feeding procedures in accordance with animal welfare, are. Each species has specific needs and preferences concerning feed, has a certain way to consume feed, and has a specific ability to exploit the feed offered, as well as a certain strategy for digesting it.
Ruminants have teeth in their lower jaw, and a plate in their upper jaw. By chewing thoroughly (40 – 60 chewing-movements per mouthful), they soak their feed in saliva before swallowing it. Therefore, consuming feed is a lengthy process. Ruminants have three ante-stomachs in which bacteria break down the raw fibres (cellulose, etc.) not digestible for monogastric animals or humans. The rumen of a cow, alone, has a volume of 150 litres, and makes up approximately 25 – 30 % of the total mass of the animal. Feed components are transformed into valuable nutrients by the bacteria in the ante-stomachs, , for example, into essential amino acids. After having pre-digested their feed, ruminants regurgitate the cud, chew it once more, and then swallow it again. Only after the bacterial pre-digestion does the feed reach the true stomach, the so-called abomasum. There, it is digested by acids and enzymes, and only then is it assimilated by the animal's body.
Because of their digestion strategy, , the use of concentrated feed would be a waste in the feeding of ruminants, since the energy available cannot be directly assimilated, but will have to be utilized by the bacteria with a significant loss of energy. Therefore, feed exploitation in ruminants is poorer than in monogastric animals. Thus, e.g., for the production of 1 kg of beef, approximately 7 kg of fodder are needed, while in the keeping of chicken approximately 2,5-3 kg of fodder will be sufficient.

Tab. 3: Effects of different rations of fodder on the milk fat content (Rahmann, 2004)

	Rations rich in raw fibres	Rations rich in starch
Time spent ruminating	much	little
Amount of saliva	much	little
pH-value	6.8 – 6.0	6.0 – 5.4

pH favourable to ... microbes	breaking down cellulose	breaking down starch
Rumen	slow fermentation relatively much acetic acid little butyric acid	quick fermentation relatively little acetic acid relatively much propionic and butyric acid
milk	relatively high fat content (small amount of milk)	low fat content

Since ruminants are able to digest plants and plant components not digestible for humans, they do not compete for feed with us. By using these plants, they produce nutrition-physiologically valuable feed for human consumption. This is an important factor in the context of feed shortages in countries suffering feed supply problems.

Chicken are birds with no teeth. They pick up feed with their beaks and swallow it whole. Similar to ruminants, feed is not directly forwarded into the stomach by poultry either. Instead of passing into the ante stomachs, it first goes into the crop, a sack-like part of the gullet. The crop serves as a short-term feed reservoir.
Here, hard feed particles (e.g., grain) are soaked in a watery secretion in order to soften them. From here, the feed reaches the glandular stomach, where it is mixed with pepsin and hydrochloric acid. In the adjoining muscle stomach, this mixture is broken up by a millstone-like grinding with the help of small stones, and is then digested.
The gastro-intestinal tract of poultry is much shorter than that of other domestic animals. That of ruminants is 30 x as long as their body, geese 11 x, ducks 10 x, and that of hens only 8 x. This helps them to store only small amounts of feed in the body, making flying easier. Nutrient contents in poultry fodder need to be very concentrated. Since, no bacterial synthesis of essential amino acids takes place during digestion; these substances have to be available in the fodder. In the intestine, the nutrients are then assimilated. Excrement and urine (white colour of the excrement) are passed simultaneously through the cloacae. Also the eggs are passed from the fallopian tube through the cloacae.
Fodder produced on site ought to be analysed as to its energy and protein contents in order to plan fodder rations. The evaluation normally used is the Weender-Fodder-Analysis or the Hohenheimer-Fodder-Test (HFT). If there are no analyses for fodder available, tables supplying nutritional standard values of fodder for the calculation of rations may be used. Organic fodder usually proves to have lower protein values and less valuable amino acid contents than comparable fodder of conventional origin. This needs to be taken into account when calculating rations with the help of fodder-value tables.

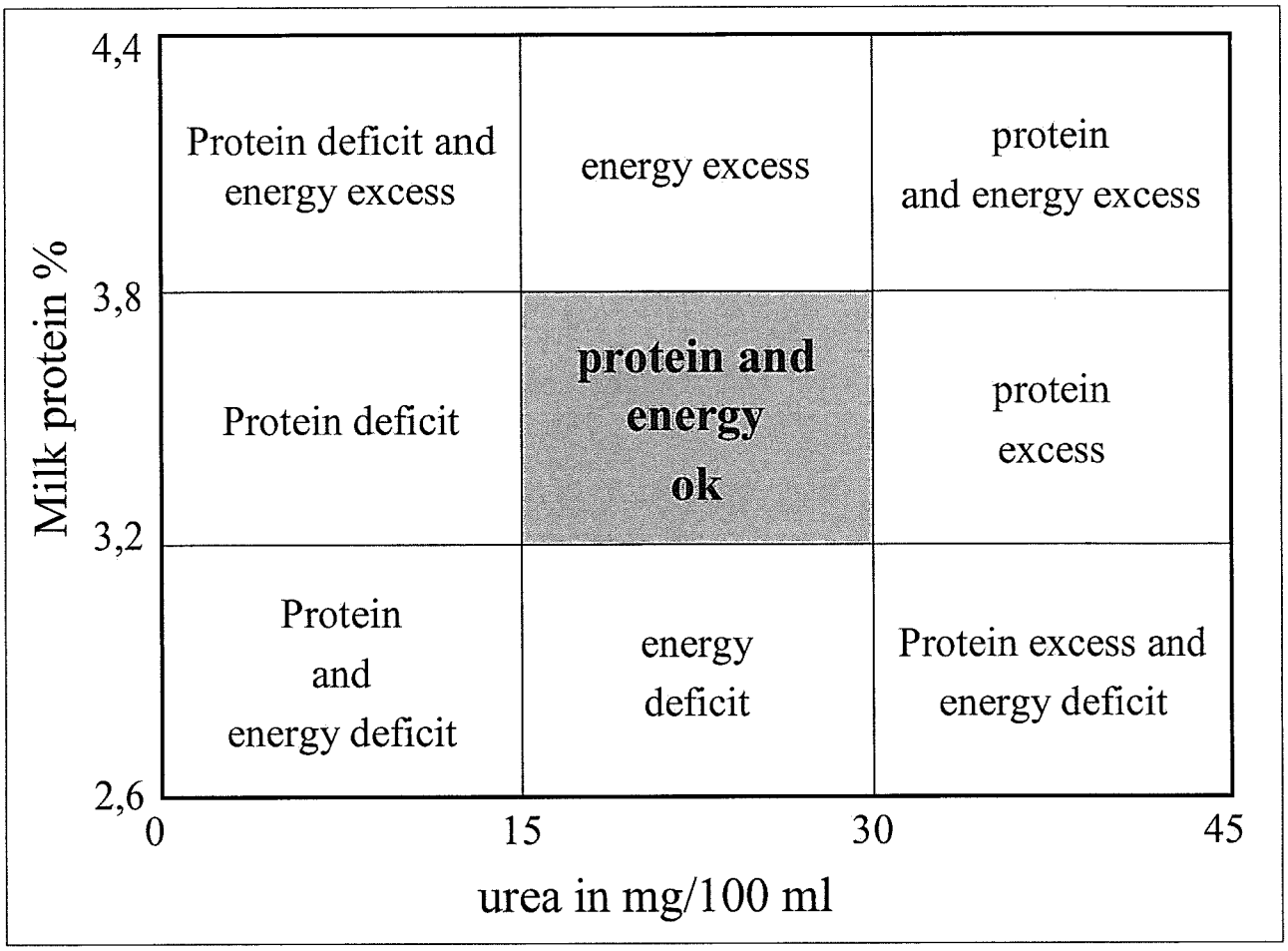


Fig. 1: **Indication of feedstuff quality for dairy cows with milk parameters**

Water and minerals

In addition to an animal-and performance-specific supply of fodder, the animals must receive sufficient water and minerals. Essential minerals are consumed by the animals through, among other things, soil particles (e.g., clay minerals). This, however, is not always possible (e.g., during the stabling phase) or sufficient (e.g., in case of high performance). A guaranteed supply of minerals, vitamins, and salt, therefore, is provided through mineral fodder in the form of licks or additives which are composed specifically according to the animal and its performance. Giving the animals too little water is not only questionable with respect to animal health, but will also have an impact on the animals´ performance, since the amount of fodder consumption and digestion both depend on the amount of water drunk. Part of the quantity of water needed is covered by the moisture contained in the fodder. Consumed fresh, for example, grass, herbs or turnips have a water content of 80 – 90 %, silage 65 -70 %, hay „on the stem" (grass that has finished flowering) 20 – 30 %, and concentrated cereal feed as well as hay only 12 – 14 %. Drinking water which is not perfectly hygienic, is unsafe for an animal´s health. Animals do not drink it (willingly); it puts pressure on animal health, and can have a negative impact on products (harmful substances in milk, meat or eggs; fermentation mistakes, storage). Drinking water for animals ought to comply with the same standards applying to drinking water for humans. Water requirements of animals depend on performance and temperature. With an outdoor temperature of 10 °C, ruminants need 2 -3 litres of water per kg fodder (dry matter) consumed, with an outdoor temperature of 30 °C this value climbs to 4 – 6 litres. Lactating animals have an additional requirement of 0.87 litres per kg milk. In view of these facts, a sufficient supply of

water is imperative at any time, and daily monitoring of drinking implements and water quality are appropriate.

Tab. 4: Water requirements of grazing animals (estimated, in litres per day) (Rahmann, 1998)

	Outdoor temperature	
	10 °C	30 °C
horse (350 kg)	15 - 25	50 - 80
sheep (70 kg)	5 - 8	9 - 15
cattle (450 kg)	20 - 35	70 - 120
goat (50 kg)	4 - 7	8 - 12

Breeding Concepts

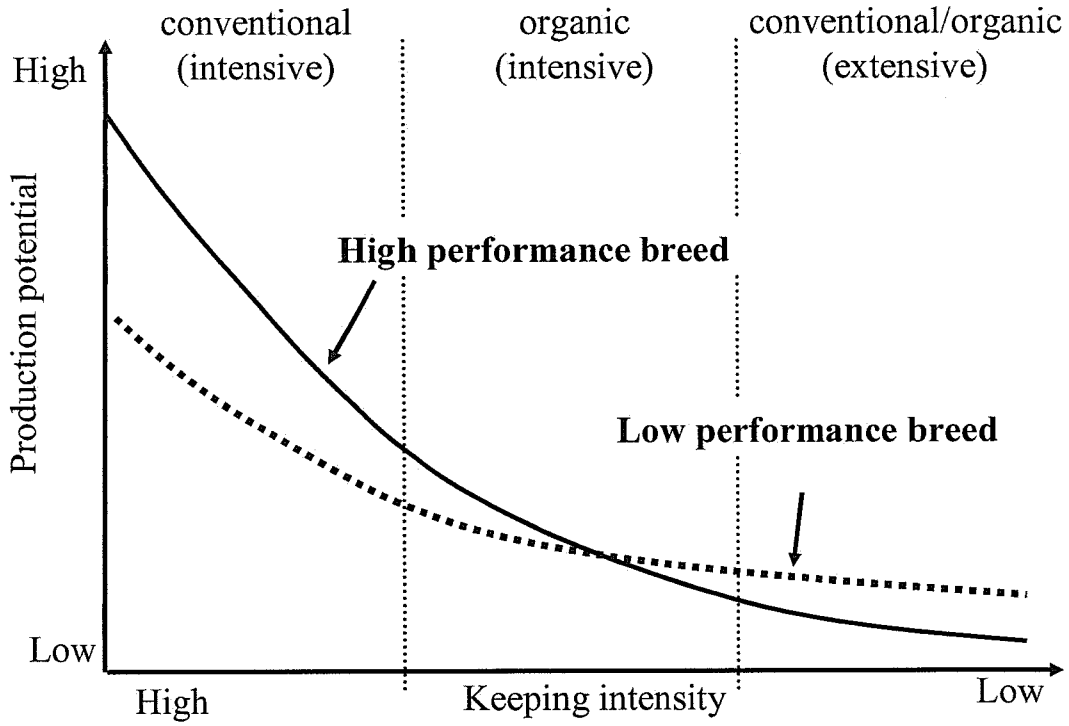
Organic breeding is targeting on healthy and productive livestock under the specific conditions of the organic farming environment (nutrition, health, keeping conditions) in the frame of genotyp-environment-interaction selection. Organic livestock has to cope with annual and seasonal changes of health, feed stuff and management without support from chemical drugs, etc. The following aspects are important:

- Shape and size of an animal,
- Stage of 1st breeding
- roughage focussed
- fertility
- condition and vitality under suboptimal conditions
- social behaviour towards herd members, own offspring and humans

Extreme housing conditions require adaptations of the following:

- fur and skin,
- pigment of skin,
- claws
- fat depot-building capability for scarce feeding periods

Organic breeding shall be done on-farm to guarantee the best breeds and animals for the farm purposes and farm conditions. Health and production patterns are the most important parameter for selection. Long living animals are an excellent base for selection of successors. Long living productive farm animals show the capability to stay for a long period under the conditions of the farm.



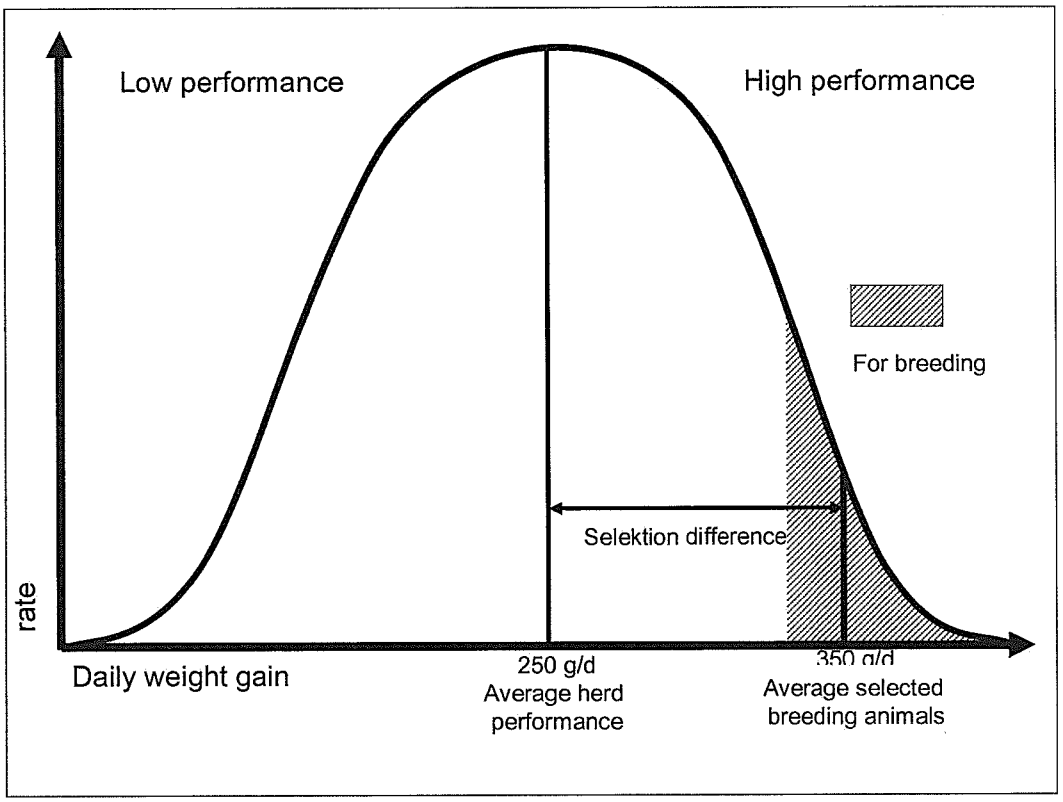


Fig. 2: **Breeding in organic farming and selection of breeding stock (example sheep)**

Organic breeding values are designed for organic farming. They consider the organic farming conditions and focus more on health compared to conventional breeding indices. For cattle two parts of indices are considered.

Tab. 5: Organic breeding value for dairy cattle

Production	**50 %**
- milk	25 %
- persistence and production increase	10 %
- beef	15 %
Condition	**50 %**
- age of ancestors	10 %
- calvings and vitality	25 %
- shape and udder	15 %
Organic breeding value	**100 %**

Health Management

Good health is a result of good management, good techniques, good feedstuff and vital animals. Farmers well-informed on health issues are crucial for low drug utilisation levels. Sick animals have a right to all veterinary treatments. Organic health management targets the avoidance of diseases (prevention).

Tab. 6: Action levels for organic animal health

Target	Time horizon	Action
Healthiness, Prevention	Long and middle term (5->10 years)	On farm: breeding; optimized animal environment (stable, feeding, management) and improved skills of health issues
Prevention of expected diseases in an early stage (no real suffering of livestock)	Middle and short term (acute to 5 years)	On farm: Quarantine stable, best feedstuff, constitutional support Alternative medicine: complementary treatments: plant drugs, homoeopathy Verterinary treatment: extension, medical attendance
Heavy acute diseases,	short term (acute)	Alternative medicine: Natural veterinary medicine and complementary medicine, if success is expected Ordinary medicine: Veterinary treatment with ordinary drugs

Annex with Tables and Figures of Organic Animal Husbandry

Tab. 7: Several concentrate feed rations for dairy cattle (% in DM) (Rahmann, 2004)

Wheat, %	10	30	25	43,5
Triticale, %		30	27.5	
Oat, %	37.5			
Horse beans, %	25		30	18

Peas, %	25			18
Flax seed cake, %			15	
Rape expeller, %		37.5		18
Minerals, %	2.5	2.5	2.5	2.5
content, 88 % DM				
Crude fibre, %	7.5	5.7	5.1	5.6
Crude protein, %	17.1	18.1	18.5	18.6
Crude fat, %	2.6	5.6	2.1	3.5
Starch, %	40.5	34.6	41.0	39.6
Sugar, %	3.1	5.0	3.3	4.4
nXP, g/kg DM	145	159	162	159
RNB, g/kg DM	4.5	5.3	5.2	6.0
NEL, MJ	6.81	7.12	7.14	7.25
Ca, g/kg DM	7.2	8.4	7.3	7.7
P, g/kg DM	4.2	5.7	4.5	5.0
Na, g/kg DM	1.7	1.6	1.7	1.7

Tabelle 1: Feeding Ration for lactating cows in kg DM per day (Rahmann, 2004)

	Grazing area		Croping area	
Milk, kg/day	15	30	20	35
Hay, medium, kg 86 % DM	2	2		
Grassilage, good, 39 % DM	32	29	23.8	21
Maizesilage, 30 % DM			18	17.5
Concentrate (18/4)		8.0		7.0
Flax seed cake			2.0	2.0
Minerals	0.1	0.1	0.1	0.1
DM, kg	14.3	20.2	16.7	21.6
DM from roughage, kg	14.2	13.1	14.8	13.2
Crude fibre, % in DM	24.5	18.2	20.7	16.3
RNB, g	2	50	- 36	45
Milk from NEL, kg	15.0	31.0	17.4	35.2
Milch from nXP, kg	16.5	29.7	18.0	34.0

Tab. 8: Examples for daily rations for rearing and fattening cattle in kg DM per day (Rahmann, 2004)

	Crop area						Grazing area					
Live weight, kg	200	200	300	400	400	600	200	200	300	400	400	600
Daily weight gain, kg	0.7	1.0	0.6	1.0	0.6	1.0	0.6	1.0	0.6	1.0	0.6	1.0
Grass, kg DM	2.5	1.9	3.3	3.3	4.5	3.5	2.4	2.5	4.8	6.4	5.6	5.8
Red clover, kg DM								0.7				
Alfalfa, kg DM		1.0										
Maize silage, kg DM	0.5		1.5	3.0	1.3	4.8						
Barley, kg DM				0.3		1.0	0.2					1.0
Wheat, kg DM		1.2		0.5				0.8				
Rye, kg DM								0.4		0.5		1.0
Hay, kg DM	1.0						1.5					
Straw, kg DM			0.7		1.2				0.7		1.4	1.4
Lupine, kg DM		0.5										
kg DM per Animal/day	4.0	4.6	5.5	7.1	7.0	9.3	4.1	4.4	5.5	6.9	7.0	9.2
MJ ME	42.0	52.8	53.6	74.1	67.4	97.1	42.5	52.5	54.9	73.9	67.7	95.7
Crude protein, g	632	779	746	943	957	1274	642	768	871	1177	1038	1277
Effective Crude Fibre, g	959	707	1541	1596	2026	2100	992	701	1532	1602	2063	2113

Tab. 9: Daily nutrition demand of ewes (70 kg LW) (Rahmann, 2007)

	intake kg DM	Energy MJ ME	Crude protein g
Empty or early pregnancy	1.0 – 1.4	10.4	80 - 115
High pregnancy (last 6 weeks)			
• 1 Lamb (5 kg birth weight)	1.4 – 1.6	14.6	145
• 2 lambs (5 kg birth weight)	1.5 – 1.8	18.7	180
lactating (1.-8. week):			
• 1 Lamb	1.6 – 2.0	18.4	260
• 2 Lambs	2.0 – 2.3	22.4	340
Dairy sheep lactating			
• 1 litre milk	1.7	18.4	220
• 2 litre milk	1.9	26.4	360
• 3 litre milk	2.1	34.4	500
• 4 litre milk	2.3	42.4	640

Tab. 10: Daily nutrition demand for goats (60 kg) (Rahmann, 2007)

	intake kg DM	MJ ME	Crude protein g
Surviving (55 kg)	0.8 - 1.2	9.4	70
Pregnancy			
• 4. month	1.9	10.8	140
• 5. month	2.1	14.0	220
production with:			
• 1 kg milk	1.5	14.0	145
• 3 kg milk	2.1	23.2	295
• 5 kg milk	2.7	32.5	445

Tab. 11: Daily nutrition demand of growing lambs (Rahmann, 2007)

Live weight kg	Daily weight gain g	intake kg DM	Energy MJ ME	Crude protein g
15	200	0.5 – 0.8	7.6	110
	300		10.4	160
25	200	0.7 – 1.2	9.3	140
	300		12.3	180
	400		15.8	230
35	200	0.9 – 1.4	11.0	150
	300		14.1	210
	400		17.7	250
45	200	1.0 – 1.5	12.5	170
	300		15.8	220

Tab. 12: Daily nutrition demands of growing goat kids (Rahmann, 2007)

Live weight kg	Daily weight gain g	Intake kg DM	Energy MJ ME	Crude protein g
10	200	0.6	6.3	80
15	200	0.7	8.4	90
20	150	0.8	8.7	100

25	150	0.9	10.2	100
30	100	1.0	10.5	100
35	100	1.1	11.1	100

Tab. 13: Daily feeding rations for mother sheep and lambs (in kg) (Rahmann, 2007)

Daily ration for:	Ewes (70 kg live weight):				Lambs with 300 g daily weight gain:		
	Empty	Low pregnancy	High pregnancy	Single	Twin	20 kg LW	30 kg LW	40 kg LW
Grass, fresh, 14 % DM	6.0						6.0	
Hay, good quality, 88 % DM		1.0	1.5	1.8	1.5	0.6		1.5
Grass silage, 30 % DM			1.5					1.0
Concentrate, 20 % CP				0.6	1.3	0.4		0.5
Fodder beets, 12 % DM		2.5						

Tab. 14: Daily feeding ration for goats (in kg original substance) (Rahmann, 2007)

	Daily feed ration[1]					
	1	2	3	4	5	6
Hay medium quality 86 % DM	1.5	1.5		1.4	1.4	1.4
Grass fresh	ad libitum					
Beets		5.0			3.0	
Grain			0.7-1.0	0.5		0.5
Concentrate[2]	1.7	1.2			0.2	
Mineral		0.02	0.05	0.02		0.02

[1] Feeding ration 1 to 3 for goats in lactation (60 kg LW, 3 kg milk with 6.4 % fat and 4.7 % protein); feeding ration 4 to 6 for high pregnant goats (60 kg LW).
[2] farm-produced concentrate with pulses and grain: 18 % crude protein, 13.10 MJ ME

Organic chicken husbandry

Tab. 15: Feed rations for layers (in % of DM; Rahmann, 2004)

Feed stuff		Min. potato protein and maize gluten		Optimised amino acid composition	
Summer barley		10	50	15	10
Oat					20
Rye					20
Corn			29		
Winter wheat		46		55	
Triticale		20			30
Peas		6		20	
Lupine-yellow		10	11		10
Flax			5		
Skim milk		5			
Potato protein			5	4	9
Maize gluten		3		3	1
Rape expeller				4	
Chalk		10 g per day			
Minerals		3 % of feed intake			
Feeding value	Daily demand	Content in ration (per kg; 88 % DM)			
ME (MJ)	10.6	10.3	10.4	10.4	10.8

Crude protein (g)	150	152	161	156	174
Lysine (g)	6.3	6.2	6.2	6.5	6.3
Methionine (g)	2.5	2.4	2.2	2.5	2.5
Methionine + Cystine (g)	5.5	5.6	5.6	5.5	5.5
Calcium (g)	40	1.4	2.6	0.9	1.0
Phosphorous (g)	5	3.4	4.1	2.9	3.8
Natrium (g)	2	0.4	0.4	0.3	0.5
Roughage (pasture)		*ad libitum*		*ad libitum*	
Minerals		demand		demand	

Tab. 16: Feedstuff demand in broiler, turkeys, ducks and geese production (in kg per animal; Rahmann, 2004)

	Broilers	Turkeys	Ducks	Geese
Starter	1.5	2	1.5	1.5
Rearing	5.0	15	1.5	1.5
Fattening	2.0	20	8.5	8.5
Full grain	0.5	5	0.5	5.5

Tab. 17: Feeding mixtures for broiler, turkeys and geese chicks (rations in % of DM) (Rahmann, 2004)

Feed stuff		Ration 1	Ration 2	Ration 3	Ration 4
Summer barley				10	
Oat			15	15	
Winter rye			5	5	
Corn					20
Winter wheat		20			20
Triticale		20	20	20	10
Peas		20	20	10	10
Lupine-yellow			20	20	15
Horse beans		20			5
Yeast		14		5	10
Skimmed milk			10		
Potato protein			5	5	10
Maize gluten		6	5	10	
Feeding value	daily demand	content of ration (per kg; 88 % DM)			
ME (MJ)	11,4	11,0	10,8	10,8	10,7
Crude protein (g)	230	229	248	253	250
Lysine (g)	12	12,1	12,1	10,4	12,0
Methionine (g)	4,8	1,6	1,5	1,7	1,7
Methionine + Cystine (g)	9	6,5	7,7	8,3	7,3
Calcium (g)	11	1,1	2,2	1,2	2,0
Phosphorous (g)	7	5,3	4,5	4,4	4,9
Natrium (g)	2	0,5	0,7	0,6	0,6
Minerals		demand			

Tab. 18: Feeding mixtures of fattening broiler and turkeys (in % of DM) (Rahmann, 2004)

Feed stuff	Broiler		Turkeys	
Summer barley			10	
Oat			30	
Winter rye			5	
Corn		20		35
Winter wheat	45	35	10	30
Triticale	20	10	20	
Peas	10	7		
Lupine-yellow	5			

Horse beans				8		
Flax seed			10			
Yeast			5		10	
Skim milk				10	10	10
Potato protein				10		10
Maize gluten			5			
Feed value	Daily demand Broiler	Daily demand Turkey	content in ration (per kg; 88 % DM)			
ME (MJ)	12,5	11,8	11,3	11,0	11,3	11,0
Crude protein (g)	200	190	171	200	148	197
Lysine (g)	10	9	6,9	8,9	7,5	8,9
Methionine (g)	4	3,6	2,9	3,2	2,7	3,1
Meth. + Cyst. (g)	8	6,8	6,1	6,3	4,7	6,1
Calcium (g)	11	12	1,0	2,5	2,1	3,5
Phosphorous (g)	7,5	7	3,8	3,8	5,1	4,1
Natrium (g)	2	2	0,4	0,5	0,9	0,6
Pasture			*ad libitum*		*ad libitum*	
Minerals			demand		demand	

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