Minimizing losses in poultry breeding and production: how breeding companies contribute to poultry welfare

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ABSTRACT

The modern poultry industry has a remarkable record in reducing mortality, applying a combination of effective disease control, adequate nutrition, good husbandry and genetic selection. Primary breeders, specialized in the adaptation of layers, broilers and turkeys to changing demands of a global food market, have made three major contributions in the past: (1) eradication of vertically transmitted disease agents such as lymphoid leucosis viruses, mycoplasmas and salmonellae; (2) selection between and within lines for general liveability and specific disease resistance; and (3) dissemination of management recommendations which may help customers to minimize losses at the commercial level. Current focus is on components of liveability which are directly or indirectly linked to poultry welfare: selection against feather pecking and cannibalism in egg-type chickens and selection against leg disorders and heart/lung dysfunction in rapidly growing meat poultry.

Introduction

Extensive poultry keeping, still widely practiced in many countries, often involves high mortality due to diseases, predators, lack of adequate food and water, extreme temperatures and other stress factors. Since the end of World War II, animal agriculture in Europe and other parts of the world has expanded significantly in terms of volume and efficiency. During the past 50 years, priorities of the industry and consumers gradually changed from satisfying basic demand for volume to focus on product quality and food safety in a saturated market. Globalization of food production from farm animals and increasing attention of societies to modern food production in terms of animal welfare, environmental protection and other sustainability criteria are calling for more transparency of breeding and production processes “from farm to fork”.

The European Commission has initiated a project “Code of Good Practice for European Farm Animal Breeding and Reproduction”, in which specialists representing the major farm animal species will develop guidelines for breeding companies to be followed in practice, with the option of certification by independent organizations on a voluntary basis. This Code can also be used in monitoring to what extent breeding companies contribute to the demand of society to minimize unnecessary suffering of animals in intensive production systems.

The term “losses” may be used in different contexts: financial losses due to market prices below production cost, lost productivity (relative to genetic potential) due to suboptimal management, losses due to inadequate product quality (e.g. shell defects; condemnation of carcasses) or death losses during the production period. We will address losses in the broad sense, but focus on mortality, where in some cases numerical data over a long time period are available.

Breeding goals and expectations of society

Breeding goals are defined in general terms for a long time horizon and gradually adapted to take current market demands into account. The general breeding goal for all farm animal species is a balanced performance profile, suitable for efficient production of meat, milk or eggs under the prevailing or expected future conditions. More specifically, egg-type strains are mainly selected for high egg

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output, efficient feed conversion, egg quality as defined by the egg processing industry, retailers and consumers, and adaptability to specified environments, including liveability. Meat-type strains (broilers and turkeys) are selected mainly for rapid weight gain, efficient feed conversion, and high yield of valuable carcass parts as demanded by processing industry and consumers and adaptability to conditions of the industry. In addition, meat strains are being selected for reproductive performance to keep a balance between parent performance and efficient meat production of the commercial cross.

While these breeding goals have served as a useful basis for systematic genetic improvement in the past, animal welfare organizations criticize the practice of intensive selection for “economic” traits which are claimed to be antagonistic to the wellbeing of animals. Instead of selecting for more eggs or more meat in a shorter productive life, animal welfare organisations demand a change to extensive systems, in which the animals can express their “natural” behaviour.

Most people will agree with breeders and producers that mortality and losses due to diseases, stress, inadequate nutrition and/or unsuitable technical environment should be minimized. The question is: to what extent are breeding companies contributing to this goal, and are the methods employed acceptable in terms of bird welfare?

European poultry breeders are actively involved in a project “Code of Good Practice for European Farm Animal Breeding”, in which guidelines will be developed for different farm animals (cattle, pigs, poultry and aquaculture). We are confident that this project will contribute to more transparency of current breeding goals and breeding practices to a wider group of stakeholders.

Selection for general liveability

Examples of successful selection for general disease and stress resistance are difficult to find in the literature. This is because the industry approach is multiple trait selection between and within lines, often without appropriate controls and not designed for publication. However, strain differences consistently observed in the field suggest that some breeders have been more successful than others to develop general liveability. Single trait selection experiments are of little interest for the poultry industry as long as they are based on experimental populations which are not available or not competitive on the market.

Dickerson (1955) presented data from a commercial breeding programme in California, where the concept of exposing the pedigree generation of commercial White Leghorn lines to “field conditions” in several farms and selecting among survivors produced apparently no progress in survivor egg production, while mortality actually increased, from about 20% in the early 1930’s to about 50% twenty years later. The main causes of mortality at that time were respiratory infections (CRD), Marek’s disease (MD) and lymphoid leucosis. Since then, it has become common practice to protect flocks by better hygiene (all-in, all-out management) and vaccination against Marek’s disease and respiratory diseases.

As long as one primary breeder can claim superior liveability in the commercial cross, all other breeders will be under competitive pressure to improve general liveability. This explains why experienced practical geneticists in the industry tend to pay more attention to general liveability than less experienced colleagues who have learned from theory that traits with low heritability and little economic value deserve little weight in the selection index.

Selection for specific disease resistance: Marek’s disease as an example

During the 1960’s, primary breeders of egg-type and meat-type chickens tested extensively for differences between and within lines for Marek’s resistance. Results of a 5-year selection programme, based on “natural exposure” to virus shedders in isolated farms, was reported by Flock et al. (1975) and reviewed by Beaumont et al. (2003) in view of new insights since the time when the experiments were carried out. Mortality during rearing under conditions of MD exposure was reduced by about 20% (35 vs. 55%) in reciprocal crosses. Interestingly, the line segregating for B_{19} and B_{21} did not respond to reciprocal recurrent selection, although the superior resistance of B_{21} known from many publications was later confirmed in this pure line. Another lesson learned from this experiment is that specific disease resistance may have a short life in the commercial world: as soon as MD vaccines became available, the relatively resistant lines were too far behind in egg production (about 2 kg egg mass per hen housed) to have any value for the egg industry.

For some time it was thought that brown-egg strains were less susceptible to Marek's disease than White Leghorns so that selection concentrated on Leghorns. However, as reported by Flock et al. (1992), brown-egg type cockerels may exhibit very high mortality if challenged with a virulent field strain. The search for better protection against MD continues. To enhance genetic resistance against Marek's disease, integrative genomic approaches are being studied (Cheng et al., 2004), which it is hoped will help primary breeders to identify resistance genes in their elite lines without exposing large numbers of birds to the disease.

Another area of ongoing research is to develop better protection against E. coli by genetic resistance and/or farm specific vaccines. E. coli infections have been known as a potential problem in meat-type flocks of broilers and turkeys for some time and are now receiving more attention in connection with the change from cage to floor management of laying hens.

Eradication of diseases: top-down principle

The hierarchical structure of the modern poultry industry has a few dedicated primary breeders supplying parent stock to franchise hatcheries or integrated customers around the world. This structure has permitted the control of vertically transmissible diseases which caused high mortality and depressed productivity of infected birds in former years.

A well known example is lymphoid leucosis, where virus subgroup LL-A was as a major problem in some White Leghorn strains until its eradication from all pedigree stock during the 1980ies and 1990ies. Fast feathering daughters of slow feathering dams are apparently immune tolerant to the LL virus in White Leghorn lines, which meant that the virus had to be eliminated before feather-sexing varieties could be introduced successfully. These varieties are not resistant to LL and can theoretically be re-infected horizontally, e.g. by LL-positive chicks hatching in the same hatchery. Knowing this, primary breeders have eradicated the virus from all lines, and their customers should not allow hatching eggs of unknown source and LL-status in their hatchery.

More recently, a new leucosis virus subgroup, LL-J, appeared in some broiler lines and caused substantial mortality in parent stock and condemnations in broilers before it could be eradicated.

Two other contributions of breeding companies: The eradication of mycoplasmas from chicken and turkey lines contributed significantly to the reduction of respiratory diseases in commercial layers and meat-type poultry, which enhances poultry health and wellbeing significantly. Bio-security and decontamination of feed to minimize the risk of Salmonella infection of breeding stock is primarily seen as a contribution to food safety, but also has correlated positive effects on the health and wellbeing of poultry.

Breeding companies are fully aware of the potential danger of multiplying problems by vertical transmission of disease agents and invest heavily in bio-security to protect their own stock as well as the interests of their customers. Further improvements are possible at the level of commercial egg production, where all-in, all-out management has become industry standard in large units, while many smaller family farms accept a lower health status to assure continuous egg production.

Considering poultry health, efficiency of production and food safety in the global context, it is obvious that breeding companies, as key players in the industry, must cooperate closely with their customers and local veterinary authorities to minimize economic losses, which will automatically contribute to animal welfare in a very practical sense.

Regional bio-security needs to take small flocks of indigenous poultry into account, which are seen as a major risk factor for avian influenza breaks and other infectious diseases.

Adaptation of laying hens to cage and floor management

Laying hens differ in their adaptability to different husbandry systems. About 50 years ago, when the egg industry discovered the advantages of cage management in large units, breeders who tested different strain crosses in cages found that some combinations adapted well, while others were too flighty or otherwise not suited for this system and were subsequently eliminated. Testing at the pedigree level then changed from trap-nesting in traditional floor pens to single bird and multiple bird cages, but grand parents and parents are kept predominantly in floor systems to this day. Following the introduction of MD vaccination, average mortality of commercial layers kept in conventional cages continued to decline to about 5% per year, as documented in a long-term analysis of German random sample tests (Flock and Heil, 2002), but is increasing again with the re-introduction of floor management. Mortality to 66 weeks of age in the 35th North Carolina Layer Performance and Management Test (2003-04) varied between 2.3 and 16.0% in conventional cages with 413 cm² per hen.

Since the EU decided that conventional cages must be phased out by 2012, primary breeders have been paying increased attention to traits with special importance for floor management, i.e. cannibalism, feather pecking and susceptibility to *E. coli*. Iable 1, recent data from two official German random sample testing stations are summarized to illustrate differences in mortality and other characteristics expected when cages are replaced by floor management, with or without beak trimming.

Table 1: Average mortality, egg production and feed conversion of commercial layers in two official German random tests (3 years data)

Station and Management System	Mortality %	Egg Mass kg/HH	Feed Conv. kg/kg
Haus Düsse, conventional cages	5.8	20.35	2.00
Kitzingen, floor, beak trimmed	6.9	18.16	2.28
Kitzingen, floor, untrimmed	17.7	17.03	2.46

Based on the figures documented in table 1, we can project what the change from conventional cages to floor pens may cost (in terms of more mortality and more feed) to satisfy the current demand for eggs in Europe, depending on whether beak trimming is allowed or not.

The European egg industry will reduce these losses in several ways: a substantial part of egg production may move to countries where cages are still allowed, beak trimming and/or light control practices may have to be applied in floor systems, and egg producers have to continue a learning process, while primary breeders try to improve adaptability to floor management - selecting mainly against cannibalism and feather pecking, but also against mortality due to *E. coli*.

Taylor and Hurnik (1996) compared the productivity of hens between battery cages and an aviary, based on 763 hens of one commercial White Leghorn strain. In this experiment, the caged hens were beak trimmed at 22 weeks of age, following an outbreak of cannibalism, whereas this procedure was not necessary in the aviary at any time during the 3-year study. These authors conclude from the literature: “mortality rates have been reported elsewhere to be higher in battery cages than in alternative systems and vice versa”.

Muir (2003) describes results of a selection experiment, in which the mortality of a White Leghorn line was reduced from 68% to 8.8% within six generations. Similar approaches have been used by commercial breeders for a number of years, but their results are less spectacular, because most commercial strains have a lower initial incidence of cannibalism and selection for multiple objectives requires more time to change additional traits.

Important differences exist between strain crosses with regard to mortality, feather loss and their response to beak trimming to control these problems, as demonstrated with results of the German random sample test at Kitzingen (Damme, 1999). Since random sample tests have all but disappeared, egg producers must depend on information from other sources. We assume that all primary breeders of laying hens are currently selecting for these traits, depending on their competitive position in the market. The response will differ, depending on the genetic parameters of the lines and actual selection pressure.

Adaptation of broilers to commercial environments

Today's broiler industry has its origin in the seasonal rearing of cockerels of egg-type or dual purpose breeds for meat. Per capita consumption of chicken meat was therefore about 1 kg from "soup hens" and even less from young cockerels. With increasing demand for meat from young chickens, breeds with good growth rate were selected for more rapid weight gain and other traits contributing to efficient broiler meat production.

In a review of the history of the US broiler industry, Gordon (1974) gives the estimates of broiler performance between 1923 and 1973 shown in table 2. The decrease in mortality is mainly due to better control of diseases and improved husbandry. Family selection for liveability and eradication of egg transmitted diseases at the pedigree level may have contributed to the reduction of mortality in the past, but the main contributing factors were probably better general hygiene, vaccination against common field infections, experience of successful farmers and reduced disease risk during a shorter life.

Table 2: Typical broiler performance in the USA (from Gordon, 1974 and Havenstein et al., 2003)

Year	Weeks of age when sold	Live weight kg	Feed efficiency kg feed/weight	Mortality %
1923	16.0	1.00	4.7	18.0
1933	14.0	1.23	4.4	14.0
1943	12.0	1.36	4.0	10.0
1963	9.5	1.59	2.4	5.7
1973	8.5	1.77	2.0	2.7
1957	12.0	1.43	3.84	4.7
2001	6.0	2.67	1.63	3.6

The data from Havenstein et al. (2003) shown in the last two lines of table 2 are based on a comparison of current commercial broilers (Ross 308) with an unselected control line representing genetic potential in 1957, using feeding regimes typical for 1957 and 2001. The modern broiler reached almost twice the live weight on 20% less feed in half the time. Comparing growth rate and feed efficiency at different ages and different weights may not be satisfactory from a statistical point of view, but the conclusion is: to produce live broilers for current consumption with the genotypes available in 1957, the farm capacity would have to be doubled and 4.4 times as much feed would be needed to produce the same volume. The figures are even more dramatic if based on edible meat, because carcass yield and percentage valuable parts were improved at the same time.

Improved feed efficiency is a major contribution of the broiler industry to sustainable production of animal protein for human consumption: more meat from less feed saves resources (land, feed, water, energy), and reduces N and P emissions.

A critical analysis of changes in liveability requires larger numbers and can only be roughly estimated from the data of Havenstein et al., because replicates were sacrificed for carcass analysis between 6 and 12 weeks (the figure of 4.7% mortality in the control line shown in table 2 was reported for 8 weeks on the 1957 ration; in the remaining replicates, cumulative mortality to 12 weeks was lower). Cumulative mortality to 42 days of age was 3.6% across both sexes and rations in the modern broiler type, compared to only 2.1% in the 1957 control line. Although mortality to a given age apparently increased, by extrapolation, a much greater number of birds would die if the same total weight of live broilers were produced from the unselected 1957 control line.

Cumulative mortality and the incidence of leg disorders depend on the specific testing conditions. In their 2001 comparison, Havenstein et al. found about half the mortality compared to an earlier comparison in 1991, both in the commercial broiler (Arbor Acres) and in the control line. They concluded that most of the improvement was due to an improved growing environment. Results of this recent study were not available when Rauw et al. (1998) reviewed the undesirable side effects of selection for high production efficiency, but strongly suggest that selection against leg defects combined with improved management has actually reduced the rate and severity of leg problems in commercial broilers.

Studying growth curves of commercial male broilers (Cobb 500 and Shaver Starbro), Goliomytis et al. (2003) found very high mortality (mainly due to leg problems), increasing especially after 10 weeks of age to almost 50% at 22 weeks of age. However, if such results were typical for the industry, these breeds would no longer be placed. These results highlight some of the problems in interpreting small scale trials and extrapolating the results to commercial practice.

Broiler breeders are working to reduce further, over-all broiler mortality, leg disorders and susceptibility to heart/lung insufficiency. At the pedigree level, broiler lines are usually “broilerized”, i.e. fed ad libitum with concentrated broiler feed, so that weaknesses can be detected and incorporated within family selection. McKay et al. (2002) reported the results of a large survey of leg health in broilers in the UK by The British Poultry Council (Pfeiffer and Dall’ Aqua, 2002), in which the gait score of 37,224 broilers was assessed by trained veterinarians and stockmen. Over a period of 6 years (1994 to 2000), the prevalence of leg defects (gait scores over 2) averaged less than 3%, decreased with time and reached 1.87% in the last observation period. More surveys of this kind would be desirable to monitor trends in welfare related traits of all farm animals under commercial conditions.

To utilize the growth potential of fast growing broiler strains to produce higher body weights, management and nutrition must be adapted to minimize losses. *Ad libitum* feeding of high density rations would not be economical and lead to justified criticism on welfare grounds. Management recommendations broiler growers obtained from their feed and chick supplier help in minimizing losses to slaughter age. For example, fine-tuning chick starter rations and correct temperature help to optimize early growth rate and reduce mortality due to heart/circulatory failure; appropriate lighting programmes and distance between feeders and drinkers help to minimize leg problems by inducing the chick’s activity and mobility.

No practical alternative to controlled feeding of broiler breeders is available at the present time, and it must be understood that *ad libitum* feeding of these lines would compromise their wellbeing even more. Management recommendations and practices are designed to ensure that maintenance requirements are always met and growth continues at a reduced yet controlled rate.

Slower growing meat lines are being offered by breeders to the market and are being used for certified (e.g. “Label Rouge”) broiler production in some countries, but their market potential is limited by cost and other constraints. In particular, their less efficient feed conversion is not compatible with two other sustainability objectives: to minimize waste of resources (feed, water, energy, land) and to reduce pollution of the environment with N and P emissions. As can be learned from French producers of “label” broilers, the higher production cost can only be recovered with a system of contracts and strictly limited volume.

Adaptation of turkeys to commercial environments

Breeding goals and selection procedures for turkeys are similar to those for meat-type chickens: male lines are selected mainly for efficient weight gain and high carcass yield and walking ability, while female lines are also selected for reproductive efficiency when fed ad libitum on appropriate feed programmes. At the parent level, artificial insemination is commonly used to achieve acceptable fertility rates. Animal welfare groups argue that this is a consequence of recent breeding for extreme breast meat yield in male lines, which are no longer able to mate naturally. Actually, artificial insemination in the 1960s pre-dates both the development of the commercial turkey industry and commercial turkey breeding in many European countries. The alternative practical viewpoint is that AI, providing it is undertaken by suitably trained and supervised persons handling the birds, enhances welfare in all turkey lines by eliminating injuries to the females during mating. These occur because males are both aggressive during mating and heavier, the latter being due to either within-line sexual dimorphism in pure line matings or significant line differences in body weights in commercial crossbred matings. Reliable field data on trends in live turkey production in Europe are difficult to find. Surveys of the kind reported by the British Poultry Council for broilers would be welcome to provide objective data on which an informed discussion can take place. Data recently published by Ferket (2002) indicate that growth rate of Large White toms to 18 weeks of age increased almost linearly between 1966 and 2002 by 194g per year, while Large White hens gained 77g more each year to 14 weeks of age. To reach typical market weights of 15.9 kg (35 lbs.) for toms and 7.3kg (16 lbs.) for hens, it took 220 and 147 days in 1966 vs. 136 and 99 days in 2002. Feed consumption per kg live weight did not change significantly during the last 30 years, if calculated on an age constant basis. Unfortunately, these long term statistics do not contain figures on liveability. Table 3 shows recent data on live production and liveability from key countries in North America and Europe from the same author.

Table 3: Average performance of commercial Large White turkeys by country

Country	Age days	Live weight kg	Daily Gain g/day	Feed/ Gain kg/kg	Condem nations Pct.	Live-ability Pct.	Sample size Mio
Toms							
USA	133.7	15.59	116	2.71	2.84	85.4	45.50
Germany/NL	145.1	19.09	131	2.85	4.27	88.6	21.30
Hens							
USA	102.4	7.50	74	2.34	1.10	91.1	59.50
Germany/NL	110.6	9.55	86	2.79	2.46	95.1	13.70

Data from Canada, Ireland and Italy are omitted here, because the sample size (less than 1 million turkeys) is considered inadequate. Comparing results from North America and Europe, it is interesting to note that liveability is better in Germany and The Netherlands, despite higher body weight. Whether higher condemnation rates reflect true differences or different grading standards cannot be answered from these data.

The list of problems Ferket received from the respondents of his survey included early mortality, coronavirus, pneumovirus, E. coli infections, airsacculitis, Mycoplasma meleagridis (passed on from breeders), mild cannibalism and aggressive behaviour, leg problems, flushing (enteritis), high incidence of late mortality and adverse weather conditions.

In a review of current breeding goals for anticipated market trends, Bentley (2002) emphasized the need for turkey-specific research to investigate the genetic basis of walking ability and injurious pecking. Selection for liveability is practiced on the basis of individual and family information, with special emphasis on walking ability and deportment at maturity in males and females while genetic control of aggressive pecking in males requires further refinement. Sometimes lines are replaced or added to the range of products offered by the breeder, in which case the relative merits of the new line are of special interest. Roberson et al. (2004) compared existing and new commercial turkey crosses, mainly on growth performance and carcass composition. In the context of the present review, it is interesting to note that total mortality to 19 weeks of age varied between 4.1 and 14.5%, mortality due to round heart disease between 1.5 and 9.3%, mortality and culling due to severe leg problems between 0.5 and 2.1%. Differences in mortality found in samples of 200 to 400 turkeys in a controlled comparison should not be extrapolated to field conditions, but they suggest that important differences may exist.

Consumer attention is expected to focus not only on high quality meat at competitive prices, but also on production under bird-friendly conditions. Beak trimming of day-old poults and control of light intensity are effective preventive measures, but subject to criticism under welfare considerations. Selection against aggressive pecking and for walking ability at the pedigree level assures that individuals with obvious defects or high frequency of defects in the family are excluded from reproduction.

Adaptation to variable market requirements is partly achieved by growing females and males of different strain crosses to different ages and corresponding live weights. The economic importance of liveability increases with the age of commercial turkeys. Breeders focus on reduction of losses in males due to aggression, which tends to increase as they approach sexual maturity.

Discussion

Poultry breeding companies can look back at an impressive record of improving the efficiency of egg and poultry meat production, which has helped to make these products affordable for more consumers world-wide. Mortality and loss of productivity due to infectious diseases have been reduced with a combination of genetic selection, poultry health research and development of management recommendations for commercial producers. From information disseminated by animal welfare organizations, the general public may get the impression that increased efficiency has been achieved at the expense of animal welfare. A balanced presentation of industry practices should include the positive developments described here.

In answering demands of the European society, the breeding industry is developing standards which take perceived needs of the animals in terms of animal welfare into account. If more transparency of the production chain is demanded, breeders may have to explain in non-technical language why free range management is incompatible with bio-security for breeding stock and why “challenging” test flocks (relatives of pedigree stock in an environment with maximal bio-security) are being exposed to sub-optimal conditions reflecting the range of conditions encountered in practice. This should not be confused with “animal experiments”.

To enhance genetic resistance against Marek’s disease, integrative genomic approaches are being studied (Cheng et al., 2004), which hopefully will help primary breeders to identify resistance genes in their elite lines without exposing large numbers of birds to the disease. This could be a significant contribution to poultry welfare in the whole production chain from breeder to producer. Similar arguments hold for any other disease where genetic resistance is established and selection strategies can be formulated. However, relationships between “markers” and actual resistance need to be verified repeatedly in each specific line or cross, i.e. the availability of genetic markers will not completely eliminate the need for exposure to disease agents under controlled conditions.

Communication with the general public will remain a difficult challenge for the farm animal industry. Poultry breeding is part of the global food chain, and breeding goals have to be defined according to expected demands of consumers and those who produce and market animal products. Increasing attention to “sustainability” in farm animal breeding includes the objective to produce under conditions which meet ethical standards of the society. Most consumers in Europe buy food on price, safety and perceived quality, whereas animal welfare groups focus on the “needs” or “rights” of animals, ignoring the fact that many consumers have a limited food budget.

Animal welfare organizations in Europe advocate the return to extensive production systems, but only a minority of consumers is prepared to pay a higher price for these products. For the dialogue between the farm animal industry and consumer organizations to be productive, it is necessary to communicate in more depth what breeders are currently doing, what changes are possible and how long it takes for desirable genetic changes to have an impact.

Some ethicists advocate a vegetarian lifestyle in order to stop the use of animals for food production (Singer, 1975). The animal industry is focused on supplying consumers with high quality products at competitive prices, but would be ill advised to ignore justified criticisms of non-consumers of animal products. We are actually dealing with two issues: the perceived “needs” or “rights” of animals, but also the ethical standards and emotions of all people.

Animal welfare organizations in Europe criticize the practice of killing day-old cockerels of egg-type chickens, for which no practical alternative exists yet (Klein et al., 2003). Research to identify alternative solutions continues. Human emotions and ethical objections against killing may be stronger when cute, fluffy chicks rather than adult cockerels or spent hens are involved. Before the advent of more efficient poultry meat production from broilers and turkeys, a cockerel was a rare delicacy few people could afford. Unless a significant number of consumers demands meat from egg-type cockerels, they will not be raised to market weight.

As recently pointed out by Savory (2004), the politicians who make the decisions, those responsible for formulating animal welfare standards, and those responsible for enforcing them have to balance between satisfying public opinion on the one hand and not compromizing commercial interests too much on the other hand. The European poultry industry and the breeders who supply it are fully aware of society demands and will continue to look for solutions which further improve poultry wellbeing within a well informed, transparent and rational debate.

References

Please refer to the original publication in World’s Poultry Science Journal 61: 227-237 or contact the senior author: dkflock@t-online.de

Zusammenfassung

Minimierung von Verlusten in der Geflügelzucht und -produktion: wie Zuchtfirmen zum Tierschutz beitragen

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In der modernen Geflügelwirtschaft ist durch wirksame Krankheitsprophylaxe, bedarfsgerechte Ernährung, gutes allgemeines Management und genetische Selektion auf Krankheits- und Stressresistenz eine bemerkenswerte Verringerung der Tierverluste erreicht worden. Basiszüchter, die sich auf die Anpassung von Legehennen, Broilern und Puten an wechselnde Anforderungen im Weltmarkt für Geflügelprodukte spezialisiert haben, können auf drei Beiträge hinweisen: (1) Eradikation vertikal übertragbarer Krankheitserreger wie lymphoide Leukose, Mykoplasmen und Salmonellen; (2) Selektion zwischen und innerhalb Linien auf allgemeine Lebensfähigkeit und spezifische Krankheitsresistenz; und (3) Ausarbeitung von Managementprogrammen und Lehrgänge für Kunden, um die Verlustraten in der Praxis zu minimieren. Gegenwärtig konzentrieren sich züchterische Bemühungen auf Komponenten der Überlebensrate, die direkt oder indirekt mit Tierschutz zu tun haben: Selektion gegen Federpicken und Kannibalismus bei Legehennen und gegen Beinschäden und Dysfunktion des Herz-/Kreislaufsystems bei schnell wachsenden Broilern und Puten.