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SCHRIFTEN DER GESELLSCHAFT FÜR WIRTSCHAFTS- UND SOZIALWISSENSCHAFTEN DES LANDBAUES E.V.

Theuvsen, L., Essmann, S., Brand-Saßen, H.: Does More Animal Welfare in Turkey Husbandry Pay off? Empirical Evidence from Germany. In: Bahrs, E., von Cramon-Taubadel, S., Spiller, A., Theuvsen, L., Zeller, M.: Unternehmen im Agrarbereich vor neuen Herausforderungen. Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Band 41, Münster-Hiltrup: Landwirtschaftsverlag (2006), S. 339-348.

Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Bd. 41, 2006: 339 - 348

# DOES MORE ANIMAL WELFARE IN TURKEY HUSBANDRY PAY OFF? EMPIRICAL EVIDENCE FROM GERMANY

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**Abstract**

Livestock husbandry is a major line of conflict in industrialized countries. Farmers are caught in a dilemma between ethical considerations imposed by, for instance, nongovernmental organizations and the wider public on the one hand and competitive and economic pressures on the other. In this paper we analyze whether it is possible to implement more animal-friendly husbandry conditions for turkey fattening in Germany without sacrificing competitiveness. Empirical results show that, at first glance, the willingness on the part of consumers to pay for more animal welfare exceeds the costs to farmers of more animal-friendly husbandry systems. We compare our results with those of market tests and discuss some methodological problems.

## 1 Introduction

Modern societies in industrialized countries quarrel about the proper methods of livestock husbandry. On the one hand, nongovernmental organizations (such as Greenpeace), consumer protection agencies, progressive agricultural politicians, some ethologists and parts of the wider public expect farmers to meet high ethical standards by implementing animal-friendly husbandry systems. On the other hand, farmers, traditional agricultural politicians and farmers' interest groups point to high competitive pressures and low product prices and question the economic viability of animal-friendly husbandry systems. Thus, farmers are caught in a dilemma. Implementing more animal-friendly husbandry systems could result in an economic disaster due to the lack of a sufficient number of consumers willing to pay for more animal welfare. But ignoring the stakeholders' demands for more animal-friendliness may contribute to a further deterioration of farmers' and farm products' image and legitimacy in society (for the deterioration of, for instance, the reputation of fresh meat see KOEHLER and WILDNER, 1998).

Is there a feasible way out of the dilemma between ethics and economics? In this paper we address the aforementioned goal conflict and identify economically tolerable measures for improving the animal-friendliness of contemporary husbandry systems. We focus on turkey fattening for two reasons. First, like laying hen husbandry, turkey fattening is one of most severely criticized agricultural production systems. Second, the usually high degree of vertical integration and standardization makes cost calculations for turkey fattening much easier than for pork or beef production. Our objective is to answer the question which measures improve animal welfare in turkey fattening and which of these are economically viable in the sense that consumers are willing to pay for the implementation of these measures and their additional costs. The analysis consists of four parts: (a) description of elements of a more animal-friendly turkey husbandry system, (b) calculation of the actual costs of these measures, (c) presentation of empirical data on consumers' willingness to pay for the implementation of these measures, and (d) discussion of results.

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## 2 Improving Animal Welfare in Turkey Fattening

In Germany turkeys are usually kept in open houses ventilated naturally by wind and gravity. Computerized ventilation systems allow the control of air supply. At the beginning of the rearing period a house temperature of about 21 degrees Celsius is common; later on temperature is reduced by 1 to 2 degrees per week. Houses are about 16 to 18 meters wide and up to 125 meters long. The floor is made of concrete and sometimes equipped with an underfloor heating system. During the first six weeks of the rearing period turkeys are kept on dust-free and fungus-free wood shavings; then rye or barley straw is used. Most turkeys are finished in all-in-all-out systems (22 to 24 weeks) or in rotation systems (19 weeks) (BERK, 2002; BERK, 2003).

Conventional turkey fattening is characterized by several problems that reduce animal welfare. Lack of stimuli causes boredom, which results in behavioral disorders such as cannibalism and feather picking. Poor equipment in turkey houses is also a problem since natural behaviour, such as spending the night on a tree, is restricted. Another problem stems from high stocking density during rearing and finishing. When stocking density is high, stress is caused, and turkeys have no opportunity to engage in natural behavior such as use of wings. Since 1999, a voluntary agreement has restricted turkey stocking density in Germany to 45 kg live weight per $m^2$ for hens and 50 kg live weight per $m^2$ for toms. Under certain conditions (farmer's training and experience, veterinary control), the tolerable live weight per $m^2$ can be up to 52 kg for hens and 58 kg for toms. In other countries, stocking densities up to 60 kg live weight per $m^2$ can be observed. An exception to the rule is Switzerland, where stocking density is limited to 36.5 kg live weight per $m^2$. This limit is becoming more and more popular. In 2005 the two German states of Northrhine-Westphalia and Schleswig-Holstein have suggested to limit stocking densities for turkeys to 38 kg live weight per $m^2$ for hens and 42 kg for toms.

In this study four measures for improving animal welfare in turkey fattening are taken into account:

- The introduction of perches for 40 % of the flock allows natural behavior and creates additional space in the turkey house, thus reducing stress.
- The reduction of stocking density to 36.5 kg live weight per $m^2$ also reduces stress and allows natural behavior.
- A supplementary outdoor-climate house creates additional space and provides the turkeys with environmental stimuli.
- Experimental implementation of outside rearing in a free-range husbandry system according to Regulation (EU) 1538/1991 Appendix 4 resulted in improved foot health and plumage.

These measures are not common in turkey fattening in Germany, but at least some of them are quite common in organic farming and in other countries, such as Switzerland. The measures are arranged according to their ethological value, which is lowest for perches and highest for free-range systems – despite some problematic side-effects on animal health and the environment.

## 3 Calculating Costs of Improved Husbandry Conditions

Improving animal welfare imposes additional costs on farmers. Since it is the major goal of this study to identify economically tolerable measures for improving the animal-friendliness of turkey husbandry systems, calculating the actual costs of these measures is paramount. Table 1 summarizes the assumptions of our calculation of actual costs of improved husbandry conditions. Data are taken from publicly available sources on turkey rearing and finishing

(BERK, 2002; BERK and ACHILLES, 2002; DAMME and MÖBIUS, 2003; KTBL, 2002) and reflect practical experiences with turkey fattening in Germany.

**Table 1. Assumptions of cost calculation**

| | Unit | Convent. turkey husb. | Perches | Reduced stocking density | Outdoor-climate house | Free-range system |
|---|---|---|---|---|---|---|
| Production system | | rotation system (19 weeks) | | | | |
| Lots per year | | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 |
| Toms/hens | % | 50 | 50 | 50 | 50 | 50 |
| House size | $m^2$ | 2.087 | 2.087 | 2.087 | 2.087 | 2.087 |
| Size of outdoor-climate house | $m^2$ | - | - | - | 417 | - |
| Fattening places | animals | 5,635 | 5,635 | 4,362 | 5,635 | 2,922 |
| Maximum live weight | $kg/m^2$ | 47.5 | 47.5 | 36.5 | 47.5 | 25 |
| Stocking density | animals/ $m^2$ | 2.7 | 2.7 | 2.09 | 2.7 | 1.4 |
| Feed consumption | kg/animal | 37.07 | 37.07 | 37.07 | 37.07 | 43.8 |
| Feed price | €/kg | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Daily weight gain | g | 109 | 109 | 109 | 109 | 109 |
| Feed conversion efficiency* | 1:... | 2.64 | 2.64 | 2.64 | 2.64 | 3.3 |
| Slaughter weight | kg | 12 | 12 | 12 | 12 | 12 |
| Slaughter yield | % | 75 | 75 | 75 | 75 | 75 |
| Mortality | % | 8 | 8 | 8 | 8 | 8 |
| Wood shavings | kg/animal | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Price of wood shavings | €/kg | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Straw (barn) | kg/animal | 5.45 | 5.45 | 5.45 | 5.45 | 5.45 |
| Straw (outdoor-climate house) | kg/animal | - | - | - | 1.09 | - |
| Price of straw | €/kg | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Sand (outdoor-climate house) | $m^3/m^2$ | - | - | - | 0.034 | - |
| Price of sand | €/$m^3$ | - | - | - | 10.23 | - |
| Financial yield loss | €/animal | | - | 16.32 | - | 20.76 |
| Depreciation time of house | years | 20 | 20 | 20 | 20 | 20 |
| Depreciation time of equipment | years | 10 | 10 | 10 | 10 | 10 |
| Repair | % of investment | 1 | 1 | 1 | 1 | 1 |
| Interest rate | % | 6 | 6 | 6 | 6 | 6 |
| Investment building** | €/place | 32 | 32 | 50 | 36 | 60 |
| Investment equipment | €/place | 3 | 3.2 | 3 | 3.2 | 4.5 |
| Additional grassland | $m^2$ | | | | | 32.496 |
| Additional cost grassland*** | €/animal | | | | | 0.18 |
| Additional cost fence | €/animal | | | | | 0.47**** |
| Working time requirements of turkey house | working hours per animal | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| Additional working time requirements of outdoor-climate house | working hours per animal | | | | 0.05 | |
| Additional working time requirements of free-range system | €/animal | | | | | 1.8***** |
| Wages | €/working hour | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 |

* Very little is known about feed conversion efficiency in free-range turkey husbandry. In organic farming feed conversion efficiency is 1:3.3 (BERK, 2004). Our calculation is based on the assumption that the same feed conversion efficiency applies for free-range turkey fattening.
** Annual building costs are calculated using the annuity method (residual value: 2€/place).
*** Rent: 300 €/ha, i.e. 0.12 €/animal. Annual cost of grassland cultivation: Seeding, machinery (tractor 67 kW, 3 m, field: 2 ha; 20 kg seeds) + rolling (tractor 45 kW, 3 m, field: 2 ha): (0.96 working hours/ha * 15 €/h wages + 79.74 €/ha machinery cost seeding + 38 €/ha seeds) + (0.77 working hours/ha * 15 €/h wages + 13.61 €/ha machinery cost rolling) = 157.3 €/ha/a, i.e. 0.06 €/animal. Total additional grassland cost: 0.18 €/animal.
**** Assumptions: Wire-netting fence; length: 900 m; wooden stakes; 186 working hours * 15 €/h + 327.67 € = 3117.67 € (Roth and Berger, 1999).
***** This figure is drawn from broiler fattening (ELLENDORFF et al., 2002).

In Table 2 we calculate the costs of different turkey husbandry systems based on the assumptions summarized in Table 1. The costs of conventional turkey fattening are 1.16 €/kg of slaughter weight. The additional costs per kg of slaughter weight are 0.012 € for sitperches, 0.08 € for reduced stocking density, 0.03 € for outdoor-climate house and 0.35 € for free-range husbandry.

**Table 2. Calculation of costs**

| | Unit | Convent. turkey husb. | Perches | Reduced stocking density | Outdoor-climate house | Free-range system |
|---|---|---|---|---|---|---|
| Feed costs | €/animal | 7.49 | 7.49 | 7.49 | 7.49 | 8.80 |
| Chicks | €/animal | 1.95 | 1.95 | 1.95 | 1.95 | 1.95 |
| Veterinary treatments, hygiene | €/animal | 0.42 | 0.42 | 0.42 | 0.42 | 0.42 |
| Energy, water | €/animal | 0.34 | 0.34 | 0.34 | 0.34 | 0.34 |
| Wood shavings, straw | €/animal | 0.45 | 0.45 | 0.45 | 0.63 | 0.45 |
| Catching and loading | €/animal | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| Maintenance building and equipment | €/animal | 0.13 | 0.13 | 0.52 | 0.14 | 0.13 |
| Interest costs current assets | €/animal | 0.15 | 0.15 | 0.16 | 0.13 | 0.15 |
| Miscellenaous | €/animal | 0.37 | 0.37 | 0.37 | 0.37 | 0.43 |
| Total variable costs | €/animal | 11.47 | 11.47 | 11.87 | 11.64 | 12.84 |
| Building costs | €/animal | 1.09 | 1.09 | 1.71 | 1.23 | 2.06 |
| Equipment costs | €/animal | 0.15 | 0.17 | 0.15 | 0.17 | 0.24 |
| Total fixed costs | €/animal | 1.24 | 1.26 | 1.86 | 1.40 | 2.30 |
| Calculatory wages | €/animal | 1.20 | 1.20 | 1.20 | 1.25 | 3.00 |
| Total costs | €/animal | 13.92 | 13.93 | 14.92 | 14.29 | 18.14 |
| **Total costs** | **€/kg** | **1.16** | **1.17** | **1.24** | **1.19** | **1.51** |

## 4 Estimating Willingness to Pay

The economic viability of improved husbandry conditions depends on consumers' willingness to pay for more animal welfare in turkey fattening. Since there are no available data on German consumers' willingness to pay for animal-friendly produced turkey meat, we conducted a conjoint analysis to understand how consumers value product attributes by determining consumers' tradeoffs between different levels of these attributes. Conjoint analysis allows the decomposition of consumer preferences into the partial contributions of product features such as price, design and convenience. In a conjoint analysis study respondents are usually not asked to indicate their preferred combinations of product attributes directly. Instead, they are presented combinations of attributes visualized as product offerings. When the number of possible combinations is very large, conjoint analysis also allows the researcher to build a subset of the possible combinations which is easier to manage (HAUSER and RAO, 2005).

A conjoint analysis consists of three major steps: (1) designing the stimuli by decomposing the product, representing the stimuli and reducing the respondent burden, (2) data collection and (3) data analysis. These steps are outlined in more detail in the following paragraphs.

### 4.1 Designing Stimuli

In the conjoint analysis the product, turkey meat, was decomposed by referring to three product attributes considered being relevant to consumers' buying decisions:

- Brand: Wiesenhof, Neuland or unbranded turkey meat.
- Price, displayed for turkey escalope: 7.99 €/kg, 9.99 €/kg or 11.99 €/kg.
- Measures for improving the animal-friendliness of turkey fattening, i.e. perches, reduced stocking density, outdoor-climate house and a free-range husbandry system.

The combinations of brand, price and measures for animal prevention were visualized as graphical stimulus cards and displayed as realistic product offerings with clearly identifiable product attributes. Three attributes with three or four levels result in 36 stimuli (or profiles). In order to simplify the task for the respondents, a balanced orthogonal design was chosen to reduce the number of profiles each respondent had to rank to 16.

### 4.2 Data Collection

In early August, 2004, 216 consumers were surveyed by two interviewers in a HERKULES market in Kassel. In the sample 56.5 % of respondents were female and 43.5 % male. 38.4 % of respondents live in two-person households. Around 60 % of consumers are roughly equally divided among one-, three- and four-person households. Only 6 % live in households with five or more members. The age-groups surveyed can be gathered from Table 3.

**Table 3. Age-groups in the survey.**

| Age-group (years) | Percentage of interviewees |
|---|---|
| up to 20 | 6.5 % |
| 21-30 | 18.5 % |
| 31-40 | 22.2 % |
| 41-50 | 16.7 % |
| 51-60 | 17.6 % |
| 61-70 | 14.4 % |
| above 70 | 4.2 % |

Nearly 23 % of respondents were not willing to declare their income. From the remaining interviewees, 21.8 % had an income of up to 1,000 €/month. 19.9 % of respondents declared that they belonged to each of the following income groups: 1,000 to 2,000 € per month; 2,000 to 2,500 € per month. 16.2 % of surveyed consumers earned more than 2,500 € per month.

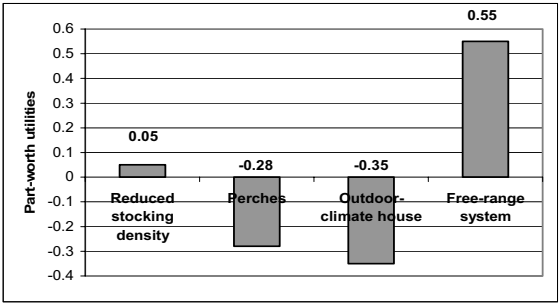
The formal education of the respondents turned out to be above-average (17.6 % Hauptschule, nearly 31 % Realschule, over 50 % Fachhochschulreife or Allgemeine Hochschulreife, 16.7 % hold university degrees, and 2.8 % PhDs).

Only consumers who declared that they eat poultry on a regular basis took part in the survey. 40.7 % of respondents buy poultry once a week, and 18.1 % two or three times a week. Turkey meat, which has a market share of about one-third in the German poultry market is bought more rarely. Poultry is generally more often bought in retail stores than beef and pork. The origin of the meat was "very important" for 56 % of the respondents and "important" for 22.7 %. Nearly all respondents declared that they would be willing to buy turkey meat from animal-friendly husbandry systems if it were offered more often in retail stores.

### 4.3 Data Analysis

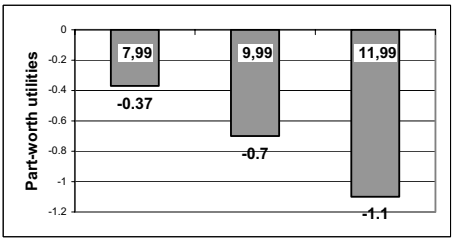
Data analysis in conjoint studies starts with estimating part-worth utilities for each level of each attribute. Regarding animal welfare in turkey fattening consumers very strongly prefer free-range husbandry systems. Reduced stocking density is also welcomed but creates much lower utility. Maybe due to a lack of knowledge about their true ethological value, perches and outdoor-climate houses are not positively evaluated (see Figure 1).

**Figure 1. Animal-friendly husbandry: Part-worth utilities**



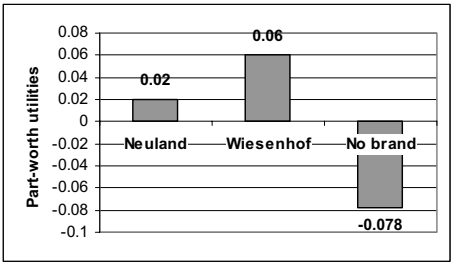

Concerning product price, the assumed negative linear relationship was empirically supported; the part-worth utility for lower price was higher than for higher prices (see Figure 2).

**Figure 2. Price: Part-worth utilities**



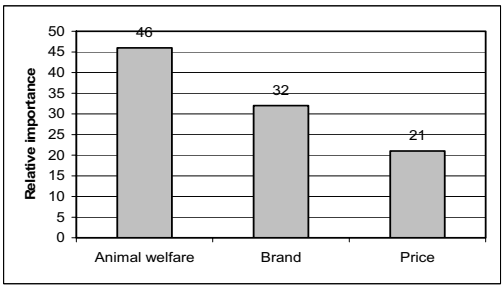

Knowledge of meat and poultry brands was generally low in our sample. The majority of respondents did not know any meat brands at all; other consumers' knowledge was restricted to the Wiesenhof brand and a few regional meat brands. In the survey consumers revealed a strong preference for the Wiesenhof brand. Positive but much smaller part-worth utility was attributed to the Neuland brand (see Figure 3).

**Figure 3. Brand: Part-worth utilities**




In summarizing these results we can say that the most preferred (ideal) product is free-range turkey meat of the brand label Wiesenhof at a price of 7.99 €/kg. Furthermore, we can calculate the relative importance of attributes from the range of coefficients (part-worth utilities) for each. Figure 4 shows that improving animal welfare has the highest relative importance of all attributes; then come brand and price.

**Figure 4. Relative importance of attributes**




Concerning the attribute price, our analysis revealed 78 reversals by factor. Obviously the relationship between price and utility (and demand) is more complex than we initially expected.

We estimated consumers' willingness to pay for more animal welfare by calculating price equivalents for measures implemented for improving turkey husbandry systems. Since outdoor-climate houses were least preferred by the respondents, this measure was chosen as the starting point of the analysis. The price premiums consumers are willing to pay for perches, reduced stocking rates and free-range husbandry systems are displayed in Table 4. Consumers' willingness to pay is highest for free-range systems and lowest for perches.

**Table 4. Price equivalents for more animal-friendly turkey husbandry**

| Measures | Price equivalent |
|---|---|
| Perches | 0.20 €/kg |
| Reduced stocking density | 1.17 €/kg |
| Free-range system | 2.63 €/kg |

## 5 Discussion: Are More Ethics in Turkey Husbandry Economically Viable?

Comparing actual costs of more animal-friendly husbandry systems and consumers' willingness to pay for these systems is paramount for determining the economic viability of improved husbandry conditions.Table 5 summarizes the results of both analyses conducted in

this study. A third aspect taken into account here is a qualitative assessment of the contribution of each measure to more animal welfare.

**Table 5. Animal-friendly turkey fattening: Cost comparison**

| Measures | Contribution to animal welfare | Actual production costs | Consumers' willingness to pay |
|---|---|---|---|
| Perches | low | 0.012 €/kg of slaughter weight | 0.20 €/kg |
| Reduced stocking density | medium | 0.08 €/kg of slaughter weight | 1.17 €/kg |
| Outdoor-climate house | high | 0.03 €/kg of slaughter weight | least preferred |
| Free-range husbandry | very high | 0.35 €/kg of slaughter weight | 2.63 €/kg |

According to the results of our analysis, all measures seem to be economically viable and a goal conflict between ethics and economics is not visible. Nevertheless, additional costs may be caused, for instance for separating batches in slaughterhouses and retail outlets. We also know that only about 30 % of retail prices for fresh meat are due to production costs on farms (SPILLER et al., 2005) and that many retailers calculate products from organic and animal-friendly farming in a different way (SPILLER, 2001). Taking these considerations into account, consumers' espoused willingness to pay does not look as high as it does at first glance.

Nevertheless, before recommending fundamental changes in husbandry systems to turkey farmers and agricultural politicians, we would like to compare our results with data stemming from market tests carried out by two major German poultry producers. These market tests provide an opportunity to assess the validity of conjoint analysis, especially asserted willingness to pay.

The first example is taken from the PHW Group, which owns the Wiesenhof brand. PHW offers broiler and turkey meat from conventional farming, organic farming and free-range husbandry systems. Both the latter have turned out to be economic failures. Broilers from organic farming are three times more expensive in the retail stores than conventional broilers. Today broilers from organic farming account for only 0.01 % of PHW's total poultry turnover. The company also offers broilers fattened in free-range husbandry systems to consumers. These broilers are less expensive than broilers from organic farming but still twice as expensive to produce as conventional broilers. At the moment free-range broilers' share of the company's turnover with poultry meat is less than 1 %.

Similar experiences stem from market tests by Heidemark, which is one of Germany's largest producers of turkey meat. A few years ago Heidemark launched the "Extensive Turkey Fattening" program in cooperation with Greenpeace. Stocking density was reduced by 50 % compared to the usual standards in turkey fattening; prices in retail stores went up by about 20 %. After just over a year, the program had to be stopped due to a lack of consumer demand.

Both market tests confirm sceptical statements by BRÖCKER (1998) concerning consumers' willingness to pay for more animal welfare. The results of market tests lead one to suppose that consumers in fact do not care very much about how animals are raised and fattened, and that actual willingness to pay at the point of sale is much lower than asserted in the hypothetical buying situations typical of conjoint analyses. Actual buying behavior seems to be more heavily influenced by, for instance, use values such as taste and freshness (WIER and ANDERSEN, 2003).

This aforementioned discrepancy also confirms the negative assessments of the (external) validity of conjoint analysis (KRAPP and SATTLER, 2001; SATTLER and HENSEL-BÖRNER, 2001; HARTMANN and SATTLER, 2004). Although conjoint analysis is mature and the most commonly used method and is believed to have considerable advantages over, for instance, direct methods of determining how much people are willing to pay, SATTLER and NITSCHKE (2001) argue that willingness to pay is systematically overestimated due to a hypothetical bias (HARRISON and RUTSTRÖM, 2005). This bias may be largest in survey settings in which respondents are aware of socially desirable behavior such as improved animal welfare, although several attempts to reduce the problem, for example maintaining the anonymity of respondents (NANCARROW and BRACE, 2000), have been made in our study.

More than thirty years after the publication of the basic ideas of this method (GREEN and RAO, 1971) and despite continuous improvements in preference measurement, deriving allowable production costs from correctly estimated consumer willingness to pay seems to be the Achilles' heel of the attempt to find a feasible way out of the dilemma between ethical considerations on the one hand and economic pressures on the other. Market tests like those carried out by the PHW Group and Heidemark are only a very imperfect substitute since consumers are confronted with only one product offering. What is needed are systematic field studies in which different product offerings are presented and consumers' actual buying behavior is observed. Otherwise it is impossible to correctly distinguish measures for which consumers show a high willingness to pay in non-hypothetical buying situations (revealed preferences) from those for which no such willingness to pay can be observed at the point-of-sale. But, due to high costs, such field studies are only very rarely conducted. Therefore, the question whether more ethics in turkey husbandry are economically viable remains partly open.

In our study testing the external validity of conjoint analysis was not the primary concern. Therefore, some methodological shortcomings in marketing research should not obscure one's view of the more important result that, in principle, we presented a useful approach for identifying economically acceptable measures for improving animal welfare in livestock husbandry. Taking into account the ethological value of improved husbandry systems, calculating actual costs of improvements of animal welfare, deriving allowable costs from consumers' willingness to pay and comparing both the latter in order to identify possible gaps between costs and prices in the market should become a standard approach in redesigning husbandry systems. Since the approach applied here systematically presents information about the ethological and economic characteristics of husbandry systems, it can be expected to rationalize debates on livestock husbandry conditions and favor logic over emotions. This contributes to the smoothing of societal conflicts about livestock husbandry and may prevent a further deterioration of the image and legitimacy of agriculture in society.

A very similar approach may also turn out to be useful to politicians, who have to decide on stricter animal protection, environmental or food safety laws. Experiences in Germany with new legislation concerning husbandry conditions for laying hens, for instance, show that political decisions are often made without taking into account the economic consequences for farmers. Such decisions tend to force local producers out of production and favor the import of agricultural products from countries with lower standards. In the end the overall political goal of improved animal welfare is not met due to the substitution of cheaper imports for domestic production; at the same time, domestic production and jobs are lost. Being able to identify improvements in animal welfare which do not seriously harm farmers' competitiveness with foreign producers may prevent politicians from economically disadvantageous decisions.

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