

## Comparison of broiler production systems in The Netherlands

H. (Hilko) Ellen<sup>1\*</sup>, K. (Karin) Groenestein<sup>1</sup>, J. (Jan) van Harn<sup>1</sup>, I.C. (Ingrid) de Jong<sup>1</sup>, M. (Merlijn) Kense<sup>2</sup>, F. (Ferry) Leenstra<sup>1</sup>, J. (Jaap) Wagenaar<sup>3</sup>

<sup>1</sup> Wageningen UR Livestock Research, Wageningen University and Research Centre, P.O. Box 65, NL-8200 AB Lelystad, The Netherlands.

<sup>2</sup> GD Animal Health Service, P.O. Box 9, NL-7400 AA Deventer, The Netherlands.

<sup>3</sup> Central Veterinary Institute, Wageningen University and Research Centre, P.O. Box 65, NL-8200 AB Lelystad, The Netherlands.

\* Corresponding author (tel: +31 320 293504, email: [hilko.ellen@wur.nl](mailto:hilko.ellen@wur.nl))

Abbreviated title: Comparison broiler production systems

### Summary

Subsidized by the Dutch Product Board for Poultry and Eggs a study was conducted in which different broiler production systems were compared on several aspects of sustainability. The production systems involved the EU-recognized systems (regular, extensive indoor, extensive outdoor, organic), and also production systems with slower growing strains of which the poultry meat is marketed under a trade (brand) name (Volwaard, Puur en Eerlijk, Gildehoen).

We studied 'environment' (emissions to the air and the soil, energy use, carbon footprint), 'public health and food safety' (toxic components in the meat, presence of ESBL, MRSA and Campylobacter), 'animal health' (use of antibiotics, mortality) and 'animal welfare' (measures of the Welfare Quality® broiler protocol). The production costs for the different production systems were also calculated. Where available we used quantitative information. If unavailable, we tried to compare the systems on a qualitative basis. Production systems were scored against the regular broiler system as a 'standard'.

The production systems differ in a number of aspects. Consequently it is not possible to provide an overall ranking, but instead an overview was produced in which systems were compared per aspect (environment, welfare, health). The economics of the production systems are discussed in a separate paper at this conference (Vermeij *et al.*, 2014).

Keywords: broilers, production systems, alternative broilers, environment, food safety, public health, animal health, animal welfare

### Introduction\*

Regular broilers attain a weight of 2200g at 40 days of age. They are kept in barns with litter flooring and are started with a density of about 20 chicks/m<sup>2</sup>. Organic (meat) chickens are kept in the same type of barn, but with access to an outdoor run and are kept at a density of about 8 chicks/m<sup>2</sup>. They are slaughtered from 70 days of age onwards at a weight of about 2600g and are of a different genotype than regular broilers.

Besides regular and organic broiler production there are 'in between' systems for poultry meat. These systems are an answer to increasing criticism from societal organisations towards regular broiler production. Because of the differences between the production systems in quite a number of aspects we compared the broiler production systems in The Netherlands on as many aspects as we could get data on.

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\* This paper is based on the summary of the report of Ellen *et al.*, 2012

In the comparison the EU-recognized systems (regular, extensive indoor, extensive outdoor, organic), and production systems of which the poultry meat is marketed under a trade (brand) name (Volwaard, Puur en Eerlijk, Gildehoen) were involved. Dutch retail also imports and sells speciality poultry meat as Label Rouge from France and organic poultry from Belgium. These foreign production systems are not included in the comparison.

## Methods

When possible we used quantitative information. If quantitative information was lacking, we tried to compare the systems on a qualitative basis. In the table below the comparison of the main systems for various aspects is summarized in a qualitative way. The regular production system is taken as starting point and for the other systems we indicated if they score higher or lower than the regular system. A '-' implies that this aspect has a lower score, and a '+' that this aspect has a higher score. '--' and '++' are used to compare the other systems among each other. **Depending on the aspect a higher score can be 'better', but also 'worse'**. For example, a '+' for risk on avian influenza implies a higher risk for disease outbreak and thus is 'worse'. A '+' for mobility, however, implies better walking ability among the chickens and thus is 'better'. 'Better' and 'worse' are value judgments and different people very well might have different value judgments for the same aspect. We therefore did not consider it appropriate to provide a table based on 'better' and 'worse'.

Volwaard and Puur en Eerlijk generally are similar to 'extensive indoor', although in the near future more and more broiler farms will have the (compulsory) 'wintergarten' (covered outdoor run) installed. Gildehoen is in between 'regular' and 'extensive indoor'.

In this paper the different aspects are discussed briefly. The authors did not rank or weigh the different aspects relative to each other to provide an overall score for a broiler production system. Weighing different aspects, again, is dependent on value judgments. It is very likely that different people attach different weights to the aspects. In comparing the current broiler production systems, none of them is 'better' for all aspects simultaneously. Or, dependent on the priorities of the consumer for (aspects of) animal welfare, environment, food safety, price, etc., different production systems will be favoured. Being the 'best' for all aspects of broiler production simultaneously is an enormous challenge. However, the differences between the current systems and the discussions on what is better and why, are important leads for social learning on how to set real steps for sustainability.

## Results

*Environment.* The non-regular systems have a lower emission of ammonia and odour and a slightly higher emission of dust per chick place. Per kg live weight (slaughter ready) is the emission of ammonia, smell and dust in all non-regular systems higher than for regular broiler production. Phosphate and nitrate emission to the soil only occurs in systems with an outdoor run. Exact data on soil pollution in the run are not available.

The non-regular systems use per kg poultry meat more (fossil) energy and feed than the regular system. Together this implies a higher carbon foot print for the non-regular systems compared to the regular system of broiler production. Due to the higher feed consumption and to some extent to the lower housing density the non-regular production systems have a higher land use requirement than the regular system.

*Public health and food safety.* With regard to public health are chickens with an outdoor run a limited higher risk for development of avian influenza infections compared to chickens kept indoor. There are no significant differences between production systems for toxic components. About as many regular and organic breast filet samples are positive for ESBL, but the quantity of ESBL-producing bacteria is lower on organic meat compared to regular

meat. Published data on MRSA date from 2008 and 2009. In those years regular poultry meat was more often positive for MRSA than organic poultry meat. Campylobacter is found least in regular poultry, more in 'extensive indoor' poultry, while in organic and extensive outdoor the highest percentage of positive flocks was found.

*Animal health.* For Dutch poultry meat production systems the differences in animal health are small. In the non-regular systems less antibiotics are used.

*Animal welfare.* Foot pad and hock dermatitis occur less among extensive indoor raised chickens than among regular chickens. Organic chickens have a higher prevalence of foot pad and hock dermatitis than regular or extensive indoor raised chickens. Chickens from non-regular systems have a higher walking ability than chickens from regular systems and show less symptoms of heat stress. The chickens from the non-regular systems score higher in the QBA test (positive emotions) than chickens from the regular systems.

## **References**

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Table: Qualitative comparison of broiler production systems for a range of aspects.  
Depending on the aspect a higher score (+) can be 'better', but also 'worse'.

Main category	Aspect	Compared to regular is		
		Extensive indoor equal (0), higher (+), or lower (-)	Extensive outdoor	Organic
Environment	Odour, NH <sub>3</sub> and dust emission per kg product	+	++	++
	Odour and NH <sub>3</sub> emission per chick place per year	0/-	0/-	0/-
	Dust emission per chick place per year	0/+	0/+	0/+
	Emission (P and N) to the soil (per range area)	0	+	+
	Energy use (per kg product)	+	+	++
	Kg feed per kg product	+	++	++
	CO <sub>2</sub> -emission per kg product (Carbon footprint)	+	++	++
	Land use	+	++	++
	Public health and food safety	Dust emission	?	?
Risk for avian Influenza		0	+	+
Dioxins		0	0	0
Residuals of antibiotics		0	0	0
MRSA		?	?	-
ESBL		?	?	-
Salmonella		0	?	-
Campylobacter				
Labour conditions	?	?	?	
Animal health	Mortality (registration DR <sup>2</sup> )	0	0	0
	Mortality (feed company)	0	-	?
	Risk for avian influenza	0	+	+
	Use of antibiotics	--	-?	--?
Animal welfare	Mortality (inventory De Jong)	0	0	0
	Foot pad dermatitis, hock dermatitis, breast irritation/blisters	-	(-) <sup>2</sup>	+
	Hock dermatitis (registration DR <sup>1</sup> )	-	-	+
	Laxy litter	+	(0) <sup>2</sup>	(0) <sup>2</sup>
	Dirtiness chickens	-	-- <sup>2</sup>	(+) <sup>2</sup>
	Mobility (gait)	+	+	+
	Rejects (% of flock)	0	0	0
	Heat stress	-	--	--
	Density (outdoor run, if available, included)	-	--	--
	Availability outdoor run	+ <sup>3</sup>	++	++
	Environmental enrichment	+	+	+
QBA <sup>4</sup> score for behaviour	+	0	++	

0 = equal to regular; - = less than regular; + = more than regular; -- = much less than regular; ++ = much more than regular;

? = no or insufficient data available; ++? = based on limited number of data.

<sup>1</sup> DR= Netherlands Enterprise Agency, registration of all flocks

<sup>2</sup> According to De Jong *et al.* (2011), based on a limited number of flocks.

<sup>3</sup> Covered outdoor run included.

<sup>4</sup> Qualitative Behaviour Assessment.