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PRESENT HUSBANDRY AND MANAGEMENT CONDITIONS AND DEVELOPMENT TRENDS IN RABBIT PRODUCTION

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THE PRESENT SITUATION:

Since the 1984-convention in Rome, rabbit production has gained in significance in many countries. Simultaneously, there has been a shift from small to large-scale productions. In 1977, for example, only 3% of registered rabbit operations in France numbered more than 20 does, whereas by 1984 the share had tripled to 10%. These large farms possessed half of the doe-stock in France, estimated to be 4.8 million at the time (VRILLON, 1987). The trend towards larger breeding operations continues and can also be observed in other industrialized countries.

In view of this development, a survey presentation should deal with the interesting question on the extent to which production conditions have kept pace with this trend. Husbandry and management in large, professional rabbit-producing operations presently exhibit the following predominant characteristics:

Husbandry: Joint housing of parent animals and their young in a continually occupied hutch;

Constant replacement of parent animals that have been lost or removed, by the breeder's own stock or outside purchase;

Housing of animals in cage units of one or more tiers, without litter, on wire-mesh or grill floors, with a tendency towards flat-deck batteries.

The doe puts her newborn in nest boxes of metal, wood or hard-foam plastic, located either in her cage, in front of it or at its side.

Holding of fattening animals in groups of less than 10. The animals in each cage are fed by separate, automatic feeders, attached inside or outside the cages; water is supplied by nipple drinkers.

Mechanical ventilation by drawing air from beneath the cages.

Management: Does are first mated at an age of 3.5 - 4.5 months (crossbred does mature earlier than purebreds). Mating is repeated 2-10 days post partum or following a negative palpation.

The young are weaned 25 - 35 days after birth.

Mating is almost always by natural mounting. More frequent use of artificial insemination is only found in German-speaking areas. One buck is kept for 8 - 9 does.

Thus, present production conditions still essentially correspond to those used in the past for small operations. The health risks of larger stocks are hardly taken into account. On the contrary, they are even aggravated by joint housing of the various age levels, and by the constant re-stocking with animals, which in some cases stem from other breeding operations. This is particularly serious since some infectious diseases are at least latent in most operations (pasteurellosis, staphylococcal infections, ear mange, yersiniosis).

Productivity: The only known representative surveys on rabbit productivity in practising operations are from France and Italy. According to VRILLON (1987), performance tests were conducted by 600 French producers in 1984. Given the high level and scope of rabbit production in France and Italy, the results from these studies by KOEHL and MAGDELAINE (1986) HENAFF et al.(1987), and HENAFF (1987) are probably also a valid yardstick for conditions in other countries.

The results presented in Table 1 may be summarized as follows: According to MAGDELAINE and KOEHL (cited by HENAFF, 1987), the greatest performance progress was made between 1974 and 1983. After 1983, there was a considerable stagnation with respect to individual performances. Mortalities in young animals up to the time of weaning were higher, the length of the does' breeding activity was reduced to 7 - 8 months. On an average, 1.8 breeding does were required per doe cage and year to ensure that hutches were always used to full capacity.

Mortalities in young animals before weaning rose to above 20% and stagnated at a relatively high level after weaning (11 - 15 %). Even above-average breeding operations were affected by the increase in mortalities of young animals (HENAFF et al.,1987). These data are also confirmed by those of SZENDRÖ and VARGA (1986), showing a mortality of 16.9% - 27.4% up to the time of weaning.

These losses in young animals are thus 3 - 4 times higher than those for the pig, another multiparous animal. BAUER and GRESHAKE (1987) report pig losses to be 7.3% before weaning and 2.2 - 3.4% thereafter. Chickens are also held on a large scale, and their rearing losses up to the age of 5 months are less than 2%, and less than 10% per year for laying hens. Four decades ago, these losses were at the same level as rabbit losses today.

High juvenile mortalities represent only part of the problem, however. A considerable percentage of surviving animals can be assumed to contract diseases which restrict their performance. And finally, it should be mentioned that the meat is of limited fitness for human consumption when slaughter animals were diseased or prophylactically treated with chemotherapeutic drugs.

No data are available concerning when or why the losses occurred in the stocks investigated. SCHEELE and BOLDER (1987) point out the relationship of young-animal losses to the state of the does' health. Health problems in doe populations are also suggested by their short life expectancy. FACCHIN et al.(1987) give detailed data on the causes, based on a production analysis of three Italian breeders having a total of 3,408 doe cages. Average doe mortality was 36% per year, with a range of variation between 26 - 55% (!). Another 50% of the does were culled, on an average, for reasons of disease and unsatisfactory performance. Thus only 14% of the does lived longer than 1 year. In an experiment, Partridge et al.(1984) report the yearly mortality of does to be 27%, with doe losses (death, disease, infertility) of 179% per year. PAILLOLE (1986) therefore considers a rapid replacement of the culled does to be the most effective means of raising productivity.

The heavy losses cited above are not a typical phenomenon for rabbits, however, as shown by the following statistics produced under institutional conditions: In a breed-comparison test in Neu-Ulrichstein (LANGE, 1986) the share of stillborth varied between 3.3 and 5.8%, mortalities before weaning were between 6.3 and 8.8%, and those between weaning and slaughter were from 1.9 to 7.2%. As has been the custom here for 20 years, doe hutches were occupied on an all-in/all-out basis. Young animals were put into another hutch following weaning at the age of 25 days.

In a two-year experiment on artificial insemination 1 - 2 days post partum, entailing 22 inseminations within 24 months (SCHLOLAUT, LANGE, 1981), mortalities in does amounted to 5% in the first year and 2% in the second. The average number of young animals reared per housed doe was 51 in the first year and 42 in the second. Before the second year began, 20% of these does were culled for not having pregnant after three consecutive inseminations.

The does achieved their highest reproductive performance at an age of 11 - 12 months, with a conception rate of more than 80% and a litter size of more than 8. These observations on the influence of age were confirmed by SZENDRÖ and VARGA (1986).

The discrepancy between results achieved in practice and under institutional conditions indicate obvious husbandry and management flaws in breeding operations. The less than optimal environmental conditions prevalent in breeding practice prevent a realization of the genetic performance potential. This places a disproportionately high risk on rabbit production in comparison to that of other domestic animals. According to KOEHL and MAGDELAINE (1986), 16% of the 120 rabbit units analysed between 1983 and 1985 showed declining productivity, with 37% having variable results. In 26% of the operations studied, productivity was steady, and only 22% showed a rising trend.

The production operations analysed in France registered an increase in monetary efficiency, despite a drop or stagnation in individual performances. Apart from the loss in purchasing power experienced in the meantime, this success is due to management measures which attempt to compensate the drop in performance. This especially involved an intensified culling of breeding does. According to MAGDELAINE and KOEHL (1986), the annual replacement rate rose 34% within 4 years to a level of 168%. The relative occupation of doe cages increased simultaneously by 11%. Thus 11% more does were continuously being kept than the number of available breeding cages. These cages were not counted when assessing performance on the basis of the number of breeding cages. Otherwise this would mean a practical reduction of 11% in the efficiency per breeding cage. Whereas FACCHIN et al.(1987) report an average litter interval per doe of 56 days, this becomes only 38 days if calculated on a cage basis.

Apart from being a questionable manipulation of operational success, this procedure also has the disadvantage of higher hygienic risks. This is due to the larger number of animals being introduced, without being adapted to the pathogenic agent in the hutch. Moreover, the purchase of parent animals means an additional expense. The common procedure is encouraged since the difference in carcass qualities between broiler rabbits and old animals is usually ignored. The latter are often sold for the same price as broilers. The short life expectancy of does also results in a rearing performance that is 10% lower on an average. The first litter is smaller and losses are greater.

In summary, rabbit production has not reached anywhere near the level of technical perfection, low-risk production or labour efficiency achieved with other meat-producing domestic species. The extraordinarily high losses are merely counteracted by managerial measures, without effectively eliminating their causes.

Possible reasons for this unsatisfactory situation can be deduced by comparing the factors in which husbandry and production techniques for rabbits differ from those employed for other farm animal species:

Failure to separate animals of different ages and origin. Of all the domestic animals held on a large scale, rabbits are practically the only livestock species in which animals of various ages are kept together. Under the best of circumstances, cages are merely disinfected after being emptied.

Failure to establish an all-in/all-out procedure for the hutches. To assure a high rate of utilization for the cages of breeding rabbits or young animals, there is constant replacement of animals lost to disease, old age or slaughter.

The construction and material of hutch facilities are often determined less by animal needs than for reasons of labour efficiency and apparent price advantages. Technopathic disorders (such as sore hocks) and behavioural disturbances (such as insufficient maternal care) are often the result.

Failure to adapt the animals genetically to the husbandry conditions employed (for example, selection for tolerance of cage-holding conditions on slatted floors).

Failure to consider the rabbit's limitation of only one daily suckling period, by adapting the number of teats to fit increased litter sizes. This omission raises the mortality rate before weaning.

Widespread failure to establish a division of labour in the production operation, such as by separating breeding animals from fattening animals, or to benefit from the technical advantages of insemination by a mobile insemination team, etc. This lack of specialization hinders performance improvements.

Inadequate genetic identification of the available animal material: Similar breed names or trade names for commercial hybrids offer no guarantee of genetically homogenous animal material.

Failure to use the bio-technical advantages and favourable production procedures of artificial insemination.

Compensation of the desolate hygienic state by means of unusually high prophylactic use of chemotherapeutic drugs.

Thus, to a large extent, rabbit producers ignore measures which are standard for the husbandry and management of other livestock species. The problem may be illustrated by the following comparison: It would be unthinkable now for a poultry farmer to keep chicks and laying hens in the same room or to replace losses among the layers with poulets from other stocks.

Despite the impressive research accomplished in the rabbit sector within the past two decades, there is obviously a widespread failure to implement the acquired know-how into breeding practice.

N E W F I N D I N G S

Reports published since 1984 in the area of husbandry and management emphasize the following points:

Housing after Weaning: Most of the available publications on the *effect of stocking density* on the development of the young after weaning conclude that daily weight gains are highest with individual housing (SCHOLTYSSEK and EISSLE, 1986; MAERTENS, 1987) and a low stocking density.(SCHLOLAUT and LANGE, 1982[a]; MAERTENS, 1987). A different result was reported by SAMOGGIA et al.(1987), who found the highest weight gains (up to 2.5 kg fattening result) at 22 animals/sq.m. The stocking density either had no effect on feed conversion (SCHOLTYSSEK, EISSLE, 1986; SCHLOLAUT, LANGE, 1986[a]; MAERTENS, 1987), or a positive impact was reported (SAMOGGIA et al.,1987).

PRAWIRODIGDO et al.(1985) and LANGE (1986[a]) point out the higher infection risk of group cages. Increasing group size and stocking density can lead to higher losses due to enteritis. This observation is confirmed by HENAFF and PONSOT (1986), who found higher mortalities in operations with 20.8 animals/sq.m. than in those with 17.4/sq.m. MAERTENS (1987) recommends reducing the stocking density with increasing weight.

He found that *transferal of animals* at a weight of 1.7 kg had no negative impact on their development. Independent investigations (SCHLOLAUT and LANGE, 1982[a]) came to the same conclusion. The influence of stocking density in the investigations cited applies exclusively to quantitative parameters. There are indications, however, that high stocking densities and, above all, restrictive cage dimensions, can lead to skeletal damage (immobility osteoporosis). This would be particularly disadvantageous for animals destined for later breeding or wool production (Angora rabbits). Breeders of other livestock species use a different stocking density for those animals for which a long life expectancy is economically advantageous. This would at least seem worth considering in rabbit production.

To meet the demand for separate housing of parents and weaned young animals, it would be of interest to learn how young animals behave when moved to another hutch. LANGE (1986[a]) found that young animals weaned at 25 days of age consumed 25% less feed after transferal. This resulted in 16% lower daily weight gains for this period, which had been compensated by the 8th week after weaning, however. The average feed intake of the young animals after moving remained 6% lower. This meant a corresponding improvement in their feed conversion. It made no difference whether or not the nest box was moved to the new cage with the animals. Nor did McNITT (1986) and PATTON et al.(1986) observe any negative effects from transferring young animals to other cages within the same hutch. SAMOGGIA et al.(1987) found higher weight gains when animals from the same litter stayed together, being separated to reduce the stocking density only after the 8th week of life.

In summary, the fears previously used as an argument against separate housing of does and weaned young animals proved unfounded. It would appear of significance, however, that hutch temperatures not drop below + 18°C. for young animals weaned at an age of 25 days. Rabbits weaned later can tolerate correspondingly lower temperatures.

In an independent study (SCHLOLAUT and LANGE, 1986[1]), groups of 100 - 150 young rabbits weaned at the age of 25 days were kept on deep litter until the 12th week of life. While feed conversion was similar to cage results, daily weight gains were 6% lower. Average losses amounted to 13%, and were due in part to coccidiosis. This demonstrates the necessity of coccidiosis prophylaxis in the first weeks after weaning. The results of this experiment open up the possibility of separate breeding and fattening operations within a single rabbit-production business, without the investment for cages for the fattening animals.

The improved feed conversion at a reduced feed intake observed by LANGE (1986[1]) is confirmed by another experiment (LANGE, SCHLOLAUT,1986), in which the *feeding time* was reduced from 24 hours per day to 12, 10, 8, 6 and 4 hours (beginning at 7 a.m.). Feed requirements were thereby reduced in comparison to controls by 5.2%, 6.5%, 10.8%, 14.8% and 20%. Reductions in final fattening weight (controls: 2.78 kg) by the 10th week after weaning were 5.5%, 6.8%, 5.1%, 8.7% and 17.8% compared to the controls. SZENDRÖ and LACZASZABO (1986) found that by reducing the feeding time to 9 hours, feed conversion was improved by up to 12.5%, with a drop in daily weight gains of up to 4%. In Angora rabbits, limiting the feeding time to 5 hours a day caused an improvement in feed conversion of more than 20%. There was no change in the wool yield of males and castrated animals if the feed had a 0.7% content of sulphur amino acids. In female animals, the reduced feed intake during shorter feeding times decreased the wool yield by 12% (SCHLOLAUT, 1987). Since there is a correspondingly smaller percentage of carcass fat with lower daily intakes (SCHLOLAUT et al.,1985), and also an increase in life expectancy, limited feed intake has additional advantages. Therefore the development of feeding equipment to enable a rational *limitation of feed intake* is of considerable significance. In Neu-Ulrichstein, round automatic feeders serve group holdings of 20-30 animals, and can be suspended to limit feeding times. This can be centrally operated for an entire row of cages. Similar facilities are in use in pig production. In growing Angora rabbits, however, increasing *hair length* makes thermo-regulation ever more difficult, thus causing an excessive reduction in feed intake. Since the number of wool follicles also depends on a high daily weight gain, it is important here to facilitate the development of young animals through shorter shearing intervals (SCHLOLAUT, 1987).

Holding without bedding on metal rods or wire mesh, or on slats of bamboo, wood or plastic is standard procedure in professional rabbit husbandry. This enables a labour-saving removal of dung and urine and helps prevent coccidiosis. Widespread use of bedding is only found in Angora-rabbit production in France.

The soles of rabbit's feet are anatomically very poorly suited for *holding without bedding*. Cushioning layers of connective tissue and muscle are lacking between the skin and the foot skeleton. This is the reason for frequent sores on the foot-soles of older and heavier animals, which can lead to irreparable damage to the epidermis and, in serious cases, to the periosteum as well. Afflicted breeding animals are restricted in their libido, semen quality, fertility and feed intake (ZIMMERMANN, 1984). Such wounds can also occur with bedding, when the hair on the soles of the feet becomes soaked with urine. The ammonia formed then leads to the destruction of the keratin (LÖLIGER, 1987). Sores are aggravated by the increasing weight and age of the animals and by the sparce hair on the foot-pads. Even Angora rabbits are endangered, in spite of their well-haired feet. This is because large supporting surfaces on the cage floor allow hair to become soaked with urine, thus forming ammonia. In a comparison test, various cage-floor constructions were investigated (LANGE, 1986). Correspondingly fewer s o r e h o c k s were observed with an increasing size of supporting surfaces. Bamboo slats proved most suitable, as long as the surface was not too steeply curved. The plastic slats tested had a surface that was too flat and rough, preventing a rapid draining of urine and becoming quickly soiled. Of the wire constructions, fewest complications arose with wire mesh that had been rolled after weaving, flattening the joints to the same level as the wire. To avoid wounds, ZIMMERMANN (1984) recommends attaching a removable, perforated plastic disk of 20-cm diameter to the cage floor.

The possibility of a "s y m b i o s i s" between rabbits and pigs is indicated by CHUNG et al. (1986). When they set the cages above pig pens, the rabbit droppings improved the pigs' weight gains.

<u>Husbandry of young animals until weaning</u>: At this age, development and losses in young animals are unusually dependent on optimal husbandry and management conditions. According to VARGA et al.(1987), natural materials (hay, camel or cashmere hair) are more suitable materials for n e s t b e d d i n g than acryllic fibres. Germ problems are highest with hay, however. According to our own experience (SCHLOLAUT et al.1985) sterilized, softwood chips mixed with torn straw proved best. This material is very absorbent, insulates well and does not hinder the young animals in their search for teats during suckling.

STEPHAN et al.(1984) heated the nest-box floor in an attempt to improve the n e s t c l i m a t e. The temperature surrounding the young animals was thus elevated from 28 - 32° C to 36 - 40° C. This had no impact on the development of the young animals before or after weaning. However, to maintain the nest temperature registered in the unheated controls, the nest-box floor must be insulated (e.g. hard-foam plastic) and appropriate nest bedding is required. TUDELA et al.(1987) tested 4 nest-box constructions: These differed in having a wooden floor (W), a sandwich floor (S), a cover of wire netting (M) or of wood (W). The sandwich floor consisted of two layers of wire netting with straw pressed in between. The highest losses before weaning (16.1 %) occurred with the "SM"-combination, with no differences having been observed between the others.

Nest-box construction and bedding material should facilitate the once-a-day suckling (HUDSON and DISTEL, 1976) in the few minutes.

In a productivity analysis, HENAFF and PONSOT (1987) found lower mortalities (12.9 %, 16.4%) with a 31 - 34 day weaning age instead of 28 - 30 days. SZENDRÖ et al. (1985) recommend an extension of the nursing period for nonpregnant does to 35 - 40 days, since stress-related weight losses decrease with late weaning.

These results require detailed analysis, however. The conclusion that the nursing period ought to be extended beyond 28 days appears questionable. This is the natural nursing period for wild rabbits, who live under much less favourable conditions, just as post-partum mating is normal. Irrespective of feeding intensity, the doe's milk performance begins to decline 3 weeks after birth. Five weeks after birth, there is not much difference in the milk production of does receiving ad-libitum feed and those on green fodder + 50g feed concentrates (Fig. 2). By this time, young animals obtain only 35% of their nutrient supply from the milk.

It has long been known that weight losses in young animals are correspondingly greater in early weaning. With a higher percentage of the nutrients from maternal milk needing substitution through solid feed, they take longer to normalize their weight development. Nevertheless, even with a weaning age of 21 days, the weight loss is compensated by the age of 63 days (SCHLOLAUT, LANGE, 1971). The climatic demands on the hutch are correspondingly higher when young animals are weaned earlier ($>18°C$). This is one more reason for separating the doe from her young after weaning. At lower hutch temperatures, it can be helpful to keep the young in their nest box the first week after moving.

In this connection, LANGE (1986[3]) points out that the nipple drinkers in the does' cages are often attached too high for the young animals to reach. Since the doe's milk does not sufficiently cover the young animals' water requirement, dry-feed intake is reduced. With free access to water, young animals consumed twice as much dry feed and weighed 15% more by the time they were weaned on their 25th day. If high losses occur after early weaning, one should check the digestibility of the feed. Since more dry feed is consumed than with a later weaning, greater digestibility increases the risk of enteritis-related losses. Based on independent investigations (SCHLOLAUT, 1987), it is recommended that feed with a higher crude-fibre content ($>15\%$ crude fibre) be offered in the first 3 weeks after weaning.

Extension of the nursing period beyond the 28th day does not even seem advisable with extensive feeding (green fodder with rationed concentrates), if the does and their unweaned young are held in the same cages. With the doe's declining milk production (Fig. 1) and the young animals' growing nutritional requirement, competition for the rationed feed increases. The doe no longer needs the concentrates for weight maintenance, but the young cannot meet their nutritional needs from roughage alone. Moreover, the risk of infection rises with joint housing. Under these circumstances, therefore, it is more efficient to remove the young animals from the doe's cage by the 3rd week at the latest (when they begin to consume solid feed). In an independent experiment in which the young were moved to separate cages, (SCHLOLAUT, LANGE, 1986[3]), 150g/day of feed concentrates were first offered to the young animals in their 3rd week. The doe received only the uneaten remainder on the following day. The result was an 11% increase in young-animal weights as early as day 28, and a 17% increase by day 42, as compared with results obtained when the young animals stayed with the doe.

Reproduction Management: Mention has already been made of the lower conception rates and litter sizes of does mating and bearing for the first time, as found by earlier investigations. AUMANN et al.(1984) determined that this was related to sexual maturity. According to their results, the ages at first breeding use were influenced by genetic differences.

SZENDRÖ and TAG-EL-DEM (1987) investigated the impact and the optimal timing of double mating on conception and litter size. No significant difference was determined between single and double mating, irrespective of the timing of the latter.

Contrasting results were obtained on the optimal timing of remating or reinsemination after birth. Remating 1 - 2 days post partum has a negative impact according to MENDEZ et al.(1986) and HENAFF and PONSOT (1987). The number of young animals reared per year was lowest when does were remated 1 - 2 days post partum. In contrast, PARTRIDGE et al.(1984) find no difference in the conception rate or litter size of does remated 1, 7, 14 or 21 days post partum. The number of young born per year was thus higher with earlier remating after birth: 75.0; 73.4; 67.4 and 59.1 young animals per year. The weights of does and young animals were not affected by the procedure. Average death rates in young animals before weaning were 42%, however, with the number of animals weaned being correspondingly lower.

Considering that remating 1-2 days post partum is natural for wild rabbits, one should determine the extent to which differing results had other causes. LICHTHORN (1985) points out the negative impact of administering antibiotics to pregnant and nursing does, for example. In the experiment by MENDEZ et al.(1984), a relatively high number of does needed replacing. An additional 128 does were required to substitute for the 72 experimental does lost to mortality, disease and infertility (6 per treatment).

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ANGORA RABBIT-PRODUCTION

In Angora rabbits, difficulties in body-temperature regulation caused by increasing hair length reduce the feed intake and consequently the wool yield as well (SCHLOLAUT, 1987[3]). Shortening the usual 91-day *shearing interval* increased both the daily weight gains of growing young animals and the hair yield. In male breeding animals, the semen quality and libido are improved. In females, the embryonal mortality is reduced (SCHLOLAUT, 1987[1]). The positive effect of a short shearing interval is correspondingly greater with increasing temperatures. The *highest wool yield* is reported from shearing at an age of 14 months. *Seasonal influences* on wool yields appear to result from an interaction of the genotype with the environment. ROUGEOT (1986) reports a 25 - 30% lower wool yield for French stocks during the summer. This is due to the photoperiodic regulation of the production of melatonin and prolactin, which triggers moulting. In contrast, German stocks exhibit a seasonal variation of less than 5% (SCHLOLAUT et al.,1985).

It would seem that selection for high wool yields has reduced the photoperiodic sensitivity of German stocks. The *light duration* also had no effect on the hair yield (SCHLOLAUT, 1987). However, one cannot rule out the impact of the wool-collecting method: Angora wool is plucked in France, while it is shorn in Germany.

Present Trends and Suggestions for Further Developments

Based on the rabbit-production situation in industrialized countries outlined at the outset, and on the recent findings cited above, the following measures would seem appropriate for raising productivity:

1. Separating the doe from the weaned young animals to prevent the spread of infection and satisfy the differing climatic requirements of the two production groups.

2. Implementation of the all-in/all-out procedure in doe houses, with stocking on a yearly basis and of fattening houses.

3. Raising breeding animals in group cages at a low stocking density of less than 10/sq.m., on a floor that allows free movement to avoid skeletal damage (immobility osteoporosis).

4. Introduction of artificial insemination to synchronize the timing of insemination and birth and to raise the conception rate independing of seasons.

5. Development of SPF breeding operations, to reduce high doe mortalities and the related complications in rearing young animals. Producers of breeding animals must also be prevented from developing into multipliers of infectious diseases.

6. Designing cage floors so as to prevent the occurrence of technopathic disorders (sore hocks), at least in the cages of breeding animals and Angora rabbits.

7. Conducting comparison tests on commercial animal material at neutral trial stations, such as the random-sample tests for laying hens. The Deutsche Landwirtschafts-Gesellschaft, DLG (German Agricultural Society) has developed corresponding test guidelines.

8. Inclusion of parameters on hair quality and reproduction as selection characteristics for Angora rabbits. These would better meet the technological demands of wool processing and counteract a further reduction in reproduction performance.

9. Separation of the two specialized operations of breeding and fattening. Since rabbit fattening can also be carried out on a shed floor covered with deep litter, no substantial investment or special know-how is required.

10. Increasing the final fattening weight of does to improve the efficiency of meat production, since rabbit meat will increasingly be butchered into individual cuts for sale.

The following measures would appear to have priority in the area of research and development:

1. Intensified research on techniques for deep-freezing semen, to facilitate the better of insemination as a breeding instrument.

2. Designing nest boxes and nest bedding to meet animal needs, and selection of does according to their teat count, to decrease mortalities in the period before weaning.

3. Inclusion of additional parameters in productivity analyses, to more easily recognize flaws in management or animal quality.

4. Drafting an internationally valid system of conducting productivity analyses, to create a unified basis for discussion.

5. Determination of the causes of mortalities by means of random-sampling diagnosis.

6. Development of more effective prophylactic measurements (vaccines, programs etc.).

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Summary:

Rabbit production has been intensified in industrialized countries, with an accompanying increase in the size of operations. Production conditions have obviously not kept pace with this development, however. They are still essentially based on the husbandry and production techniques practised with small operations in the past, with but few modifications. This is seen as the main reason why the available productivity analyses have indicated stagnating or even negative tendencies in individual animal performances since 1984. The losses in young animals before and after weaning represent an especially negative development, as do the mortalities in breeding does. These production figures are many times higher for the rabbit than for the pig, another multiparous animal, and correspond to the state of poultry production four decades ago.

This is by no means a typical phenomenon of rabbits. Basic hygiene requirements for large-scale animal husbandry have been neglected, and there has been inadequate use of modern know-how. Present husbandry and management practices do not take advantage of progress achieved in the areas of genetics, nutrition and disease prevention, and are therefore unsuitable for raising productivity./

Zusammenfassung:

Die Kaninchenproduktion ist in den Industrieländern durch eine Intensivierung und die Vergrößerung der Bestände pro Betrieb gekennzeichnet. Die Produktionsbedingungen haben jedoch offensichtlich mit dieser Entwicklung nicht Schritt halten können. Sie basieren im wesentlichen noch auf der nur wenig modifizierten Übertragung der früher in den Kleinbeständen praktizierten Haltung und Produktionstechnik. Dies wird als Hauptgrund dafür angesehen, daß nach den vorliegenden Produktivitäts-Analysen die auf das Einzeltier bezogenen Leistungen im Berichtszeitraum (seit 1984) stagnieren oder sich sogar negativ entwickeln. Letzteres gilt insbesondere für die Jungtierverluste vor und nach dem Absetzen sowie die Mortalität der Zuchthäsinnen. Diese Werte liegen in der Kaninchenhaltung um ein mehrfaches höher als bei dem ebenfalls multiparen Schwein. Sie entsprechen dem Niveau in der Geflügelproduktion vor vier Jahrzehnten.

Dies ist keinesfalls ein artspezifisches Phänomen des Kaninchens. Es ist die Folge einer Vernachlässigung der allgemeinen hygienischen Voraussetzungen für die Tierhaltung in Großbeständen und die ungenügende Umsetzung von neuen Erkenntnissen in die Praxis. Haltung und Management sind in der Mehrzahl der Produktionsbetriebe zur Zeit nicht geeignet, die erzielten Fortschritte in den Bereichen Genetik, Ernährung und Krankheitsverhütung im Sinne einer Produktivitätssteigerung zu realisieren.

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Table 1:

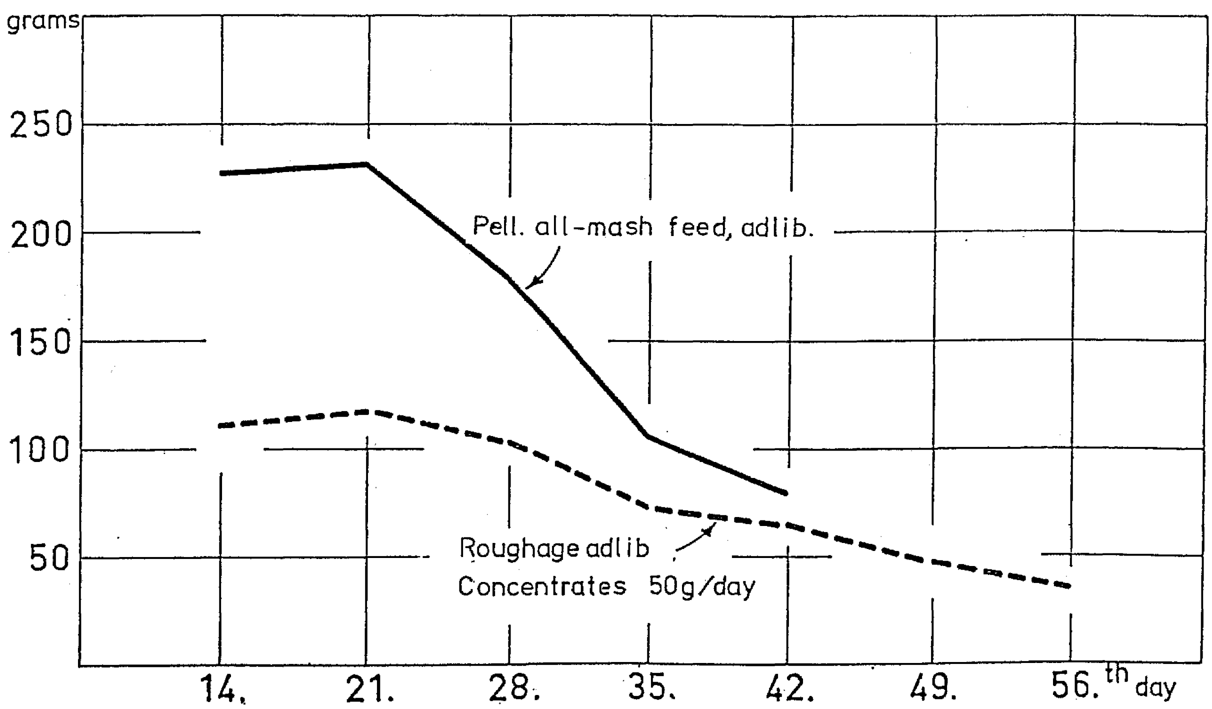
Development of productivity parameters in 1974 - 1986 (GITALAP)*

Year		1974	1983	1984	1985	1986	Difference 1974:1983 %	Difference 1983:1986 %
Sl.rabbits prod./ Aver. doe/year		29,1	40,0	39,9	39,3	40,2	+37,4	+0,5
Relat.Occupation of doe-cage	%	85	103	101	106	115	+21,1	+12
Sl.rabbits prod./ doe-cage/year		24,7	38,8	40,3	41,7	46,2	+57,0	+19
Yearly renewal of does	%	83	125	140	152	168	+50,6	+34
Conception rate	%	57	66	68	65	69	16	+5
Littering interval per doe cage	days	69	52	52,4	47,7	43,3	-25	-17
Liveborn kids/litter		7,2	7,7	7,7	7,8	7,8	+ 7	+1
Mortality till weaning	%	18,9	17,5	23,6	23,6	23,5	- 8	+35
Mortality after weaning	%	7,7	11,2	10,8	11,2	11,2	+45	±0
Liveweight at slaughtering	kg	2,38	2,33	2,34	2,31	2,31	- 2	-1
Surplus over feedcosts per doe-cage/year	FFr	131	517	468	523	635	+392	+23

*According: MAGDELAINE, P. KOEHL, P.F. cited from HENAFF, 1987

Fig. 1

Lactation-curves influenced by different nutrition levels



Independing from nutrition level, the milk yield of the doe decreases after three weeks.

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