WUR and the ASG

Visit to WLR and CVI

Feb 12 2014

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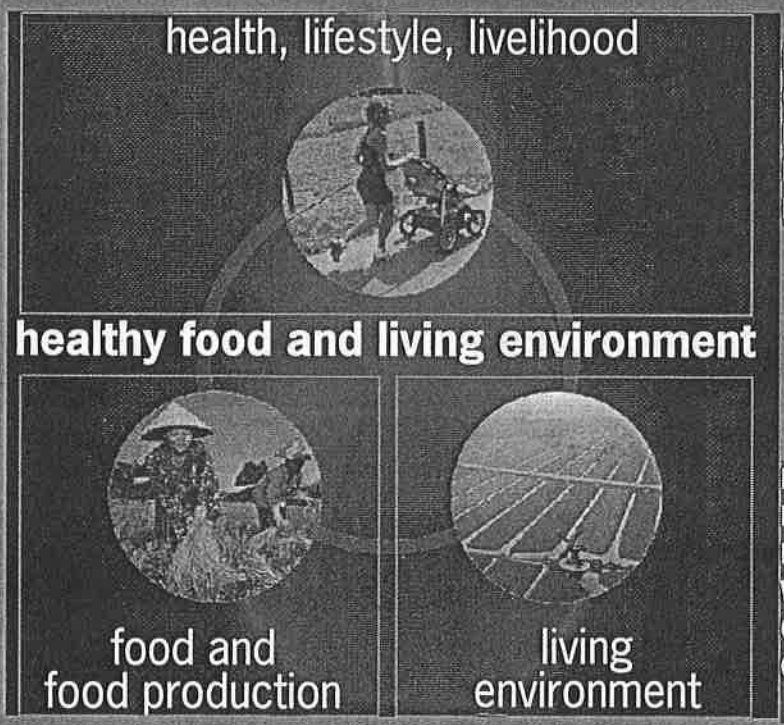
Wageningen UR: our domain



Behaviour/perception
Consumer/citizen
Institutions
Food & Agric Policy
Food security

Agric. & fisheries
Inf. animal diseases
Nutrition & health
Bio-based products
Food prod. chains
Food safety

Marine resource mmt
Landscape / land-use
Nature & biodiversity
Water management
Climate change
Competing claims

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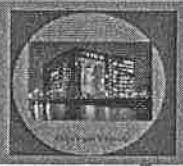
Wageningen UR: organizational structure



Supervisory Board

Executive Board

Concern staff

Facility Services

Agrotechnology & Food Sciences Group	Animal Sciences Group	Environmental Sciences Group	Plant Sciences Group	Social Sciences Group	Wageningen Business School
Wageningen University					Wageningen International
Agrotechnology & Food Sciences	Animal Sciences	Environmental Sciences	Plant Sciences	Social Sciences	
Applied Research Institutes					IMARES
Food & Biobased Research	Livestock Research & Central Veterinary Institute	Alterra	Plant Research International Applied Plant Research	LEI CID	RIKILT

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WageningenUR Livestock Research

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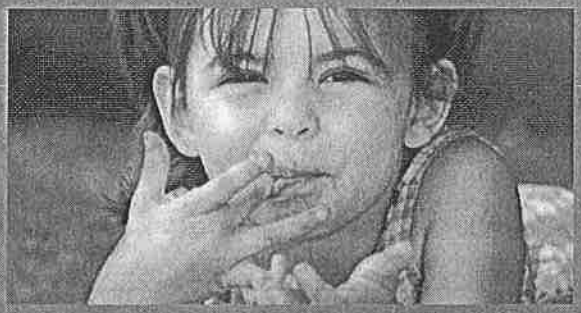
mission Wageningen UR Livestock Research



Wageningen UR Livestock Research develops knowledge for a sustainable and profitable livestock industry, translates this into practice-oriented solutions and innovations, and ensures that this knowledge is disseminated.

Together with our clients, and on the basis of practical experience, we integrate our scientific know-how in the areas of the nutrition, genetics, welfare and environmental impact of farm animals to produce livestock concepts for the 21st century.

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WageningenUR Livestock Research Departments

- Genomics
- Animal Nutrition
- Animal Welfare
- Environment
- Livestock Systems

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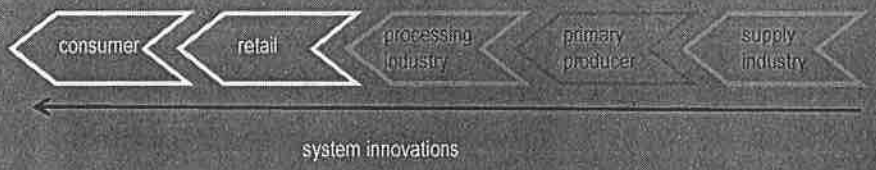
Domain Livestock Research

1. primary producer: farm
2. supplier industry
3. processing industry
4. system innovations: interaction of primary producer with farm animals and society



system innovations

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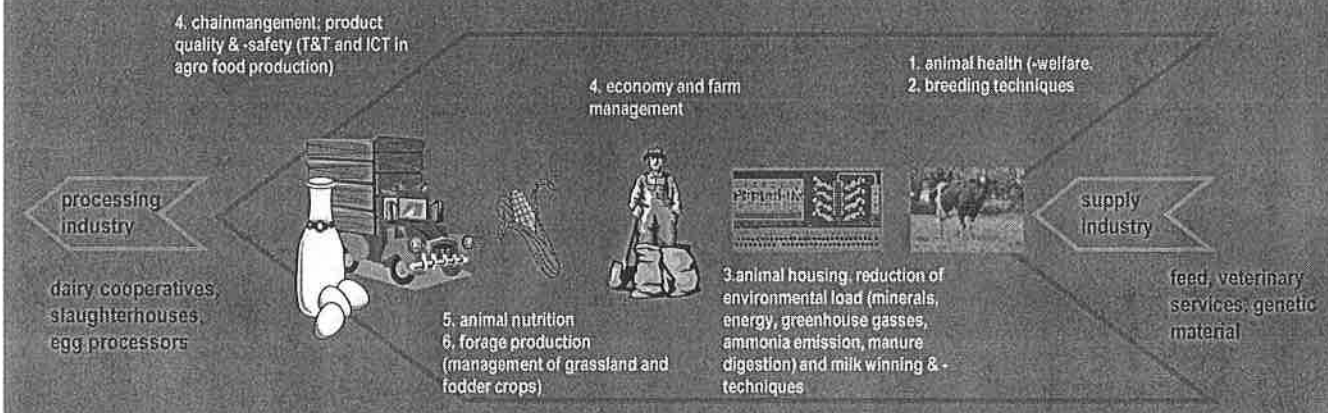
Primary producer



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WLR Scientific tasks

- Antibiotics free livestock farming
- Reduction methane production cattle
- Phosphate and energy from manure
- Selection on social behavior
- Feed and health: systems biology of gut functioning
- "Free" husbandry systems
- Adaptation biology
- Monitoring of individual animals in a group

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Innovation Centers Livestock Research

Schothorst

Dairy Campus

VIC Sterksel

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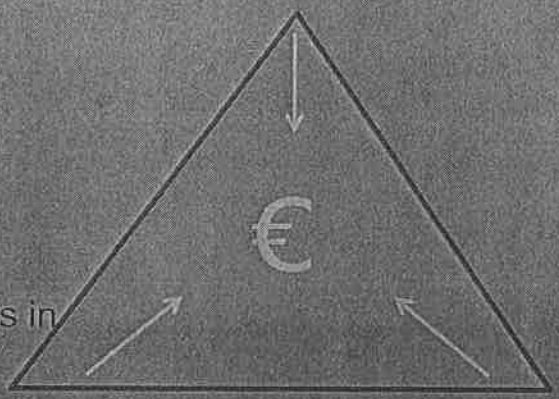
The key to succes: "golden triangle" Innovations by Public Private Partnerships

Government: policy agenda & priorities



Private sector: compelling limitations in their own R&D

Knowledge institutions: Vision & competencies

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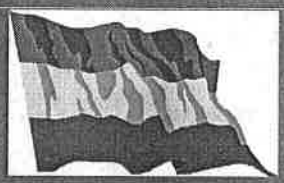
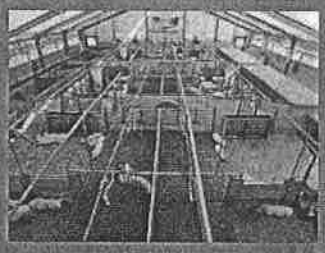
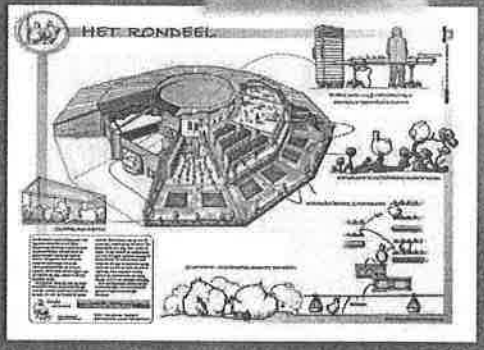
Innovative Leadership







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New Livestock Concepts with Farmers

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Central Veterinary Institute, part of Wageningen UR

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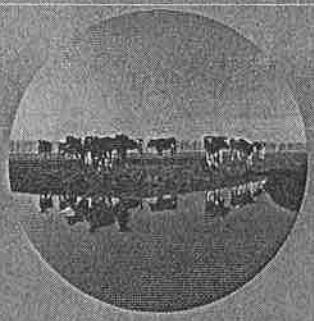
Our mission statement



Protecting animal and public health through top level veterinary research.

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Organization Central Veterinary Institute

Director

Andre Bianchi

Animal technology
Henk Sloetjes

General staff

Virology

Riks Maas

Bacteriology & TSEs

Hendrik-Jan Roest

Epidemiology, Crisis Org. & Diagnostics
Johan Bongers

Infection Biology

Annemarie Rebel

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Location Houtribweg, Lelystad

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Location Edelhertweg, Lelystad

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We are

- National reference laboratory for all important animal diseases
- International reference laboratory for Campylobacter, Aujeszky's disease, CEM, Q fever
- One of the top 5 veterinary research institutes in Europe
- Reliable and transparent partner for government and industry

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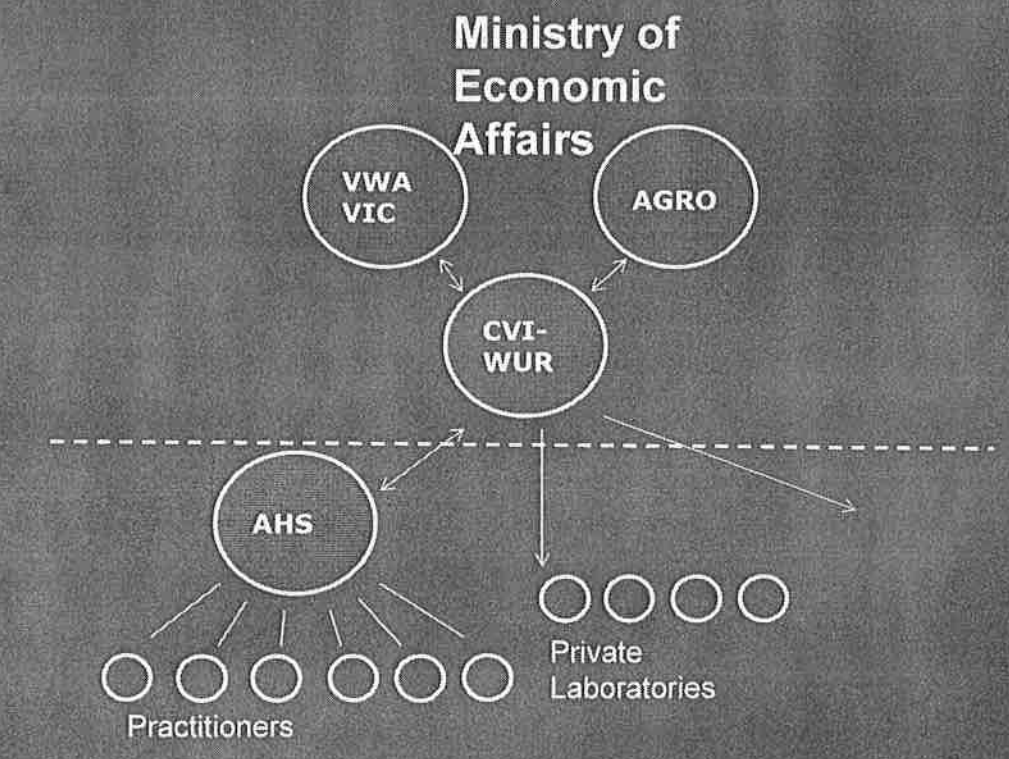

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Our clients

- Dutch ministries (including Ministry of Economic Affairs and Ministry of Public health, welfare and sports)
- Industries and providers of service: veterinary pharmaceutical, biotechnology, food, meat
- European Union

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Facilities

- Laboratories for bacteriology, virology, pathology, fish diseases
- High Containment Unit for high contagious pathogens (BSL 4 veterinary, including BSL 3 human)
- Experimental animal facilities for laboratory animals and farm animals
- Surgery facilities

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International collaboration

- Coordinator EU-projects (NoE, IP TB-VAC, many STREP projects)
- Participation in many networks (Venomyc, MED-VET-NET, Neuroprion)
- CoVetLab (5 European reference laboratories)
- EPIZONE
- Working groups ETPGAH
- ERANET
- EFSA panels and working groups
- INRA
- UTMB (CCHF) and Univ. Collorado (RVF)

Specific research topics

- (Re)emerging infectious diseases and zoonoses like vector borne: APP, BTV, RFVV, CCHF
- Antibiotics resistance
- Host-pathogen interaction/PRRSV
- Gut Health
- Avian Influenza
- Strep. Suis, Q fever
- Epidemiology and risk assessment

Crisisorganisation

- 24/7 available
- Crisis scenarios + exercises
- Advice and diagnostics during the crisis
  - 1990: Classical Swine Fever (CSF)
  - 1992: CSF and Swine Vesicular Disease (SVD)
  - 1994: SVD
  - 1997/98: CSF
  - 2001/03: BSE
  - 2001: Foot and Mouth Disease (FMD) and Anthrax
  - 2003: Avian Influenza (AI)
  - 2006: AI, CSF, Bluetongue virus (BTV)
  - 2007-2010: BTV
  - 2009-2010: Q-fever
  - 2011-2012: Schmallenberg virus (SBV)

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Working on approx. 25 virus diseases

- Foot and mouth disease
- Classical Swine Fever
- Rinderpest
- Newcastle disease
- Avian Influenza
- African Swine Fever
- Bluetongue
- Schmallenbergvirus
- African horse sickness
- Bovine leukosis
- Sheep pox and goat pox
- Peste des petits ruminents
- Riftvalley fever
- Vesicular diseases
- Aujeszky's disease
- Rabies
- Fish and shellfish diseases

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Working on approx. 70 bacterial /prion diseases

- Salmonella
- Campylobacter
- Tuberculosis
- Brucellosis
- BSE
- Scrapie
- CEM
- Malleus
- American foulbrood
- Psittacosis
- Q fever
- Botulism
- Contagious bovine pleuropneumonia
- Leptospirosis
- Fish and shellfish diseases
- Wild life mortality
- Antibiotics resistance

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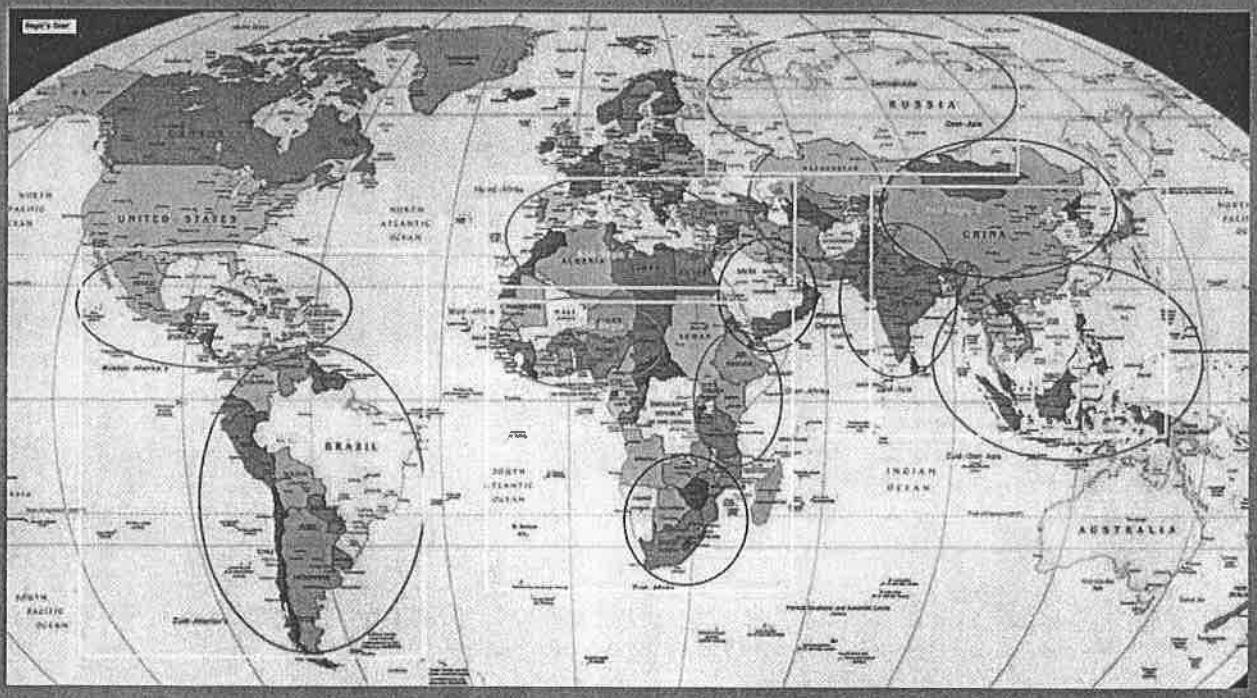
International activities ASG



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Thank you for your attention

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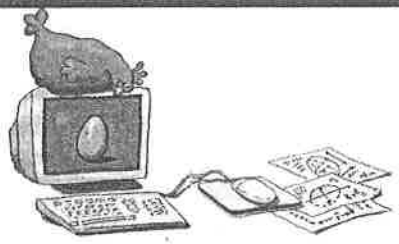
http://www.cvi.wur.nl/uk

Innovations in Poultry Production Systems

Sander.lourens@wur.nl



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Innovations in Poultry Production Systems

- Healthy Poultry in a Healthy Production System
- Incubation and chick quality
- Care for young chicks
  - *Hatchbrood*
  - *Patio*
- System Innovations: Broilers with taste (Sum of Parts; Winds of change)
- Knowledge exchange programs

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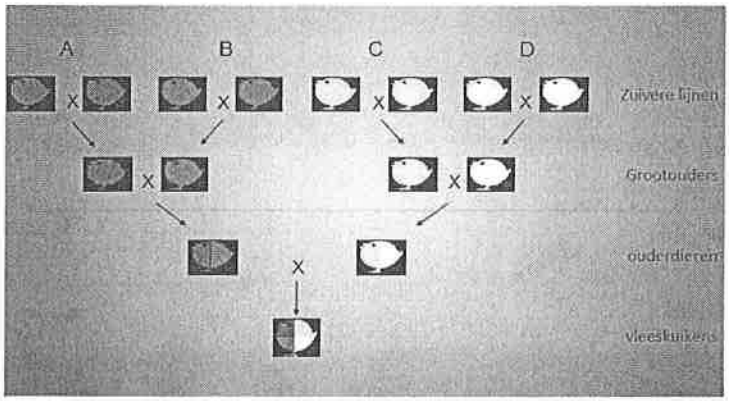
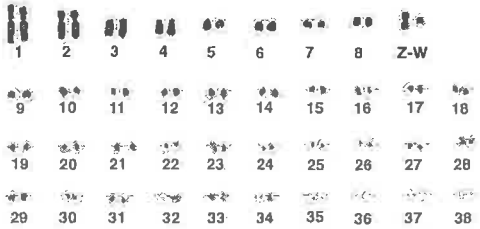
The broiler meat chain





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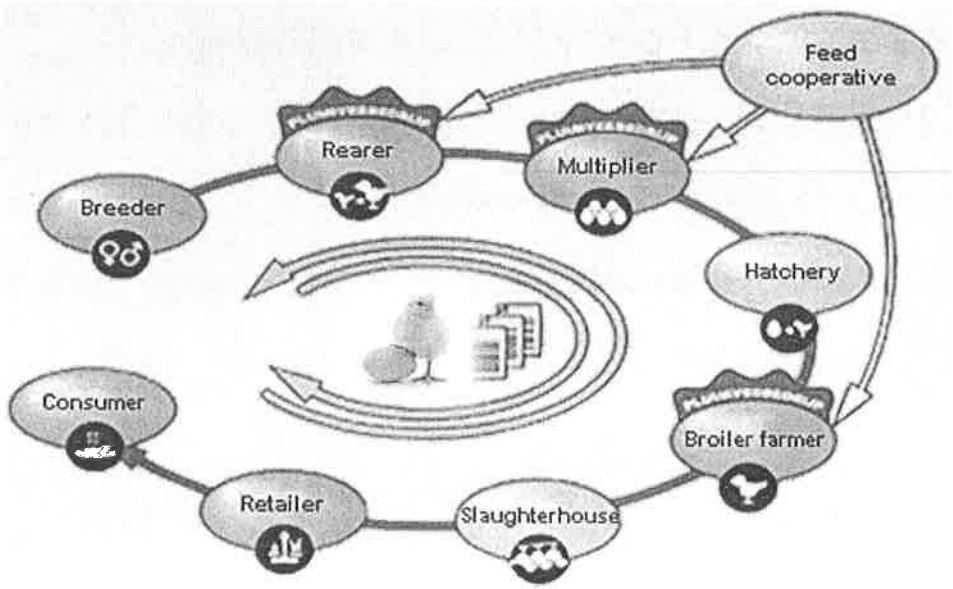
A healthy broiler meat chain



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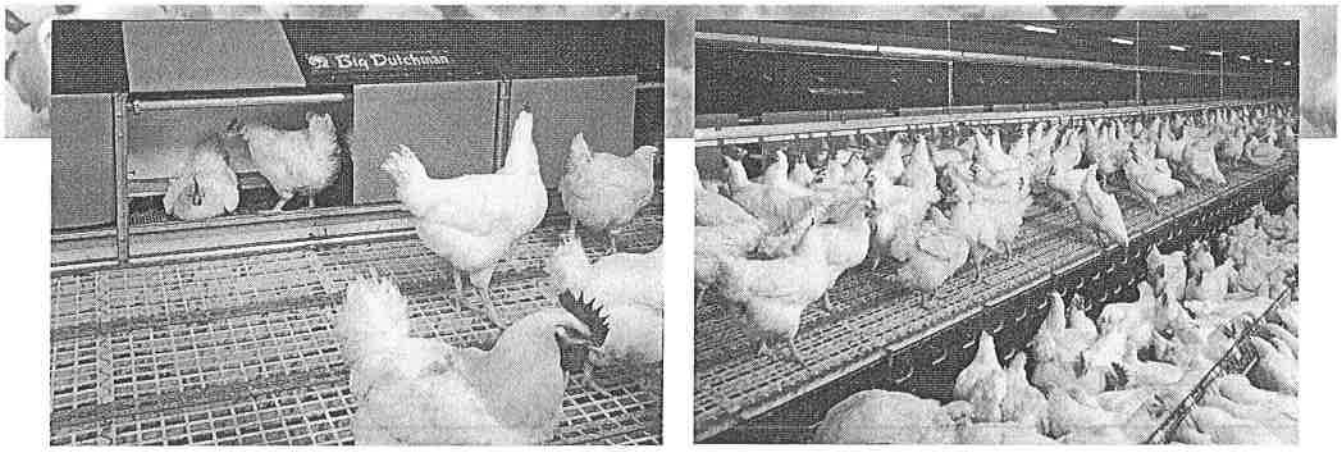

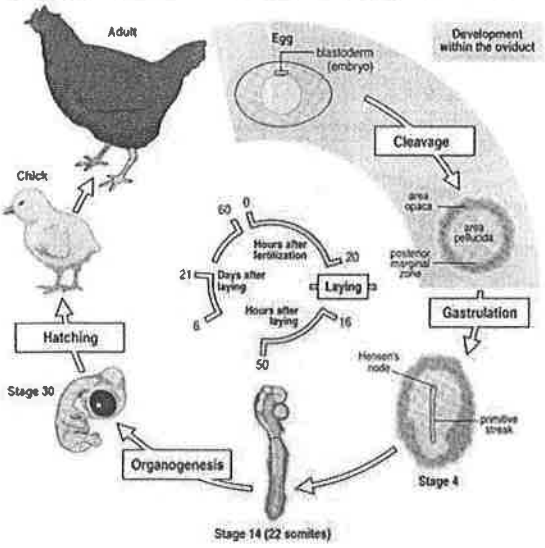

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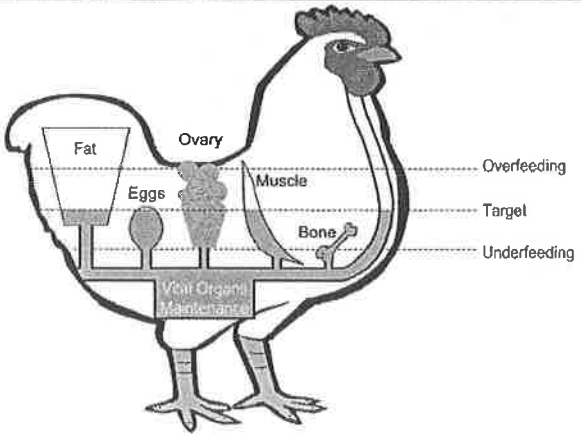

Large effects of rearing and breeder farms on offspring performance!!

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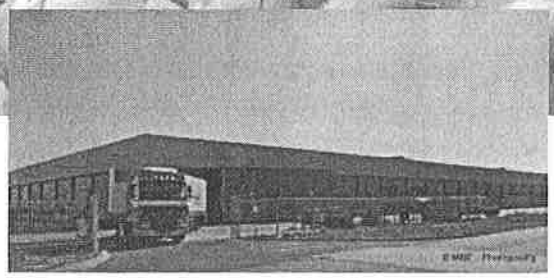
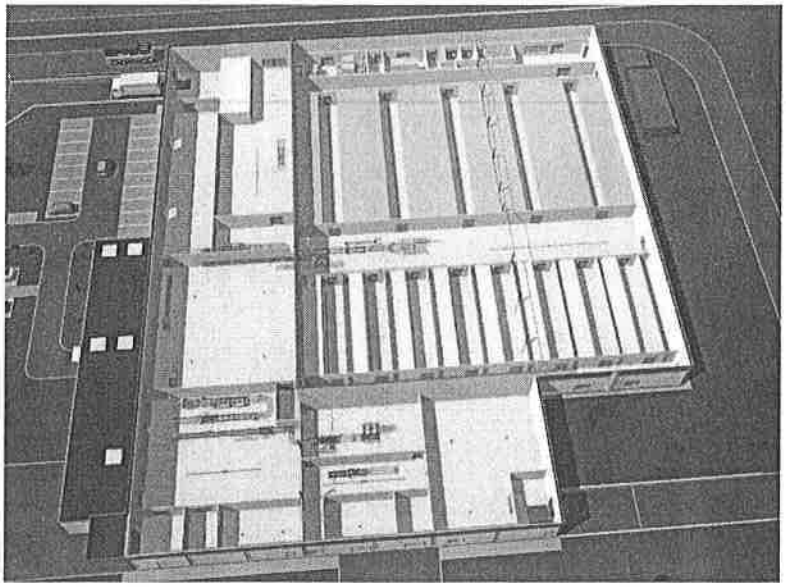


1-2 million chicks per week



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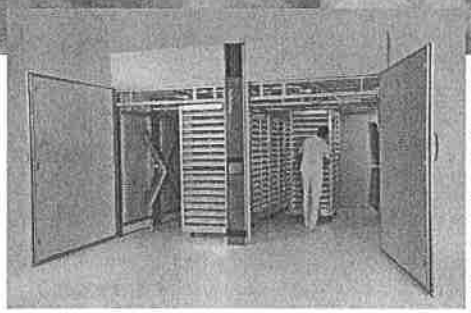
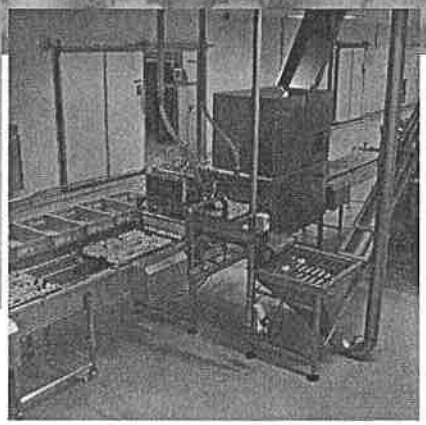
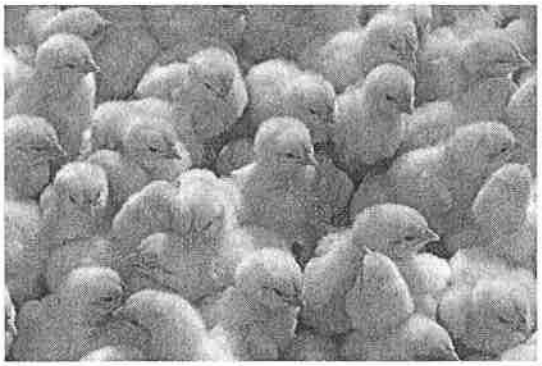
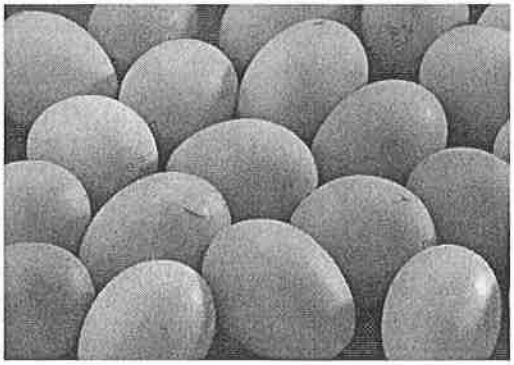




Embryonic development





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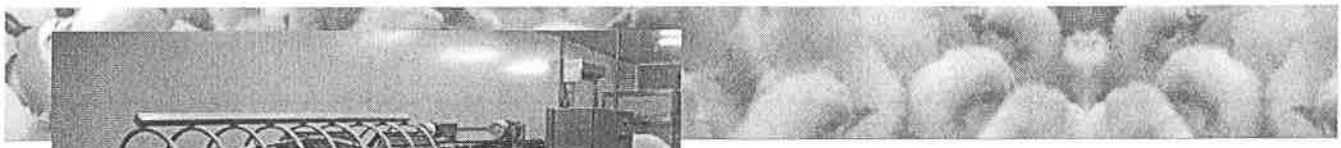

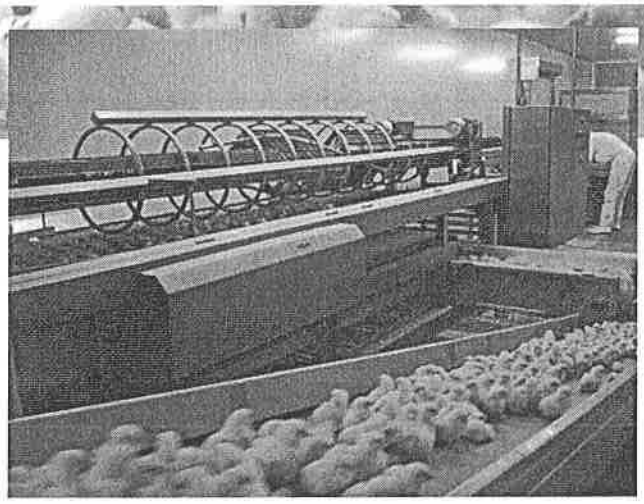

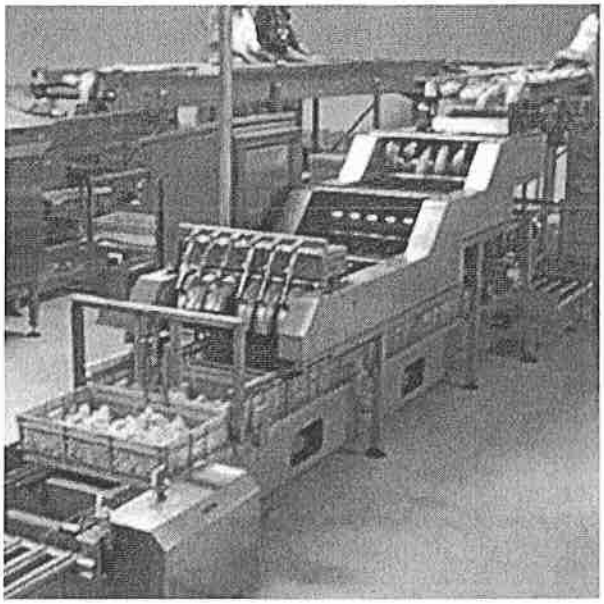

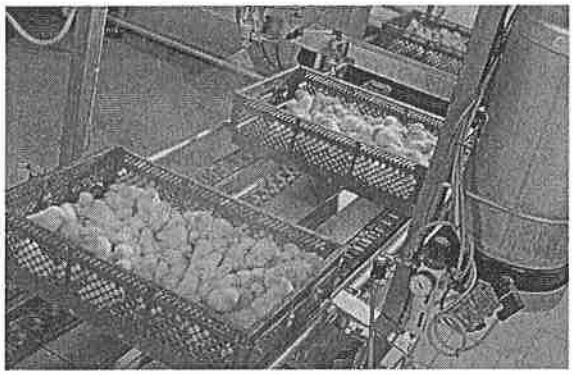

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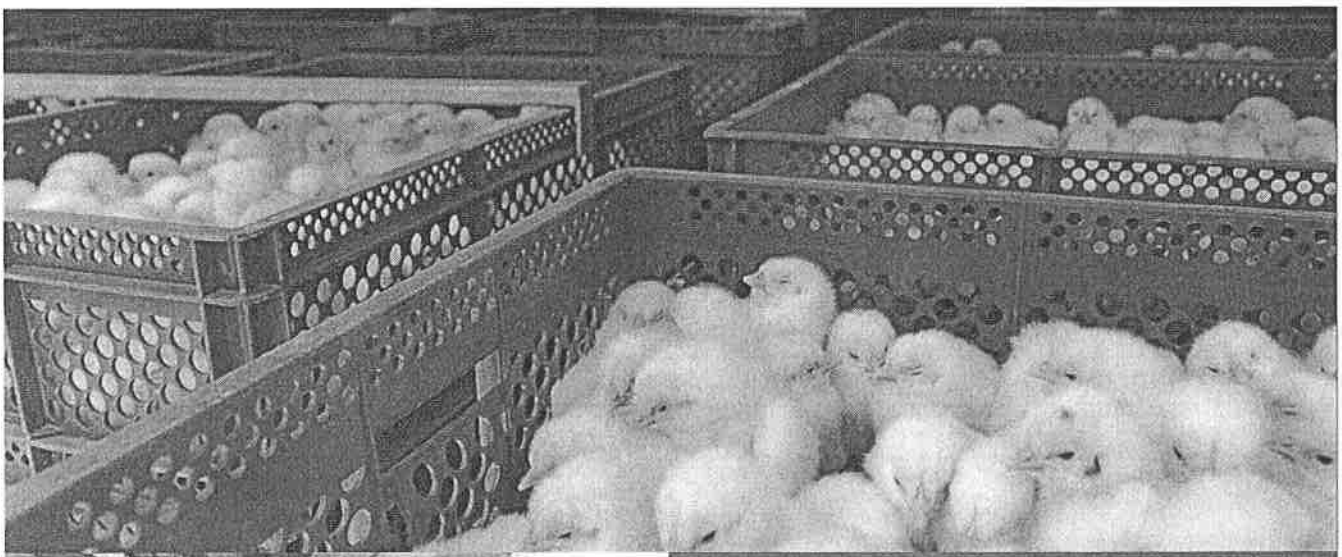

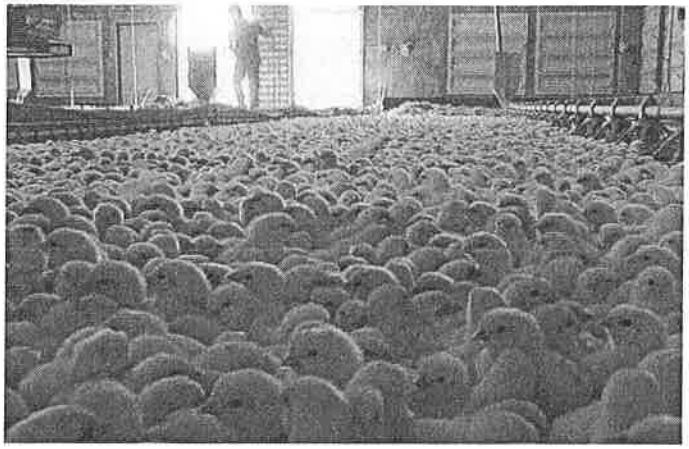

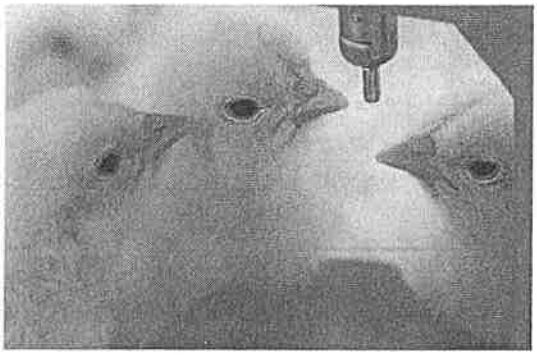

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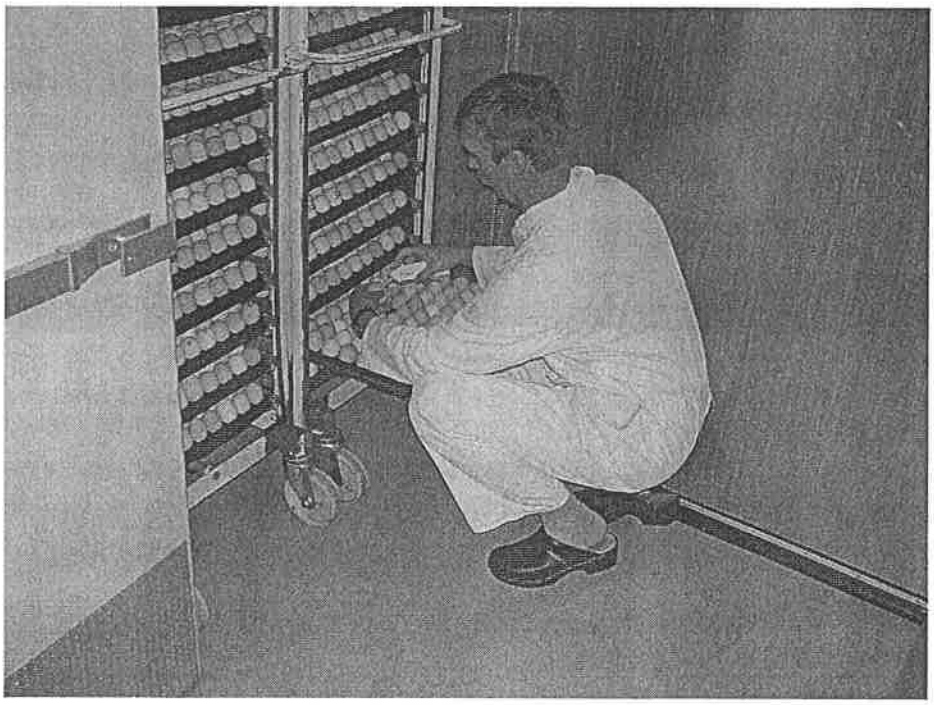

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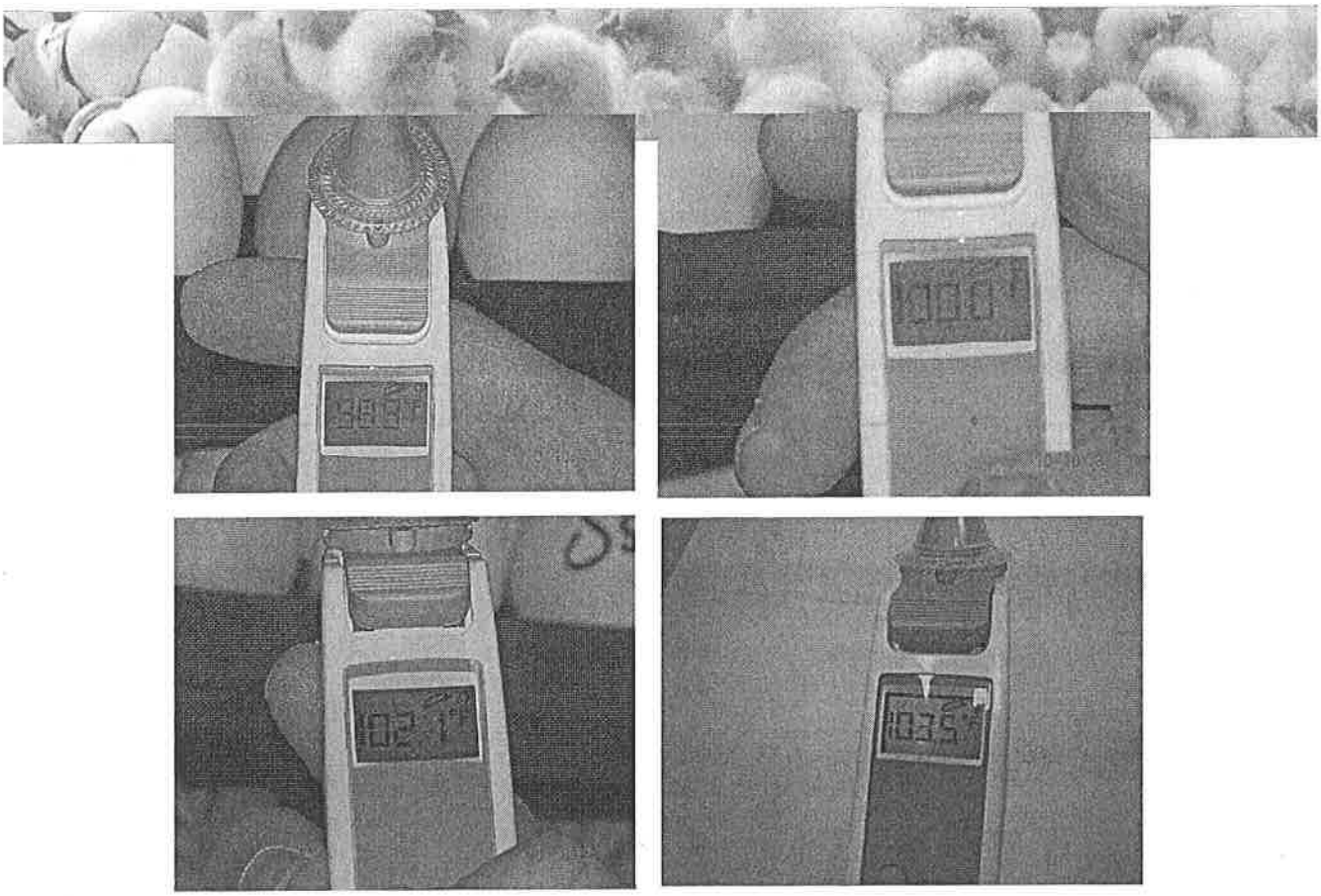

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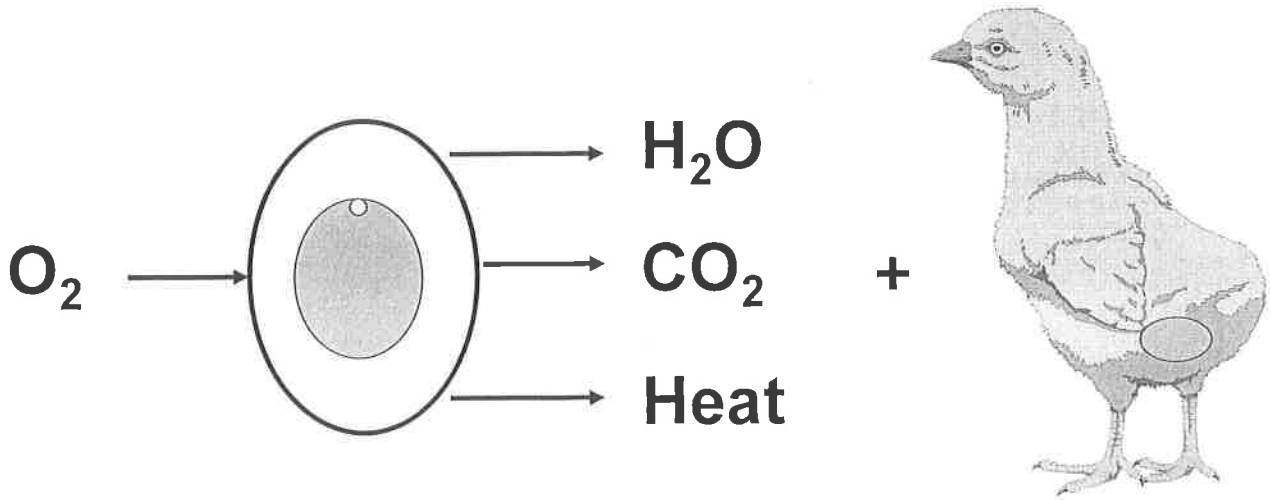
The incubation process



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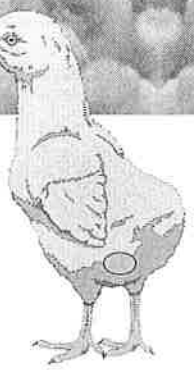

38 + 2 g

O_2 →

60 g egg

→ H_2O

→ CO_2 + of

→ Heat

Embryo temperature

37.8°C = optimal

32 + 8 g

Poor development

- mortality
- diseases
- Poor technical results

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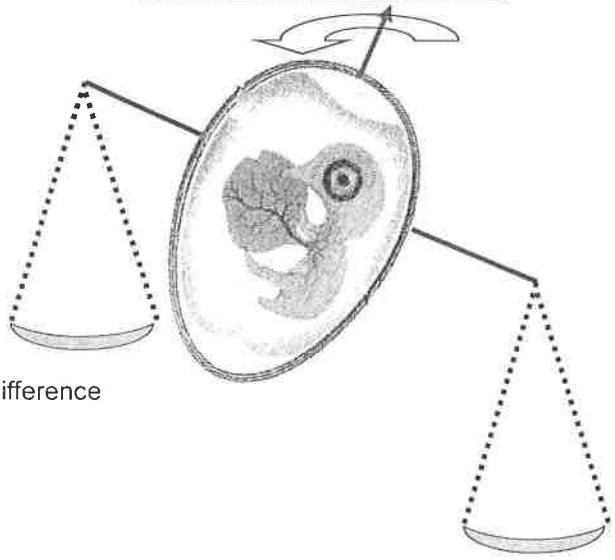
Embryo temperature (°C)

36.0 36.5 37.0 37.5 38.0 38.5 39.0 39.5 40.0



Heat loss

- Evaporation
- Heat transfer
  - temperature difference
  - heat capacity
  - air velocity

Heat production

- Time / development
- Physical factors
- Biological factors
- Environmental factors

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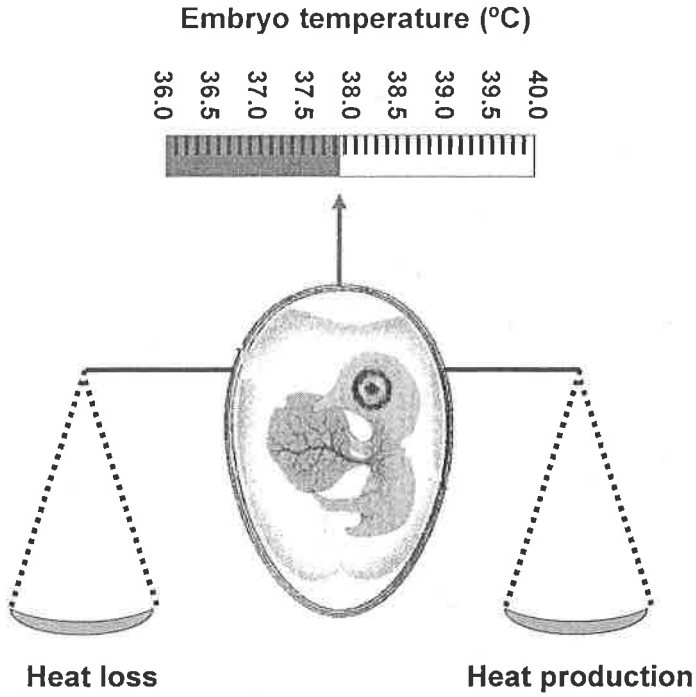

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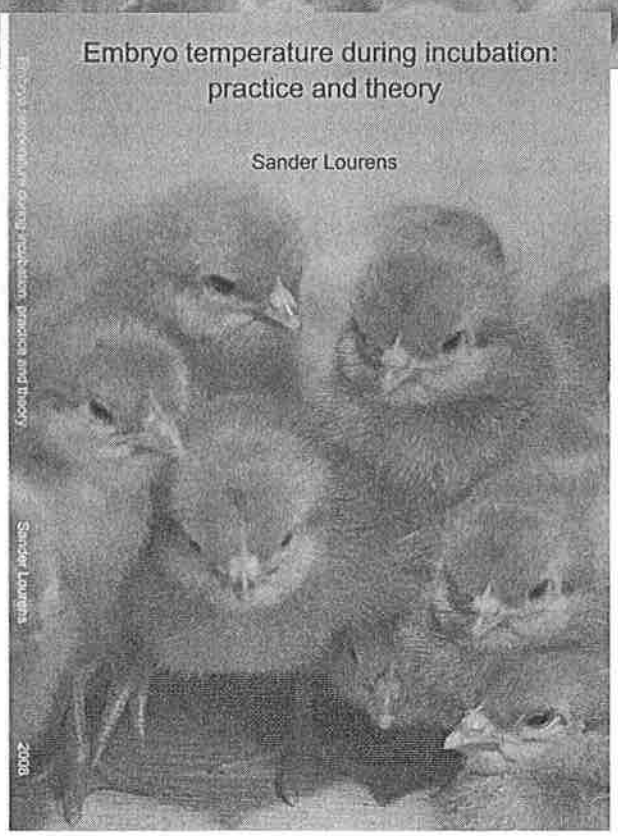

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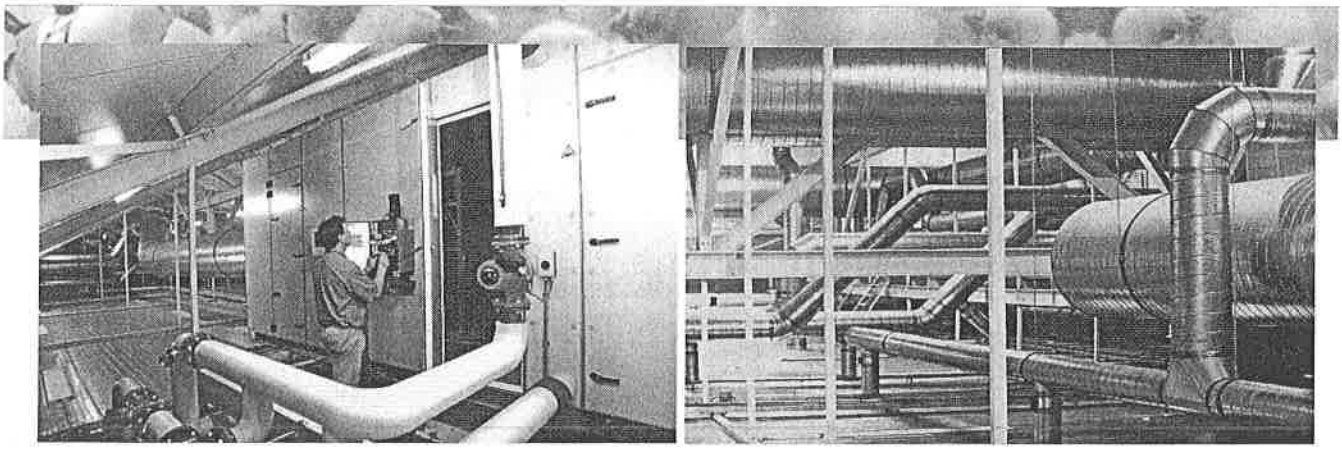

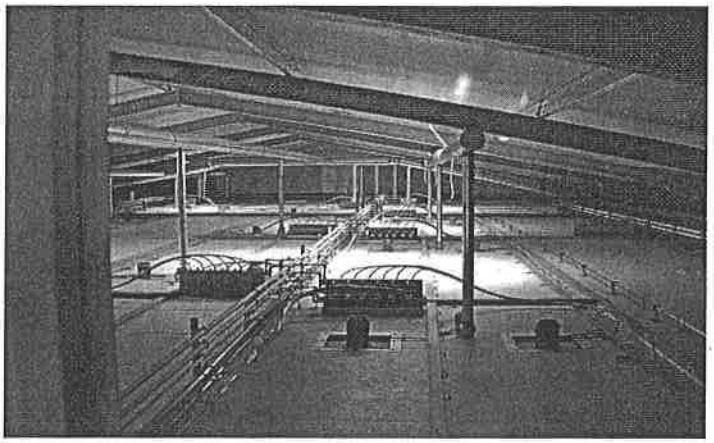

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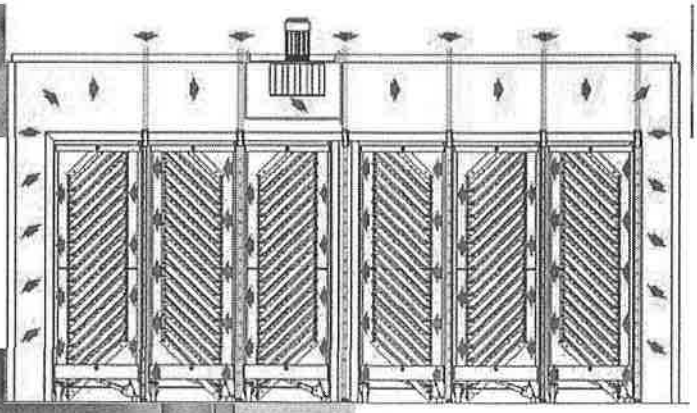
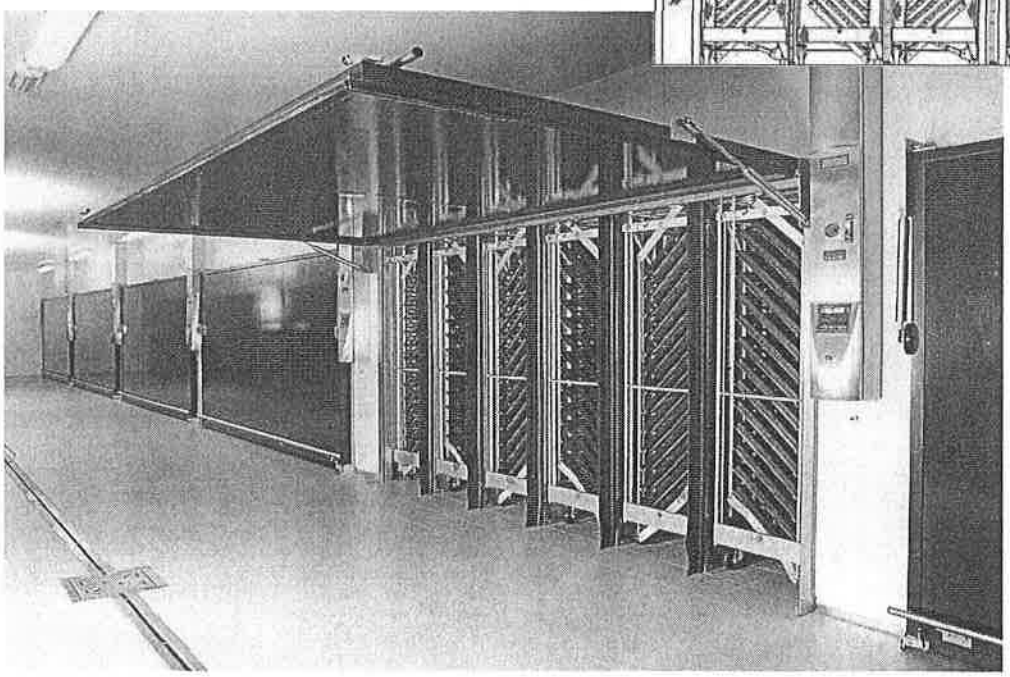
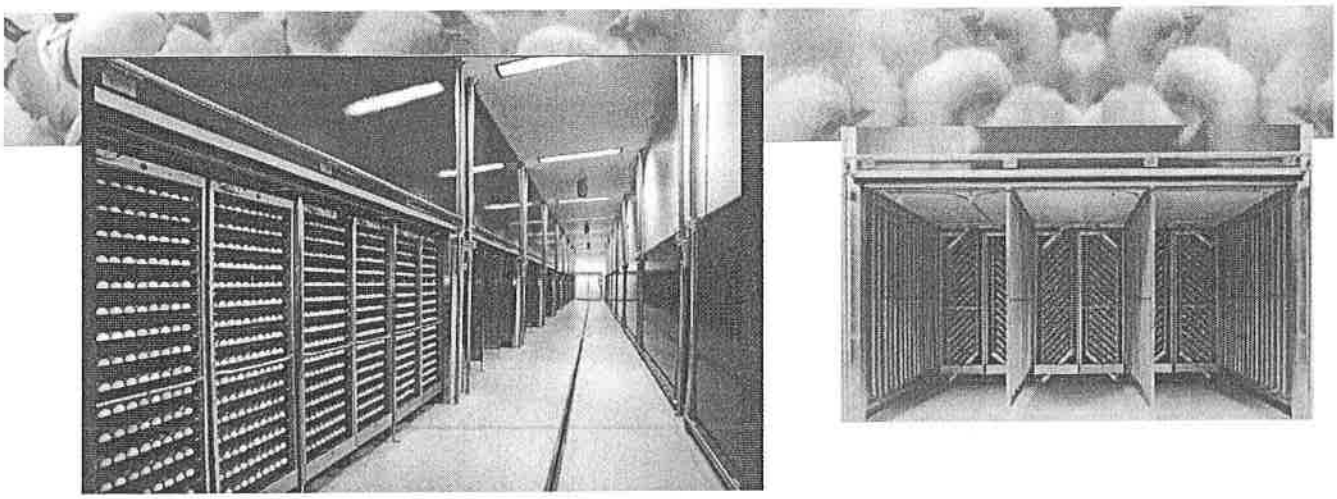
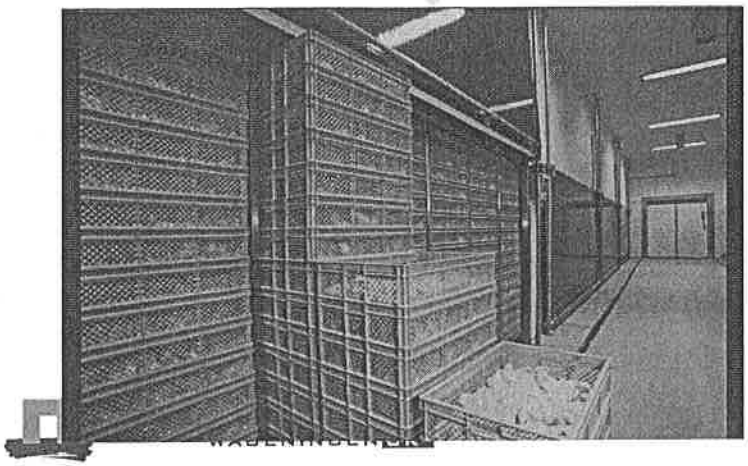
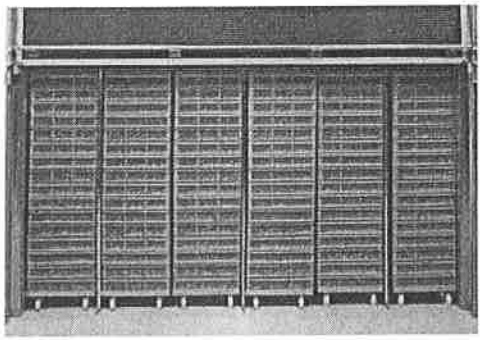


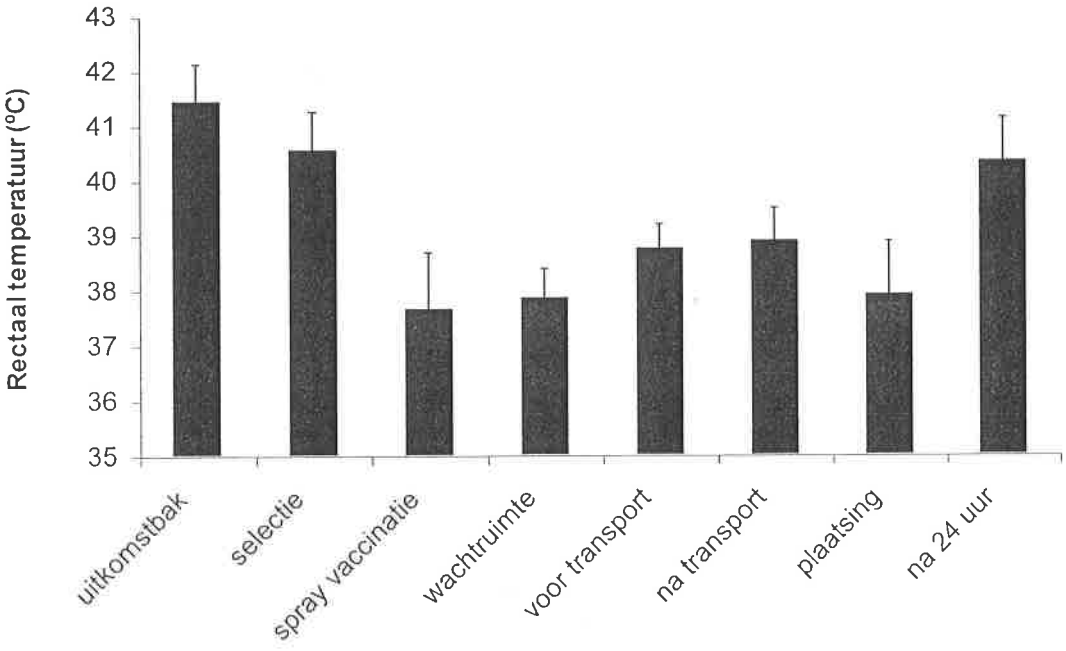


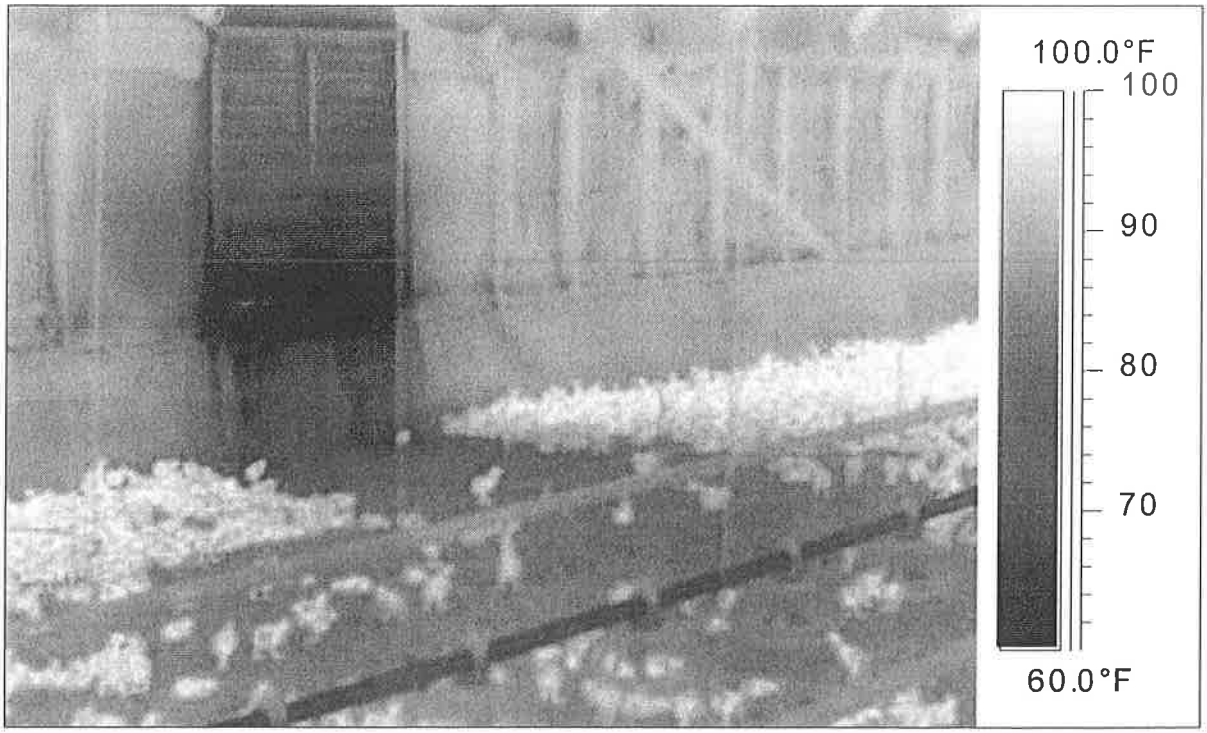






Opvang van eendagskuikens





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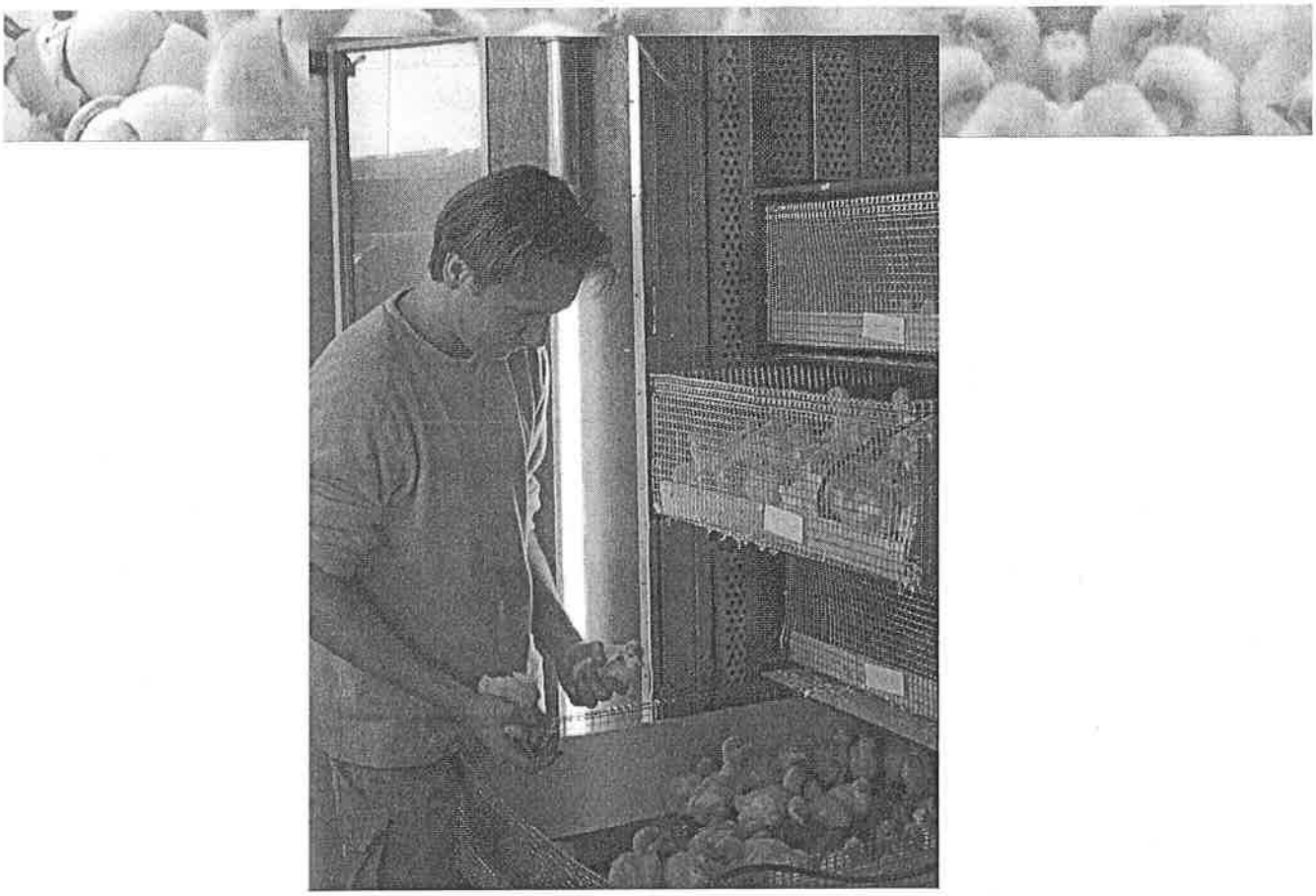
Hatchbrood broilers

All efforts are lost when chicks are placed at the farm under wrong conditions!!

- First week high care unit
- Feed and water available
- Chick temperature: measured and “set” at 40,5ºC



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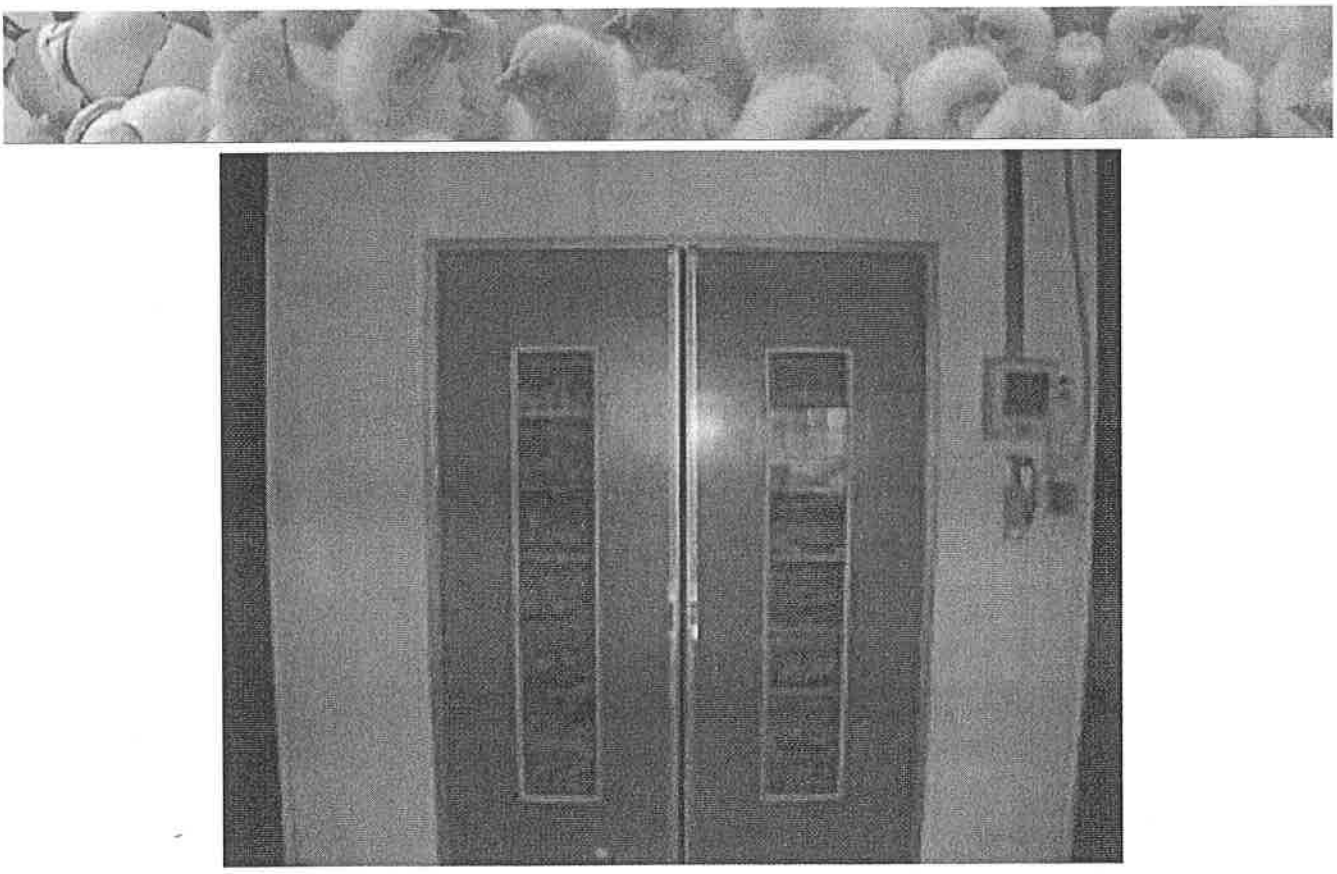

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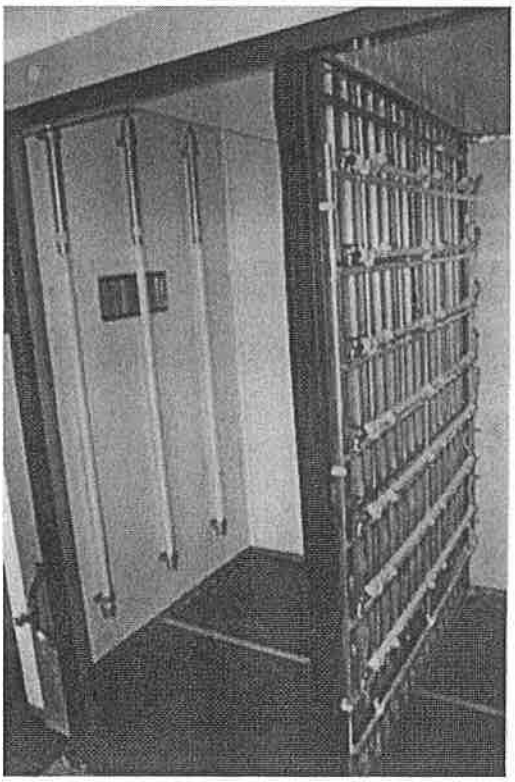

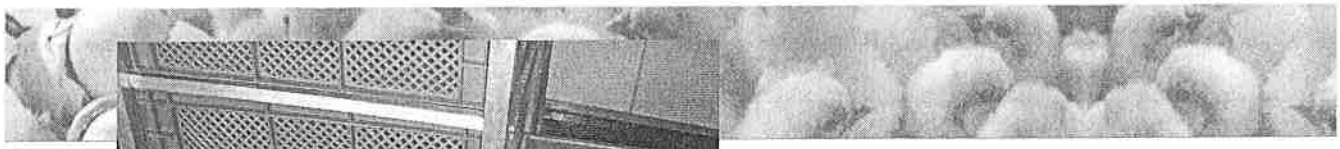

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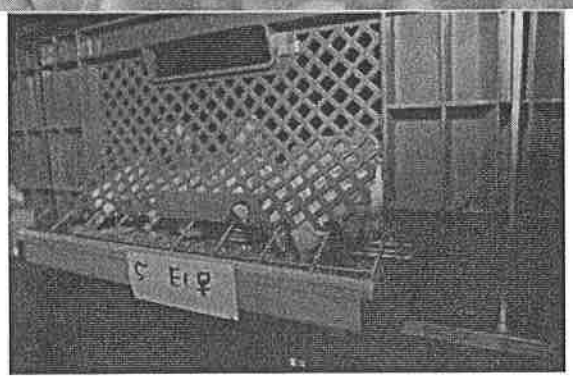

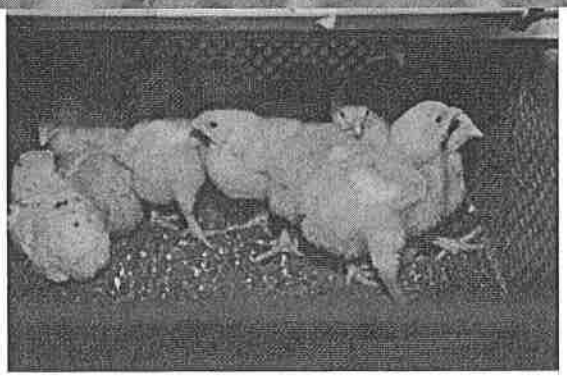

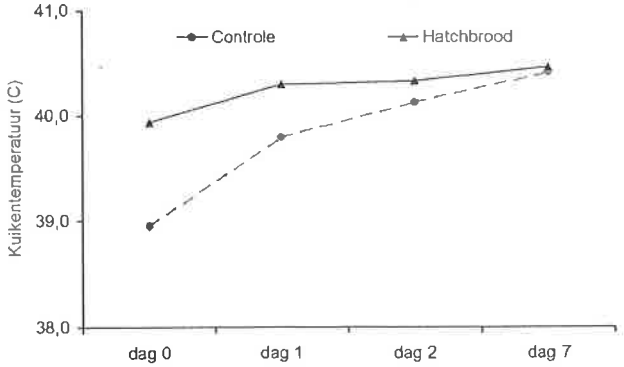

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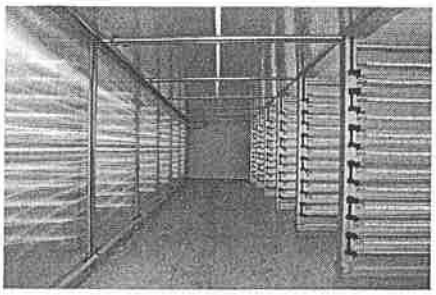
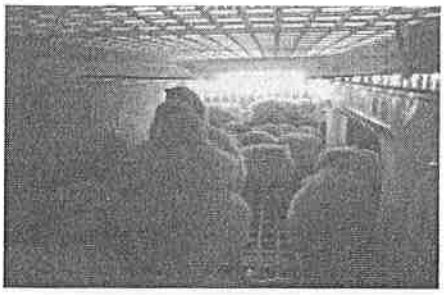
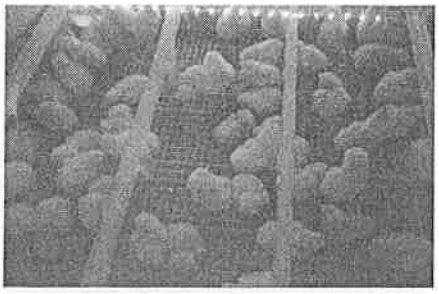
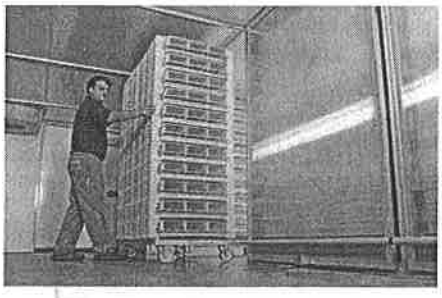
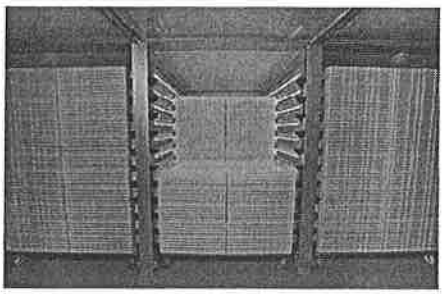
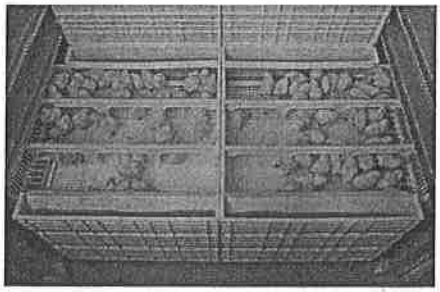
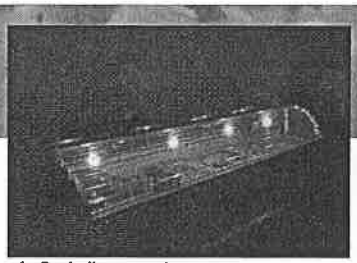
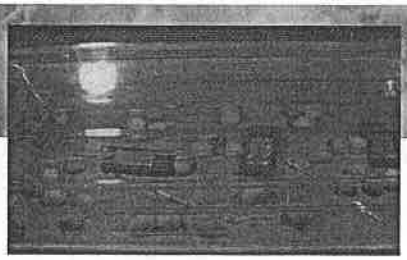




HATCHTECH
PROVIDING SUPERIOR CHICK QUALITY

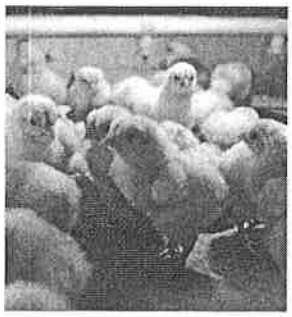
HATCHBROOD
BROODING CONTROL


1. De kuikenmoeder


2. Temperatuurloggers en 80 broedeieren


3. 78 eieren kwamen uit; 2 onbevrucht


4. Na uitkomst: slapen



5. Dan pas drinken en eten

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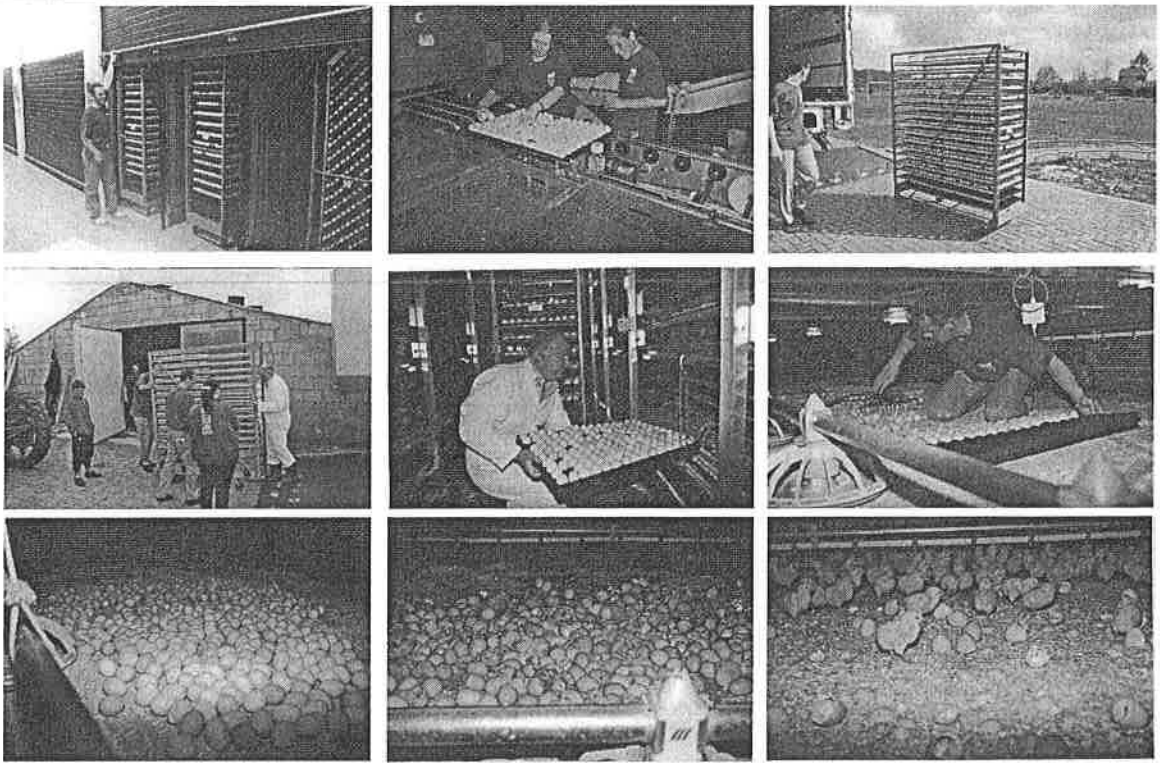

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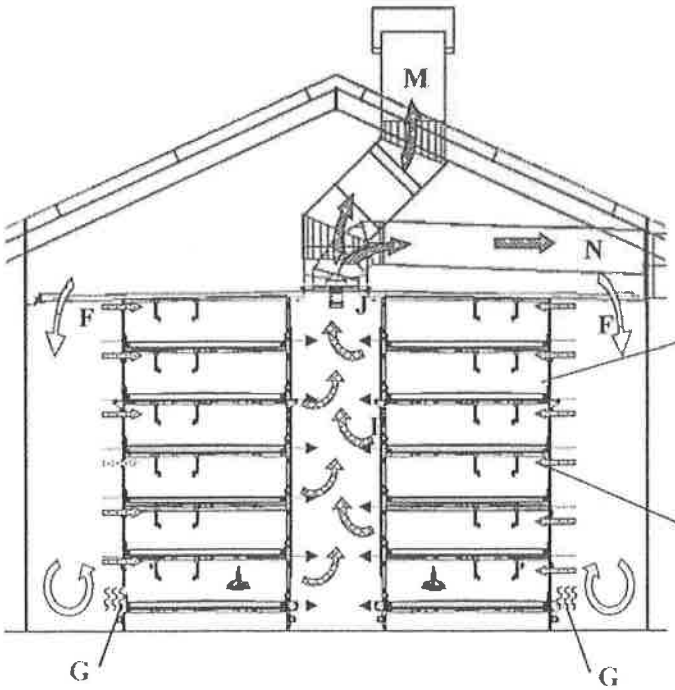
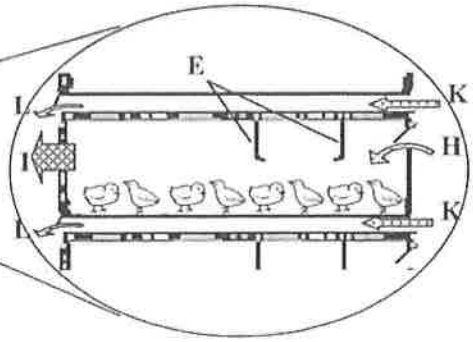


Vencomatic®



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(P)atio

7 sites; 5 broiler houses per site; 250.000 broilers per house

Dimensioning for slaughtering of 12.000 broilers per hr; 1 house per day

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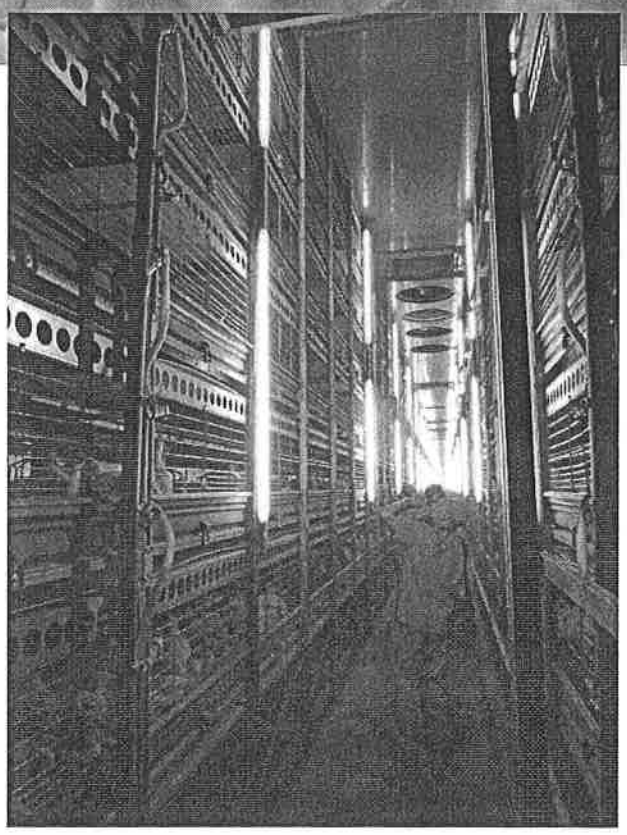

3 cells per broiler house

2 rows per cell

6 floors (tier levels) high

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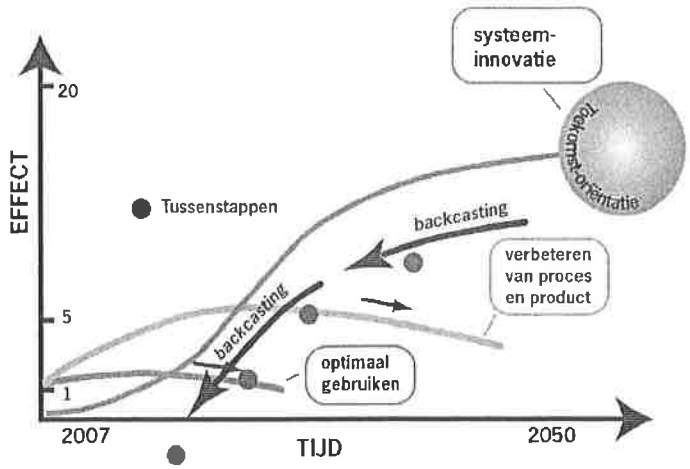
WUR approach for System Innovations

- The design and introduction of feasible **design concepts**
- Based on requirements of animals AND all stakeholders
- Design approach: Reflexive Interactive Design (RIO)



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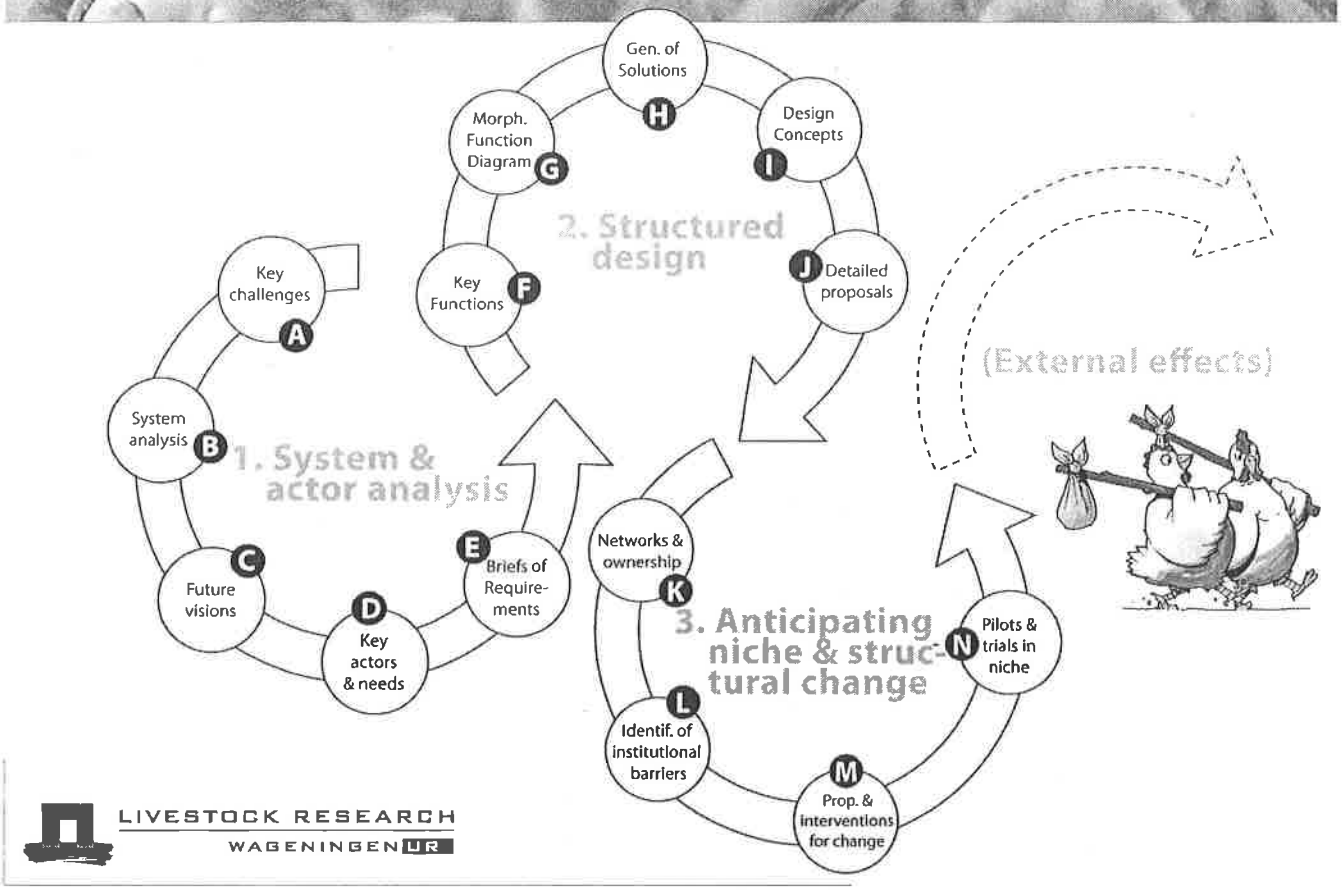
Gen. of Solutions
H
Design Concepts
I
Morph. Function Diagram
G
2. Structured design
J Detailed proposals
Key challenges
A
Key Functions
F
(External effects)
System analysis
B
1. System & actor analysis
Future visions
C
Briefs of Require-ments
E
Key actors & needs
D
Networks & ownership
K
3. Anticipating niche & struc-tural change
N Pilots & trials in niche
L
Identif. of institutional barriers
M
Prop. & interventions for change
LIVESTOCK RESEARCH
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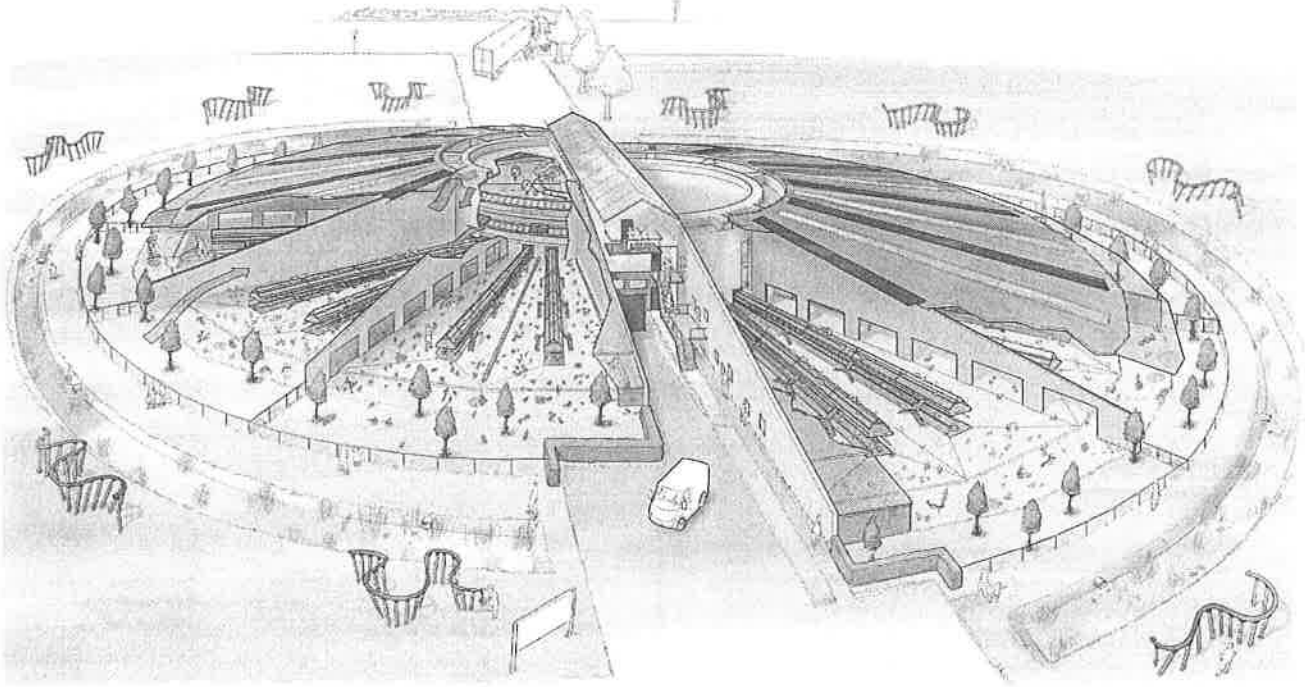
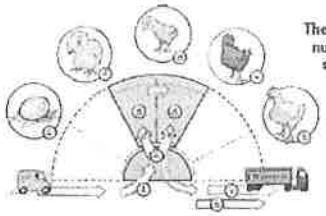
Sum of Parts



The Sum of Parts



The Sum of Parts offers spaces for every age: four nurseries in the centre for the young chicks, and six segments – each with two living areas for the older chicks – around it.

Schematic representation of how one batch of chicks – from egg to slaughter – proceeds through the Sum of Parts for further explanation, see the numbers of the text boxes in the main illustration). The number of nurseries and segments are tuned to a cycle of eight weeks, plus one week to completely clean an area. Each week, a cycle starts and ends.

Eggs that are nearly hatched, arrive at the nursery (1). In a super clean and warm area where the chicks, after hatching, immediately have food and drink available and where they are selected on sex (2). The incoming fresh air is filtered to remove pathogens. A slight positive pressure prevents contamination by other routes. The poultry farmer must observe strict hygiene and shower regularly.

Supply and removal, sto
feed and manure, climat
tems and visitor area ar
in the interior street. The
walls offer visitors a clea
on the nurseries and live

Daylight enters
skylights in the
covered free-ra
with windbreak
pansion with a
free-range p

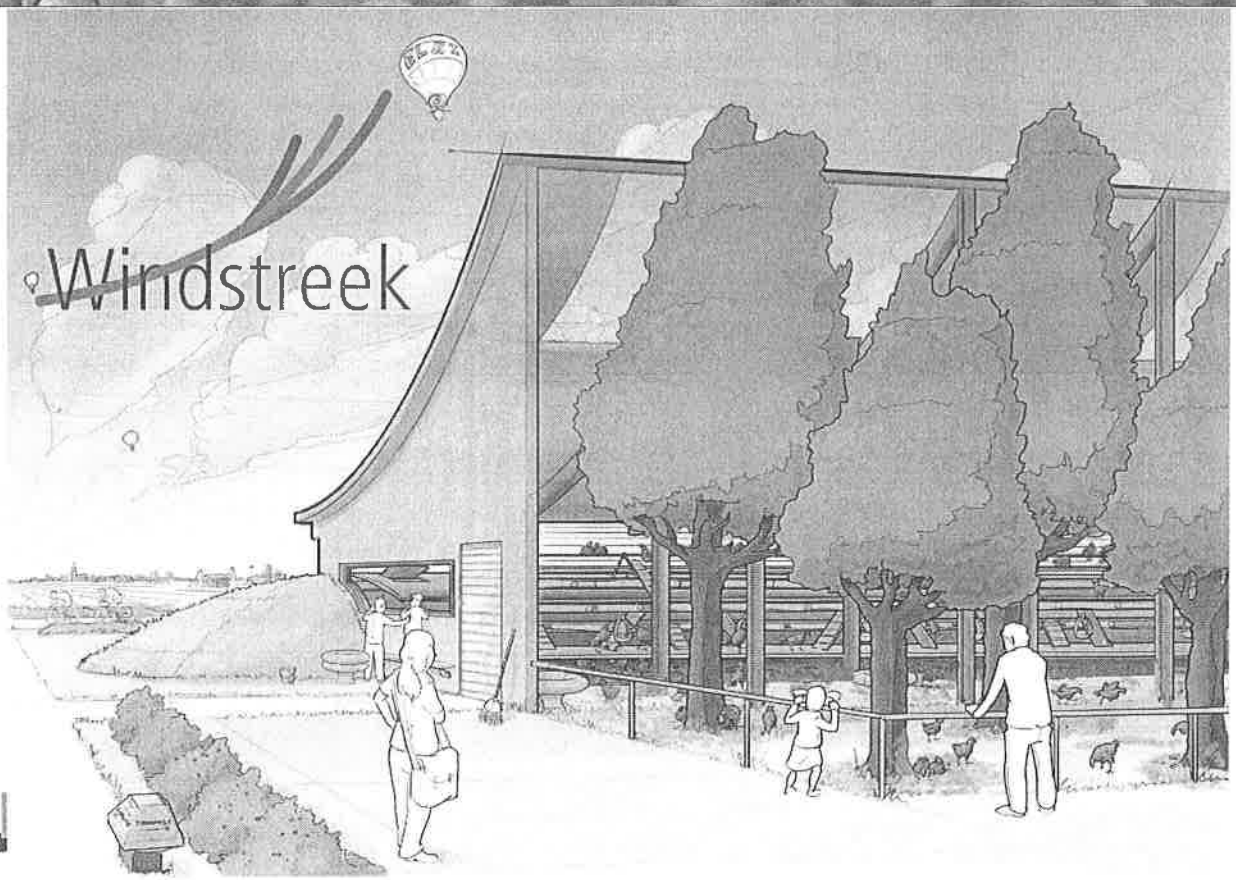
Thorough cleaning is essential in order to reduce the occurrence of pathogens. The rinse water is cleaned in the surrounding reed circle.

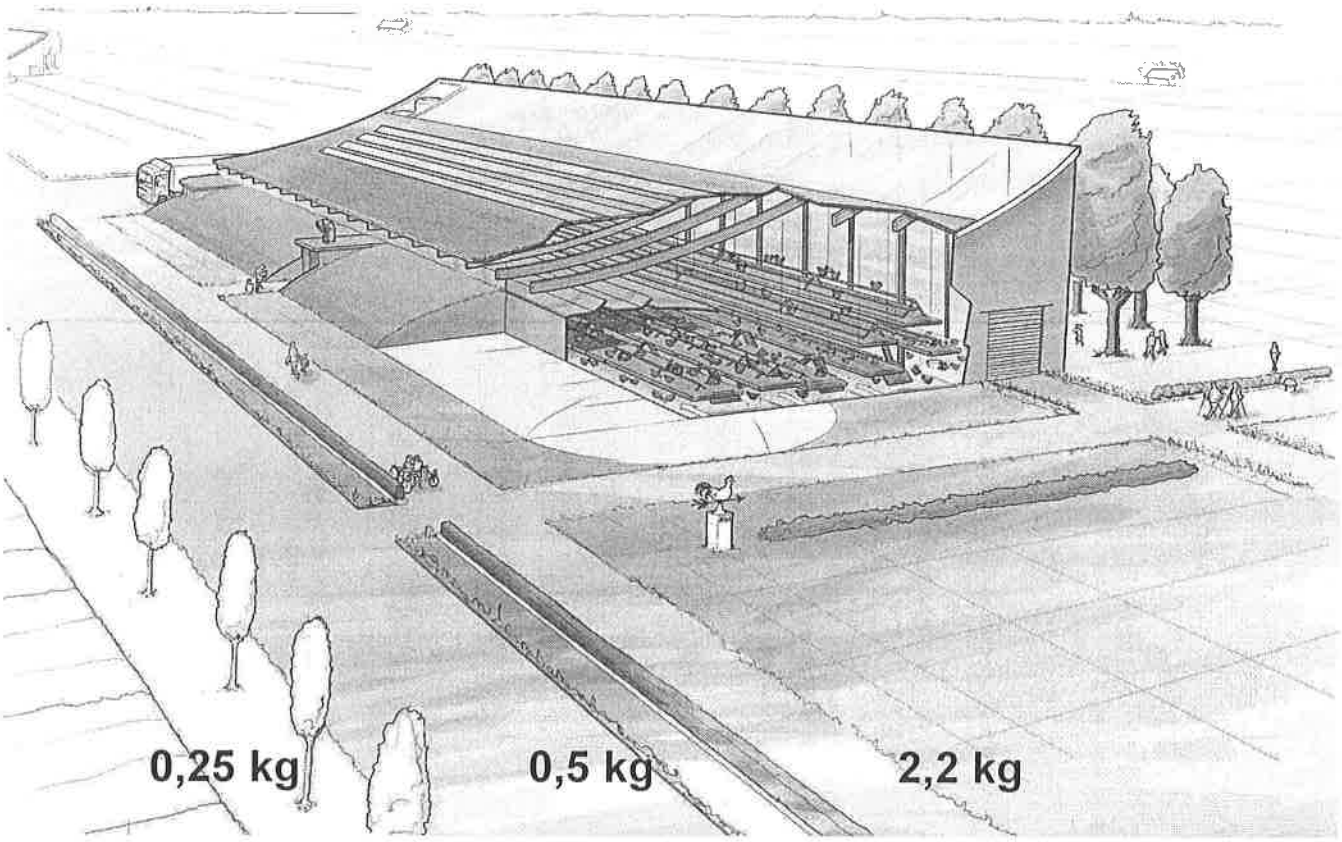
The warmth of the older chicks is reused for the younger chicks in the nursery. The rounded shape and the chimney-effect draw the warm air to the roof ridge in the middle of the building, where heat exchangers transfer the heat to the incoming air for the chicks.

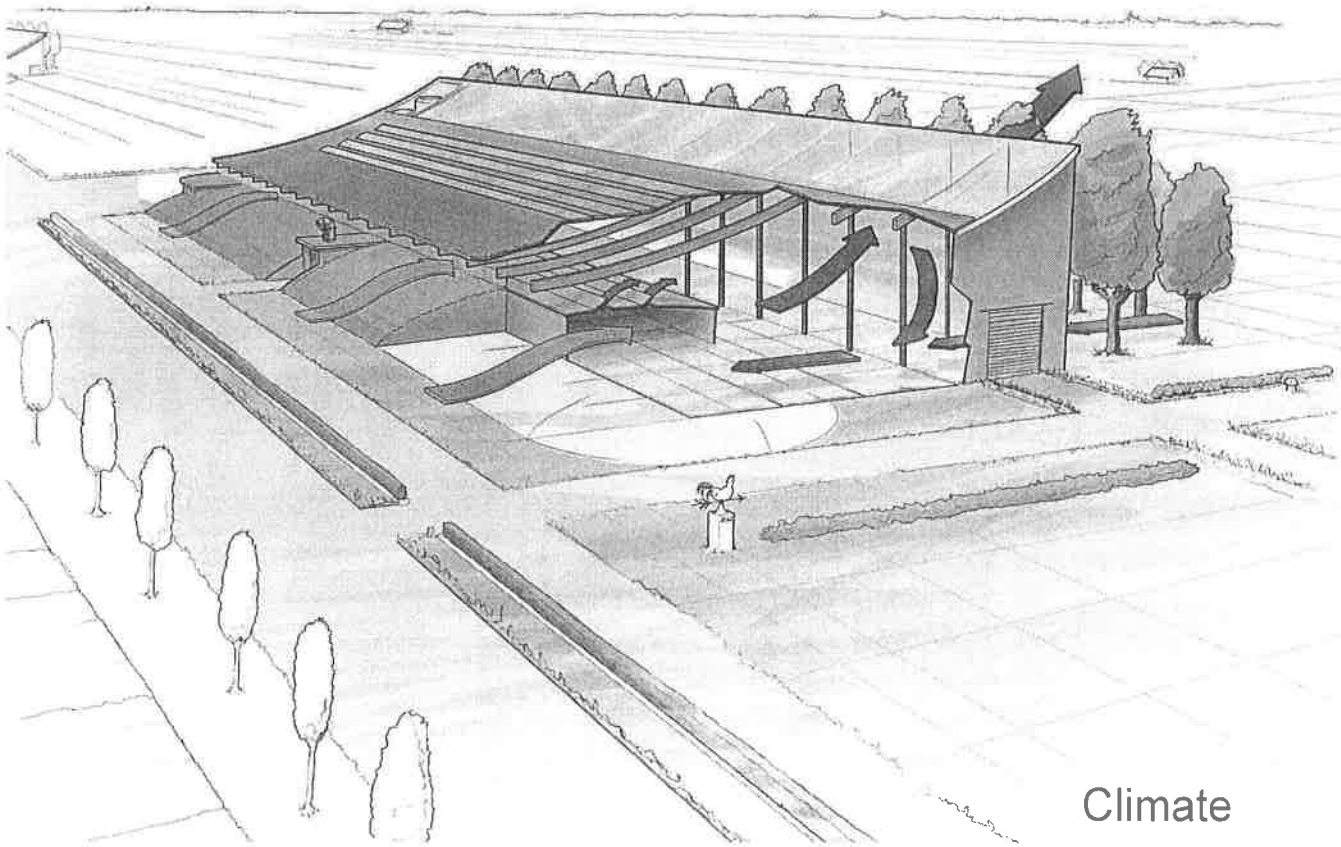
After three weeks, the male and female broilers are separately moved to one of the twelve segments in the outer ring (3). These contain all the features a broiler needs. When the hens are ready for slaughter, they are transferred from their living quarters to the slaughterhouse, using a conveyor belt system (4).

The male chicks get the
cant hall as extra living
until they too are ready
slaughter one week later

Cardinal Point / Winds of change




0,25 kg
0,5 kg
2,2 kg


Climate

2014-2017:Project on food security in West Java – Indonesia

How to double broiler meat production in 5-6 years time

Broiler house design

Slaughter facility design

System design

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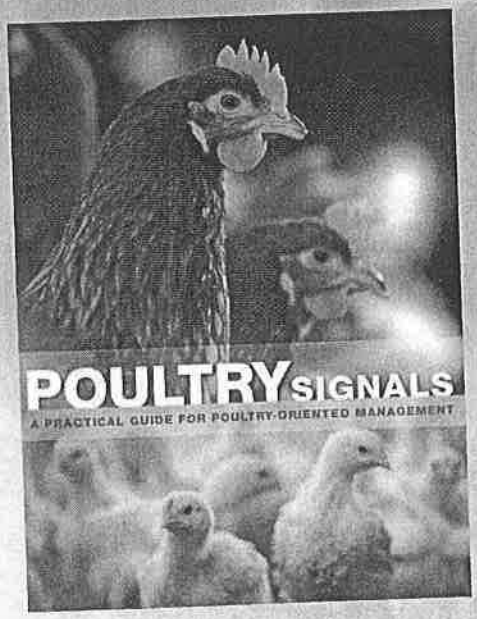
Poultry signals 2010

Marko Ruis
(WUR Livestock Research)

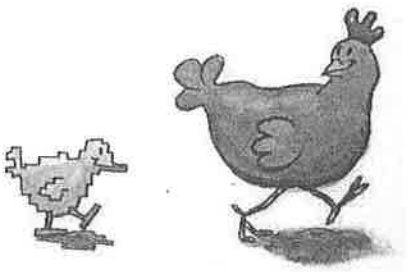
Poultry Signals 家禽信號



A PRACTICAL GUIDE FOR ANIMAL-ORIENTED POULTRY FARMING

原生雞種飼養管理實作手冊

Thanks for your attention!!



LIVESTOCK RESEARCH
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Designs for
System Innovation

Broilers with Taste

Sustainable chicken takes flight

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Long live the chicken!

"Sustainability is the future for livestock farming." The Dutch poultry sector has a reputation of being the ringleader in innovation. Responding to the sustainability trend offers opportunities to remain in the league of world-class players."

Once upon a time ...

Whereas wild fowl was originally a forest animal, chickens have been living together with humans for thousands of years. From South-East Asia they slowly conquered the world – Julius Caesar (100 – 44 BC) already spotted them in Europe. From exclusive gift to land lease money, as a means to drive out the devil and as status symbol: the chicken was and is all that! Most farms had a few chickens, to provide eggs and meat or as a means of exchange. Since the industrial revolution, poultry farming has been professionalised continuously, especially for the export of meat and eggs to urban populations in surrounding countries.

... today ...

Currently, the poultry industry is divided into a poultry meat and an egg production sector. 'Broilers with Taste', the project described in this brochure, deals with the poultry meat production sector. This sector consists of modern, specialised enterprises that each play an important role in the production process: from hatcheries to farming, from processing to packaging.

Chicken is the second most popular type of meat in the Netherlands after pork. We annually consume an average of 20 kilo's of chicken meat per person. The favourable price, the low fat content and the versatile ways of preparation make chicken, especially the fillet, a welcome item on any menu.

... and in the future!

There are many reasons why chicken will remain one of the most popular forms of animal protein worldwide:

- Broilers can efficiently convert feed to meat. Most of the environmental impact in the entire production chain is due to feed production. Chicken meat, therefore, has a relatively small ecological footprint. This is a positive aspect, considering the growing world population that is becoming more prosperous.
- Health issues will become even more important in the future, considering the increase in prosperity diseases such as obesity in Northwest Europe. Chicken can provide in the demand for healthy, high-protein and low-fat foods.
- People, who do not have easy access to the global food market to obtain meat, may be able to keep a few chickens for small-scale production of animal protein.

The meat sector has a gross production value of 728 million euro. In the Netherlands some 45 million broilers are being raised in approximately 700 companies.

Contents

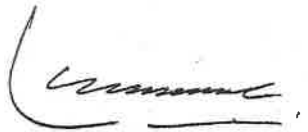
Preface

The Dutch poultry sector faces the challenge of moving towards sustainability. To properly deal with societal concerns with respect to antibiotics resistance, animal welfare and environmental impact, food safety and whether poultry barns fit into the landscape. An effective and transparent realisation of all these aspects in the production chain is, ultimately, a precondition for economic survival and also offers possibilities for the sector to position itself on the international market.

'Broilers with Taste' shows us where those opportunities are. Two distinct concepts, the Sum of Parts and the Cardinal Point, each offer in their own way practical approaches to implement sustainability at farm level. They contain important sustainability elements that can be put into practice as a whole, today or in the future. Sustainability, after all, takes on not only one but many forms, depending on the entrepreneurs, the market and the location.

The poultry farmer cannot make the desired sustainability transition alone. This requires involvement of the entire chain, from breeding company to retailer and veterinarian. The complete picture must be just right in order to earn back the added value of a better product as well as a better production mode. This is where 'Broilers with Taste' outlines several interesting possibilities.

I am proud that so many from the poultry sector, in dialog with society, have been involved in the development of the ideas in this brochure. What sustainable poultry production will look like in practice, will be a journey that we will have to embark on together. The Dutch Commodity Product Board for Poultry and Eggs supports this exploration wholeheartedly. Please contact us via mvo@pve.nl to see how we can be of service to you.



Bart Jan Krouwel

Chairman, Dutch Commodity Product Board for Poultry and Eggs

1 Sustainability objectives

Realistic, inevitable, ambitious: Sustainability is all around us, but can be interpreted differently by any one of us. This flexibility, however, can also be considered a strength. The concept of sustainability adapts to the requirements of the times, societal concerns and prevailing circumstances.

During the first design workshop, parties from the entire production chain and societal organisations together determined which goals must be met to ensure sustainable broiler production. They shared the following definition:

"Broilers with Taste entails a delicious, safe and healthy product originating from a valued, future-proof and profitable production system in which healthy animals are being raised under ideal animal welfare conditions in a very environmentally friendly way, embedded in a transparent production chain in which people like to work"

This vision formed the starting and end point of a joint design process. The challenge was to arrive at an integrated design: not to choose between objectives, but to unite them into a coherent whole. Only then the circle is closed and value is created.

Nine points that still can be improved on

Clear to society, with communicable, attractive enterprises in a transparent chain
The consumer often does not know where his piece of chicken comes from, while confidence in the product and the way it is produced, is under pressure. Open exchange of information between the parts of the chain, can benefit the sustainability of the chain as a whole.

Pleasant environment to work in. This applies to working conditions in the broiler farm and to cooperation and transparency in the rest of the chain
Hard work under difficult circumstances with very low wages: due to this image, the poultry sector has encountered difficulties to attract enough personnel. Especially fine dust particles and ammonia in the barns and capturing the chicks by hand are considerable working condition challenges.

Delicious, safe and valued products that tell their own story
Consumers often consider chicken as an anonymous bulk product without recognisable origin. To create added value, consumers need to appreciate the whole chicken instead of just the end product.
- Product safety remains a concern. The poultry sector has been working for years on the reduction of Salmonella and Campylobacter, with good results.
- The increase of antibiotics resistance in bacteria and the emergence of the so-called ESBL-producing bacteria are related to the significant use of antibiotics in (among others) broiler farming.

Ideal animal welfare conditions. The chick and its parents can perform their natural behaviour and experience as little stress as possible
Current practice can be improved with respect to leg disorders, breast blisters, movement, capture and transport, as well as the almost constant feeling of hunger in broiler breeders.

Fitting in the landscape
Barns and stables currently used are often closed and fit poorly in the landscape. This is often met with criticism from local residents.

Healthy animals, resilient animals
Health problems are related to barn climate and rapid growth of the animal, in combination with the quality of the feed.

Environmental impact is equal to or less than in conventional broiler farming
Life cycle assessments (LCA's) show that much of the environmental impact – especially land and energy use – is caused by the production of feed. Fast-growing animals receiving the same feed are therefore considered 'more environmentally friendly' than slower-growing animals. Environmental impact on the individual barn-level is caused by ammonia, fine dust particles and odour.

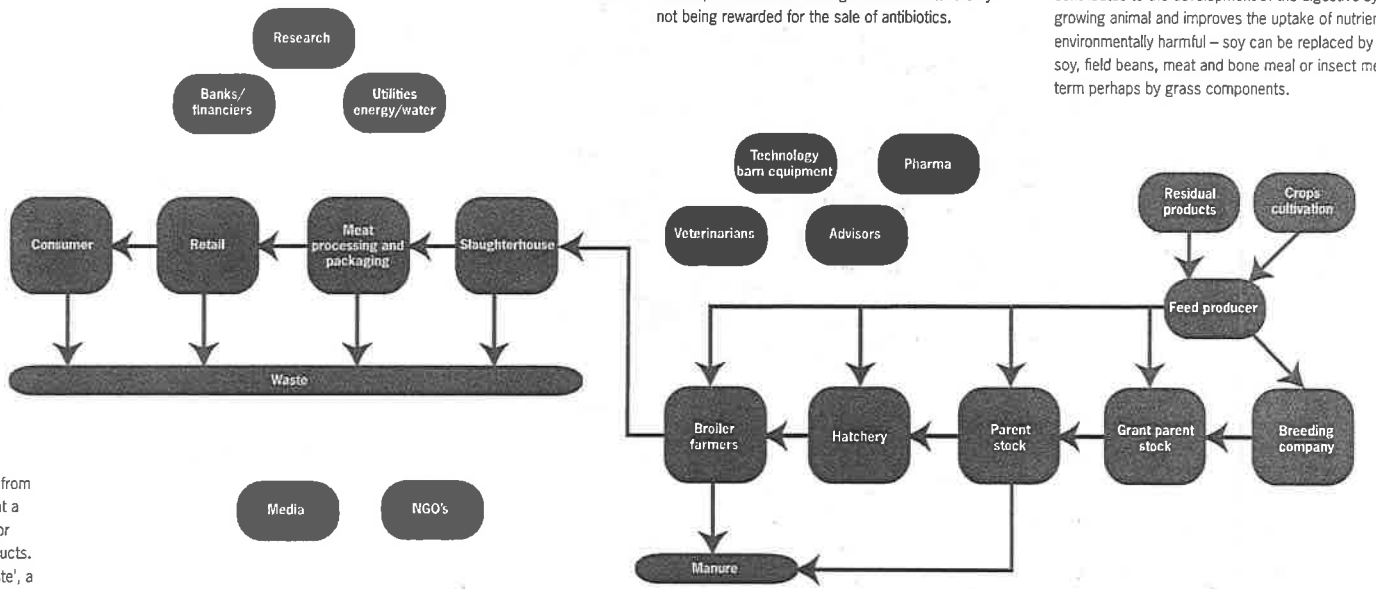
Robust and flexible
To withstand the test of time, the broiler farm will have to continually adapt to the changing demands of the environment.

Economically profitable
People earn their living in broiler production. But chicken is, for the most part, a commodity, a product with which one can only compete based on price. Margins are low and highly dependent on the price of feed. Just like in the other parts of the chain, the dominant strategy in the poultry sector is to work with large numbers of chickens in order to obtain sufficient income from small margins.

The chain in motion

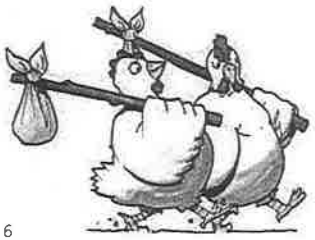
One small adjustment for sustainability in the chain will not be enough. Sustainability in poultry production is a shared responsibility throughout the chain that many are already working on. Some sustainability objectives can be easily achieved by improving the poultry barn itself. Most points, however, require action and change in different parts of the chain, or in the market.

Where in the chain lie opportunities for sustainability?



1. Consumer. Organic, Fair Trade, or Animal Welfare labels: the trend towards sustainable consumption is here to stay. By eating all parts of the sustainably produced chicken, rather than only the fillet, the incurred additional costs can be distributed over a larger part of the chicken. Sustainable consumption, thereby, becomes more accessible to a wider audience (page 8).

2. Retail, processor, slaughter. Tasty convenience products that are produced from all parts of a sustainably raised chicken at a reasonable price make it very tempting for the consumer to opt for sustainable products. Within the framework of 'Broilers with Taste', a number of attractive product concepts have been developed and tested (pages 8 – 10).



3. Broiler farmer. A sustainable product requires a sustainable broiler housing system. 'Broilers with Taste' has developed two concepts: the Sum of Parts (page 13) and the Cardinal Point (page 17). Both designs meet the requirements of the animal, the poultry farmer, the citizen/consumer and the environment. Both designs allow for adaptations. Ultimately, the entrepreneurs in the chain decide which design best suits their situation and market concept.

4. Breeding company. The common broiler breed is optimised for the production of meat at the expense of animal health and welfare of the chick itself and of its parents. Health and welfare are aided greatly when a chick can perform its natural behaviour. The chick must, however, be allowed to do so. This is why a slower growing chick is essential for the welfare objectives of the project. It is also more robust, leading to fewer health problems. Moreover, slower growth offers opportunities for the use of more environmentally friendly and less costly feed – their longer life does not necessarily lead to a higher environmental impact. Breeding farms could further optimise breeds genetically.

5. (Grand) Parent stock and hatchery. The parts of the chain preceding the primary farm are crucial for the technical performance and the health of broilers. Sustainable cooperation and information exchange between these parts of the chain can lead to a better overall supply chain result with fewer antibiotics.

6. Feed. Different feed with less energy, more structure and alternative, as much as possible regionally grown, protein sources can reduce the environmental impact of poultry production. The diet contributes to the development of the digestive system of a slow growing animal and improves the uptake of nutrients. The common – environmentally harmful – soy can be replaced by sustainably grown soy, field beans, meat and bone meal or insect meal, and in the longer term perhaps by grass components.

7. Veterinarians. The use of antibiotics in the commercial broiler sector will have to change from preventative to curative. Veterinarians play an important role in changing the mind-set of poultry farmers, which is needed to further realise this change. One way in which they can fulfil their role as independent health management consultant is by not being rewarded for the sale of antibiotics.

> 2

The market

Demand becomes more sustainable ...

Sustainability counts, in the Netherlands and in the countries that surround us. And as said before: everyone interprets sustainability differently. To some, the product must be regionally produced, others choose maximum animal welfare or organic, and still others believe that environmental impact is decisive, or a combination of all these. The emphasis varies between countries. In the Netherlands, animal welfare is a hot topic; in Great Britain many products contain labels that include their ecological footprint, while Germany prefers local products. All market segments that claim sustainability are growing in spite of the economic recession. And businesses eagerly respond.

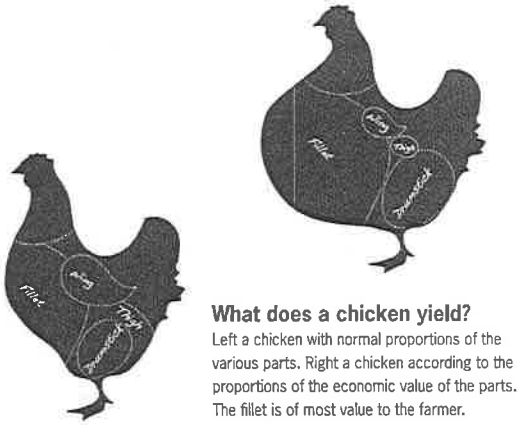
... but supply only reluctantly follows

For chicken, the market of sustainable products in the Netherlands is limited. An important factor is the price difference between conventional and (much) more sustainable chicken. Samuel Levie of the Green Peas: "The Dutch consumer does not understand why an organic fillet can be up to six times more expensive than discount meat. This is hard to explain!"

The Green Peas, a Dutch agency that combines knowledge of food and advice on sustainability, has been commissioned by 'Broilers with Taste' to explore market opportunities for sustainable chicken products. With a taste test and discussions with various parties from retail and out-of-home market and with consumers in the supermarket. They have also enlisted the network of young food professionals from the 'Youth Food Movement' to generate ideas. The product concepts that emerged have been further developed in a food lab and have been tested (and approved!). The full report (in Dutch) can be viewed at: www.pluimveemetsmaak.nl

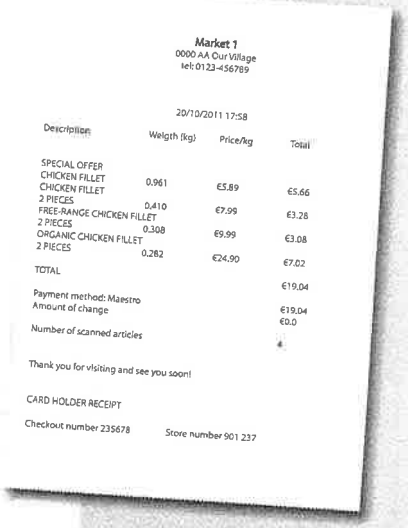
Legs and wings

Each broiler has two fillets, plus two legs and two wings. The fillet generates most of the money. The rest of the animal sells at much lower prices, mostly in neighbouring countries. The art of making money off of the entire animal is called 'carcass value optimisation'. For more sustainable production modes, carcass value optimisation is especially difficult because not every market values sustainability in the same way. This is why the added costs are mainly earned back on the fillet, which becomes disproportionally expensive. This is a known and persistent problem for any alternative initiative. Because working sustainably requires using the entire chicken, including bones and wings. The pieces containing bone must, therefore, look attractive, be easily accessible and reasonably priced to reach a broad audience.



What does a chicken yield?

Left a chicken with normal proportions of the various parts. Right a chicken according to the proportions of the economic value of the parts. The fillet is of most value to the farmer.



Market 1
0000 AA Our Village
tel: 0123-456789

20/10/2011 17:58

Description	Weigth (kg)	Price/kg	Total
SPECIAL OFFER CHICKEN FILLET			
CHICKEN FILLET 2 PIECES	0.961	€5.89	€5.66
FREE-RANGE CHICKEN FILLET 2 PIECES	0.410	€7.99	€3.28
ORGANIC CHICKEN FILLET 2 PIECES	0.308	€9.99	€3.08
	0.282	€24.90	€7.02
TOTAL			€19.04

Payment method: Maestro €19.04
Amount of change €0.0

Number of scanned articles 4

Thank you for visiting and see you soon!

CARD HOLDER RECEIPT

Checkout number 235678 Store number 901 237

Whose move is it?

Yet another sustainable chicken (fillet) product that competes with existing initiatives for store shelf space? With the product lines 'WERELDelen', 'Vleeswaarden' and 'Kip Culinair' we suggest a different flight path. For this to be successful requires audacity, sound agreements and sustainable partnerships in the entire production chain, from primary production to slaughter, processing and distribution channels. The sustainability claims of the product must be in accordance with the broiler housing system (pages 13 – 21). And they must be recognisable to and verifiable by the consumer. In addition to Animal welfare and Environmental labels, labels for antibiotics-free and local products offer opportunities to tune in to what the consumer considers important. From our experience with the Roundel™ we have learned that value can be added when poultry farmers actually open their doors to the public: the story behind the chicken will be appreciated again.

The product lines offer the processing industry ample opportunities to increase added value. There are certainly enough challenges, such as trimming the bone pieces or to tune the cooking time of the different parts.

Retail has the key to distribution. With a clever launch time supported by effective marketing, these unique products can be assured of a flying start. And for the out-of-home market, such as caterers and fast food chains, pre-cooked, processed products can be of interest and can also save on working hours.

Fair sharing, using all parts

To achieve a sustainable chicken product in considerable volumes, a better carcass value optimisation is essential. Fair sharing works better when using all parts (of the chicken).
We can call on consumers to eat other chicken parts as well, instead of only the fillet. The question is how effective this would be. It seems better to produce sustainable products from the undervalued (bone) parts of the chicken that are in tune with the consumer trends convenience, health and taste. And to help consumers in their behaviour towards eliminating this barrier to sustainability. The chefs of the Green Peas have developed a number of product concepts that fit this trend:

- *WERELDelen* is Fair Trade, animal friendly and good for the environment. Uses local knowledge from other cultures that know how to enjoy cooking using the extra flavourful parts of the chicken.
- *Vleeswaarden* is produced from those parts of the chicken that are considered 'left-overs'. Moreover, *Vleeswaarden* chickens are allowed more room, do not receive antibiotics and grow up in an environmentally friendly barn.
- *Kip Culinair* uses bones and wings of slow-growing chickens that are produced locally.

3

Design according to needs

Sustainable chicken brought to the market must be produced in a genuinely sustainable manner. In the 'Broilers with Taste' design workshops, we outlined nine more specific objectives (pages 4 – 5). Many of these apply to the fulfilment of needs: those of the chick, the poultry farmer and the consumer. A sustainable system meets all these needs and requirements.
Below, we discuss the most important needs and requirements from the perspective of the chick, the poultry farmer, the environment, as well as citizens and consumers.

What does the broiler need?

Broilers still perform behaviour that is imprinted from the wild fowl that lived in the forest. Their needs originate from this behaviour. For instance, they will search for elevated resting areas that keep them safe from predators. And they still like to forage in the litter even if there is enough food in the feed line. Because this is what chickens do!

All needs at a glance

Chickens, including broilers want:

- good and sufficient food
- good and sufficient drink
- to forage and scratch
- to stay healthy (absence of disease, avoiding injuries)
- to explore their surroundings
- to interact with other chicks
- to feel safe
- to reproduce (although the broiler does not get around to that)
- to rest comfortably
- to preen their bodies and plumage
- to get enough exercise
- a pleasant living environment, not too warm or too cold, with plenty of fresh air
- to dispose of their manure

Does being outside make chicks happy?

Fresh air, daylight, foraging and exploring: an outdoor free-range area can meet the different needs of the chick all at once. This would be an excellent solution that also appeals to the consumer. However, it increases the risk of animal diseases. But do we know if a chick necessarily wants to be outside? A chick may be quite happy being inside, but would perhaps be much happier when she can go outside as well. This is why the designs contain, in any case, a covered free-range. The designs make it easy to let the chicks forage in the open-air as well, if the farmer or the market so requires.

The Sum of Parts

What does the poultry farmer need?

Every entrepreneur is different. Yet, they all have some needs in common:

- A poultry farmer earns his income with meat production. To be able to do this in the long term, his business must continue to develop. This requires investments.
- The poultry farmer preferably decides for himself how to develop the business and which market he serves. Within the preconditions set by the local environment.
- Good working conditions that contribute to good health.
- Varied work that is sufficiently challenging.
- Normal working hours, allowing time off once in a while.
- Societal appreciation. For example by a fair price for the product.

These needs translate into the following specific design requirements:

- Sufficient income generated by sufficient revenues from the market and, where possible, lower costs.
- Good overview on the animals, all areas of the business are easily accessible.
- Good climate, the poultry farmer can enter the stable without a dust mask.
- Flexible setup in order to serve different markets.

How to balance the environment?

Compared to other forms of meat production, conventional broiler production is relatively environmentally friendly. The production of feed has the greatest impact on the environment, especially due to land use and tillage, acidification and fertiliser production. A slow-growing chick will eat more food during its entire life. The environment, however, does not necessarily have to be negatively affected. A slower growing animal can also handle different food. The aim is to keep the environmental impact along the entire production chain at least equal to that of current conventional broiler production.

Locally, at the broiler housing level, the important issues are energy consumption, ammonia emission, fine dust particles and odour, as well as fitting into the landscape. This places the following requirements on the design:

- The emitted air is just as clean or cleaner than the air entering the barn – this applies to ammonia, fine dust particles and odour.
- The housing system is energy-neutral: it generates as much energy as it consumes.
- Wastes such as manure can be re-used efficiently in order to add ecological and economic value.
- The housing system makes a positive contribution to the environment: local residents and passers-by feel that the business enhances the local surroundings.

What does the citizen-consumer want?

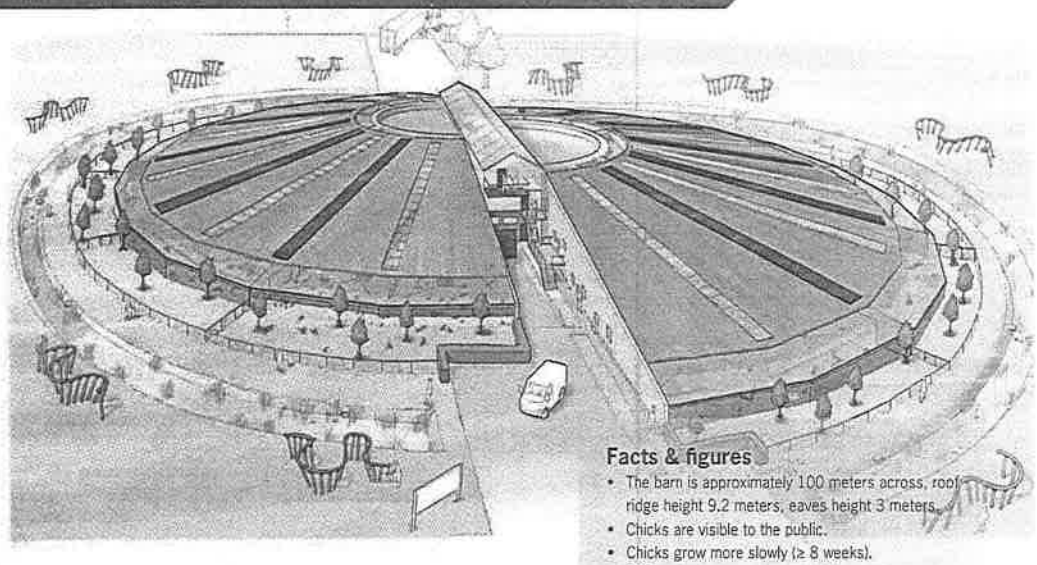
Citizens are also consumers. And they often compromise between their ideals and the price at the checkout counter. Despite consumer differences, some common needs can be identified with respect to the product itself and the mode of production. These are taken into account in the design:

- Affordable food prices
- Tasty, fresh and convenient products
- Safe and healthy products with high nutritional values that are free from pathogens such as Salmonella, Campylobacter or ESBL-producing bacteria.
- Good production conditions that can be verified with respect to animal welfare, environmental impact, origin of the product, fair trade and minimal use of antibiotics.

Brief of Requirements for the broiler

For the broiler, we have translated all these needs to specific requirements on the housing system, based on scientific literature. This is the Brief of Requirements for the broiler. These requirements have been incorporated into the design. This is why the designs differ from those of conventional broiler farms. The most important differences:

- A different type of chick that can grow more slowly and is, therefore, more resistant to diseases. A chick that is able to fulfil its behavioural needs. Conventional broilers are not able to do so anymore because they are selected for their meat-making potential. They have problems walking longer distances or perching. Their parents are chronically hungry. They are predisposed to overeating but are not allowed to do so because they would not lay enough eggs.
- Upon hatching from the egg, the chick has direct access to fresh food and water.
- More room for foraging, wing flapping, playing and running. By the time they are fully-grown, there are a maximum of eleven chicks per m² instead of twenty.
- A varied environment for various needs, such as shelter, rest and foraging.
- A natural day-night rhythm.
- An environment that keeps animals healthy and that prevents the occurrence of hock burns, footpad lesions and breast blisters.
- As little stress and damage to chicks during capture and transport as possible.



Young and old together

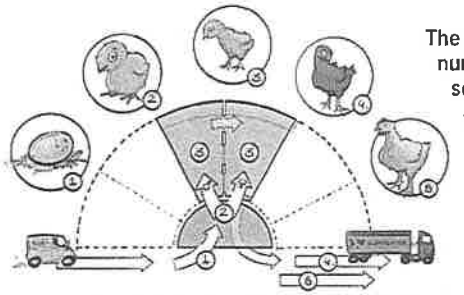
Space for chicks and at the same time using space efficiently. Utilising residual heat, instead of releasing it into the outdoor air. An open production system to show what is going on. Ensuring the public that operations will be continued in the same way, even when nobody is watching. The Sum of Parts is doing just that.
Eggs hatch each week and each week chicks are delivered. While they are still very small, they live in a safe, secure environment in the central core where pathogens will have no chance. When they get bigger and can better withstand variation in the environment, they are moved to one of the exterior segments that offer all the space and facilities that they need, no matter how big they get. Skylights in the roof and a completely open front facing the exterior, offer daylight and night darkness.
The chicks grow more slowly than usual and can, therefore, perform their natural behaviour such as foraging, dust bathing, perching, even when they have obtained the right weight. Male chicks continue to grow more efficiently than females, that grow fat at a younger age. Male chicks may, therefore, stay for another week – they yield a heavier product. During that last week after the hens have been removed, the males will also have more space available.

Facts & figures

- The barn is approximately 100 meters across, roof ridge height 9.2 meters, eaves height 3 meters.
- Chicks are visible to the public.
- Chicks grow more slowly (≥ 8 weeks).
- Different age groups are present at the same time.
- Chicks have twice as much space than is commonly available.
- Male and female broilers are fattened up separately; there are 6 segments, each with a separate section for 4,250 male broilers and 4,250 hens.
- Male chicks get the space abandoned by the hens.
- Each week, 4,250 male broilers and 4,250 hens are delivered.
- At any time, between 68,000 and 72,250 chicks are living within the system.
- There are 4 nurseries, each with 8,500 chicks.
- The open outer ring has natural ventilation.
- The central core is regulated by positive pressure.
- The covered free-range offers possibilities for outdoor access.
- Foraging, eating, drinking and resting take place in separate areas,
- The litter is frequently refreshed and therefore always clean.
- Antibiotics are rarely needed.
- The animals are transported out of the system on conveyor belts.
- The barn offers work to one and a half fulltime workers.

The Sum of Parts

The Sum of Parts offers spaces for every age: four nurseries in the centre for the young chicks, and six segments – each with two living areas for the older chicks – around it.



Schematic representation of how one batch of chicks – from egg to slaughter – proceeds through the Sum of Parts (for further explanation, see the numbers of the text boxes in the main illustration). The number of nurseries and segments are tuned to a cycle of eight weeks, plus one week to completely clean an area. Each week, a cycle starts and ends.

Eggs that are nearly hatched, arrive at the nursery (1): a super clean and warm area where the chicks, after hatching, immediately have food and drink available and where they are selected on sex (2). The incoming fresh air is filtered to remove pathogens. A slight positive pressure prevents contamination by other routes. The poultry farmer must observe strict hygiene and shower regularly.

Supply and removal, storage of feed and manure, climate systems and visitor area are located in the interior street. The glass walls offer visitors a clear view on the nurseries and living areas.

Daylight enters through the skylights in the roof and via the covered free-range that is closed with windbreak netting only. Expansion with a completely outdoor free-range is possible, if desired.

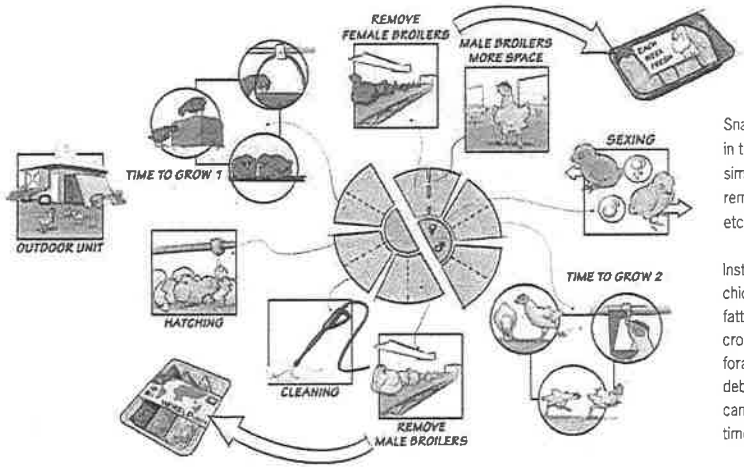
Thorough cleaning is essential in order to reduce the occurrence of pathogens. The rinse water is cleaned in the surrounding reed circle.

The warmth of the older chicks is reused for the younger chicks in the nursery. The rounded shape and the chimney-effect draw the warm air to the roof ridge in the middle of the building, where heat exchangers transfer the heat to the incoming air for the chicks.

After three weeks, the male and female broilers are separately moved to one of the twelve segments in the outer ring (3). These contain all the features a broiler needs. When the hens are ready for slaughter, they are transferred from their living quarters to the slaughterhouse using a conveyor belt system (4).

The male chicks get the vacant half as extra living space until they too are ready for slaughter one week later (5).

The Cardinal Point

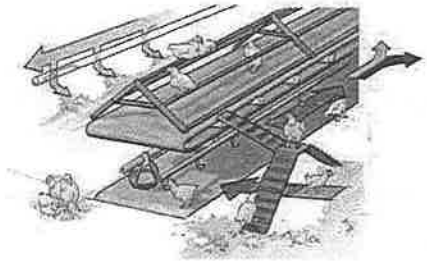


Snapshot of how the various areas in the Sum of Parts are being used simultaneously for rearing, growing, removal, cleaning, determining sex, etcetera.

Instead of in the outer ring, the chicks can be moved elsewhere to fatten up after three weeks. To a crop field, for example, so they can forage for remaining seeds or plant debris. Or to an orchard where they can eat insects and, at the same time, fertilise fruit trees.

Design of the outer ring

Each compartment in the outer ring contains all the facilities that a broiler needs: food and water, perches, sufficient space and material for foraging, playing and for occasional dust bathing.



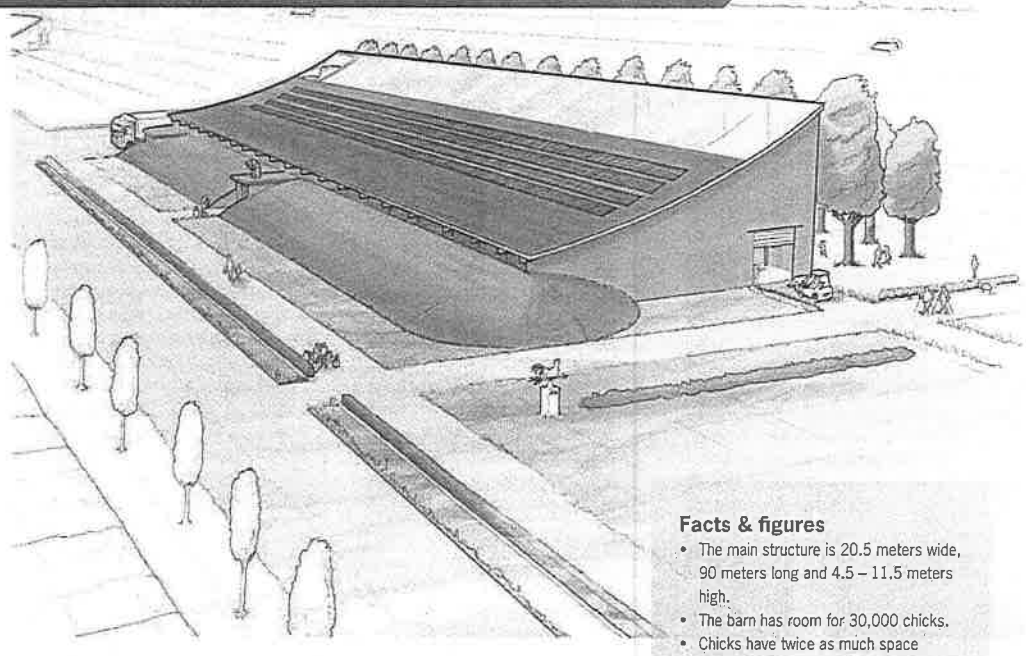
Cleaning: chicks are doing it themselves

Chicks clean the foraging area on the barn floor themselves. The floors are sloped and the litter including the manure collected by the foraging chick slowly rolls down towards the lowest part where it is removed via a conveyor belt system. Fresh or cleaned litter is supplied through the raised sides. This way there is minimal contact between the chicks and their own manure.

Stress-free transport

In the Sum of Parts, chicks are allowed ample time to grow. The area is as stress-free as possible and there is minimal contact with human hands. This is good for the animal and the final meat quality. The day before transport, the perches are winched up. At night, while the chicks are resting on raised conveyor belts, these belts are locked at the sides. In the morning, when the chicks wake up, the belt slowly transports the chicks outside, directly into a truck that is equipped with conveyor belts as well. The chicks that have spent the night in the lower area are gently led to the conveyor belt and transported in the same manner.

The females are brought to slaughter sooner than the male broilers, because the growth of their muscle mass stops earlier. But both males and females are transported out of the barn the same way. This process is repeated twice each week, always in a different segment. This is why the Sum of Parts can deliver fresh chickens each week. This way a special market segment can be addressed more easily, and it is possible to quickly tune in to a specific demand.



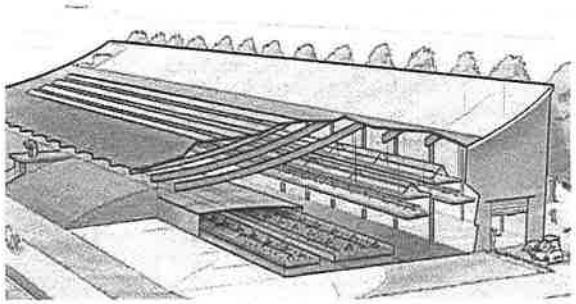
Ancient principle

Broilers that always enjoy fresh air and a comfortable temperature. And at the same time reducing the use of fossil fuel energy to a large extent, while being as transparent as possible to the public.
This is all possible in the Cardinal Point. By applying an ancient construction principle in a new way: building with the rear into the prevailing wind direction. The prevailing southwest wind in the Netherlands provides the primary ventilation and cooling for the Cardinal Point. The unique shape produces much effect using little energy by cleverly applying different physical principles (the Coandă effect and the Venturi effect).

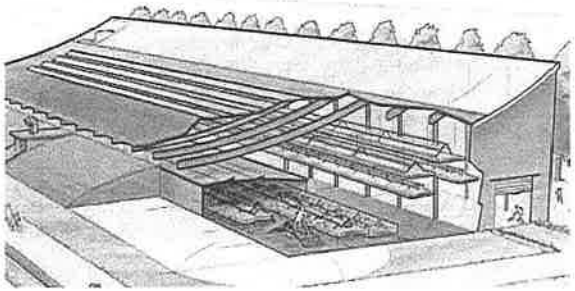
In the Cardinal Point, chicks are allowed more space as they grow. When chicks are small, they live in a safe, secure environment under an incubator hood at a convenient working height for the poultry farmer. As they grow, they will have the entire space at their disposal – with covered free-range, enrichment, places to hide and trees. Because the chicks grow more slowly than usual, they can perform their natural behaviours like foraging, dust bathing and perching. In short, due to the variation in climate and living environment, each chick can choose where it feels most at home: cosy and warm or open and fresh.

Facts & figures

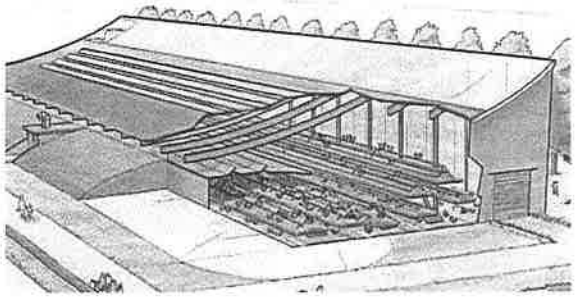
- The main structure is 20.5 meters wide, 90 meters long and 4.5 – 11.5 meters high.
- The barn has room for 30,000 chicks.
- Chicks have twice as much space available than usual.
- Chicks grow more slowly (≥ 8 weeks).
- All chicks are the same age.
- Chicks enjoy the freedom to find a climate comfortable to them.
- Chicks have separate areas for foraging, eating, drinking and resting.
- The chicks are visible to the public.
- The incubator hood is heated and adjustable in height.
- The covered foraging area is high with the possibility for a free-range under trees.
- The litter is frequently refreshed and therefore always clean.
- Antibiotics are rarely needed.
- The animals are transported out of the system on conveyor belts.
- The barn offers work to one half-time worker.



The Cardinal Point during the first two weeks: from the last few days in the egg until about two weeks of age, the chicks live on raised conveyor belts under the insulated incubator hood.



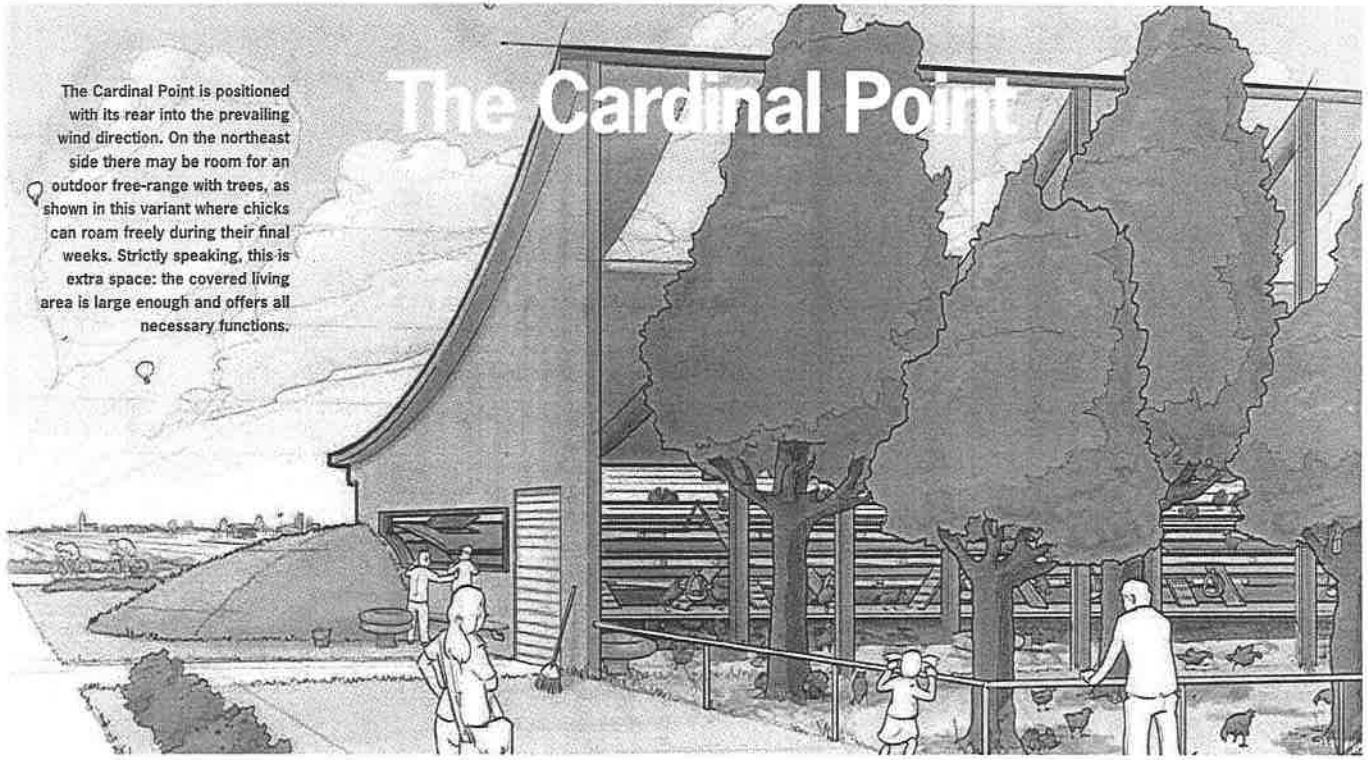
The Cardinal Point during the third week: from then on, the chicks can move down, which allows them access to the living area under the belts.



Foraging area, a covered free-range, raised perches, conveyor belts and possibly a range/chicken run under the trees: from about three weeks of age, the chicks can use the entire space.

The Cardinal Point

The Cardinal Point is positioned with its rear into the prevailing wind direction. On the northeast side there may be room for an outdoor free-range with trees, as shown in this variant where chicks can roam freely during their final weeks. Strictly speaking, this is extra space: the covered living area is large enough and offers all necessary functions.



Older and bigger: more space

As the chicks age and grow, more space becomes available. First on the ground floor under the incubator hood, later also the right-hand part and eventually the covered foraging area, and possibly the outdoor free-range. The ground floor is the foraging area, which is fully equipped with conveyor belts for frequent refreshment of the litter. The covered foraging area is easily cleaned, once the chicks have been removed.
The raised areas with perches that can be winched down provide additional space as well as a resting area that fit the natural behaviour of the chicken.

Comfortable breeding hood

Another old idea with a modern twist. Warm water flowing through long tubes, hanging in longitudinal direction under the incubator hood, keeps the chicks comfortably warm the moment they hatch from their eggs. Fresh water and food are supplied to the left and the right of these tubes. The incubator hood is adjustable in height and ventilation can be controlled via valves. The poultry farmer can walk underneath to check the area and can remove any dead chicks using a long pole.
The incubator hood also serves as a primary heat source in subsequent growth phases. This is why it is always warmer under the hood than in the rest of the area and why each chick can always find a comfortable spot. For chicks that are sick, a separate sick bay can be easily set up under the incubator hood.

Plants, chicken and market

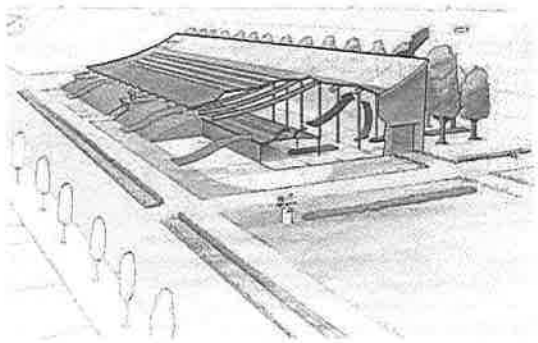
Variations on the Cardinal Point that combine plant crop production with broilers are possible. For example, by simply planting fruit or nut tress adjacent to the barn. Or more radically, by building a greenhouse directly adjoining the covered foraging area. This way, heat and nutrients can be exchanged between the two systems – which closes the cycle even further. Special attention, however, must be paid to the transmission of pathogens. A solution is offered by a helophyte filter that reuses biomass to generate energy, as a buffer between both cultivation systemen.
The combination of broiler and plant crop production also offers market opportunities. For example, by processing part of the nuts, herbs, fruits and vegetables grown on the farm in a WERELDeIen™ meal.

Mushroom shelters

The high covered foraging area can actually be considered to be 'outside'. Chicks, however, also like to have shade and shelter. Dark tinted strips in the otherwise transparent canopy provide shade. Special mushroom shelters offer shelter on the level of the chick. The mushrooms can be stacked and are easily removed when cleaning the foraging area.

A fresh wind

The main source of ventilation is the prevailing southwest wind. The fresh wind enters the Cardinal Point through a long, narrow air inlet along the lower side and is subsequently carried upwards along the sloped smooth ceiling by the Coandă effect. This air current, in turn, ensures a continuous air circulation throughout the entire barn, even without ventilators. In case of no wind or if the wind is blowing from a different direction, a small mechanical system is sufficient to generate the primary airflow. The chimney effect draws the used, warmer air up to the highest point, and the trees adjacent to the barn filter the dust.



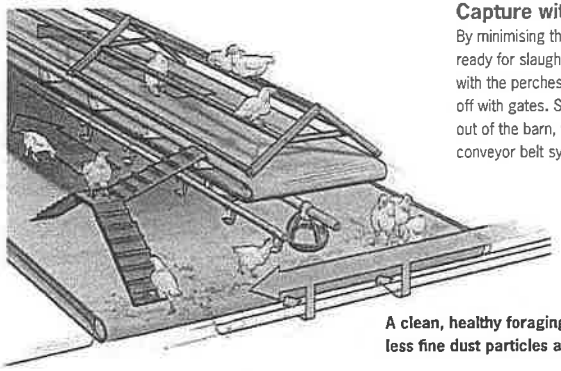
The prevailing wind is the main source of ventilation.

Warmed by the sun

Solar collectors installed on the roof generate heat for the young chicks. Depending on their needs, the heated water is used directly or is temporarily stored in the earthen wall alongside the lower part of the barn and under the floor. This can be compared with underfloor heating: the water transfers heat through pipes under the incubator hood. And because only the small volume under the incubator hood needs to be heated, less energy is needed. Moreover, the conveyor belts on the floor provide added insulation.

Clean litter

In the foraging area, the litter, such as wood shavings, slowly becomes contaminated with chicken manure. In the Cardinal Point the litter can be removed regularly, for example once a day, and replaced by a fresh layer. An alternative is the litter cleaner, which separates the manure from the wood shavings in a drum using air circulation. After drying and UV-irradiation, the shavings can be returned to the barn. This way the chicks always have a clean, healthy foraging area and the production of fine dust particles and ammonia is considerably reduced.



Capture without stress

By minimising the use of hands, the chicks are 'captured' when they are ready for slaughter with as little stress as possible. The conveyor belts with the perches are slowly winched up and the raised areas are closed off with gates. Subsequently, the belts slowly transport most of the chicks out of the barn, where they are transferred into the truck via a second conveyor belt system.

A clean, healthy foraging area with considerably less fine dust particles and ammonia.

4 The potential of the designs

Of course, the Sum of Parts and the Cardinal Point are still conceptual designs on paper and not accurate blueprints to start building tomorrow. The designs outline principles for sustainable broiler farming. They are, however, well thought-out and able to meet the sustainability objectives (pages 4 – 5). Their expected performance is discussed below. Subsequently we outline the ten keys to sustainability that are responsible for this performance.

1. Tasty, healthy, safe and valued products. With their own story

Slower growing chicks are often considered tastier than conventional chicken during tasting events. Both designs offer extremely good hygienic conditions. Frequent litter change and good management by the farmer ensure that Salmonella and Campylobacter are kept at a minimal level. The combination of a slower growing breed and hygienic conditions enable the use of less or virtually no antibiotics. This will prevent the survival of resistant and ESBL-producing bacteria. Moreover, both design concepts have a highly recognisable shape that can be easily matched with the marketing of the product.

2. Transparent to the community. Communicable, attractive companies in a transparent chain

Both designs are as open as possible, from the inside as well as from the outside. In the Sum of Parts, the entire growth process, from eggs to chicks ready for slaughter, is visible to the public. By having the eggs hatch on the farm itself the origin of the chicks is more easily traced. To be able to better trace the other aspects of the chain, other measures are needed such as a 'Broiler ID' and feed certification. A strong brand around the design makes this easier.

3. Pleasant to work in. And a collaborative supply chain

Fine dust particles, ammonia and capture by hand are the most important problems facing workers in present barn systems.

These designs allow manure – the main source of fine dust particles and ammonia – to be regularly removed from the barn. Capture is automated by conveyor belt systems, which is less stressful for animals and humans. Moreover, the work is carried out during daylight and in the fresh air.

From supplier to slaughter and processing: both design concepts are highly dependent on good cooperation within the chain. They are especially suitable for enterprising poultry farmers that feel involved with their product until it reaches the consumer's plate.

4. Ideal animal welfare

The chicks as well as their parents can perform their natural behaviour with minimal stress. Both designs, in principle, fulfil all the needs of the chick – and in turn, meet the entire Brief of Requirements. Key features include the space per animal, facilities for foraging, dust or sun bathing, raised perches for resting, hiding places and a natural rhythm of day and night.

The choice of breed is also important. The current slower growing chicks are much better able to perform their natural behaviour, but there is certainly room for improvement, especially with respect to their ability to move (*gait score*).

The occurrence of stress and damage is decreased because the eggs hatch directly in the barn and capture is automated. This has an immediate positive effect on the loss per round and on the quality of the delivered chicks.

5. Healthy animals, resilient animals

Slower-growing chicks can invest more energy in developing resistance than their conventional fast-growing conspecifics. By letting them hatch from the egg in the barn and immediately offering them water and food, they will get through the first few critical days much better. They will get more exercise, especially in later growth phases, and therefore remain in good physical condition. The hygienic conditions in the barn – regular litter change, fresh air and being able to find warm areas – ensure that the amount of pathogens remain at a low enough level for the animals to be perfectly able to deal with that.

6. Less environmental impact

The local environmental impact of both designs is expected to be low. By regularly refreshing the litter, there is less ammonia and fine dust. In the Cardinal Point, the surrounding trees filter the fine dust particles from the air, which will limit emissions to the environment. In the Sum of Parts, the remaining fine dust particles and ammonia are purified from the air in the roof-ridge of the system, where heat is also recovered. With a different feed composition, the total environmental impact per kilogram of product can also compete with that of the conventional broiler housing system. This is possible, on the one hand, because the feed composition is less critical for a slower growing animal. And, on the other hand, by replacing conventional soy by sustainably produced soy, meat and bone meal or in the long term, by stabilised protein products from refined grass or insect meal. This can even reduce the environmental impact. Moreover, the advantage of these materials is that they can largely be produced regionally (in northwest Europe), which results in more balanced mineral cycles.

7. Economically viable

Both designs do not compete with current regular practice purely on cost price. The overall estimated additional costs per kilogram live weight is 30 per cent. At current prices (August 2011), this is about 28 eurocents per kilogram of live weight. The higher costs are especially due to the much lower stocking density, the longer life of the chicks and the more complex construction of the housing system. In the Sum of Parts, however, the lower stocking density is compensated for because the space is utilised much better over time. In both designs, the slower growth of the chicks requires feeding longer, but this slower growth also allows the use of feed that contains cheaper ingredients. Compared to the organic production of broilers, these systems are indeed highly competitive, while scoring as least as good in terms of animal welfare with lower environmental impact. In combination with a much smarter carcass value optimisation (see description of product concepts earlier in this brochure) it is possible to market super-sustainable broilers and broiler products at an additional cost that is acceptable to the environmentally conscious consumer. And without the use of antibiotics.

8. Robust and flexible

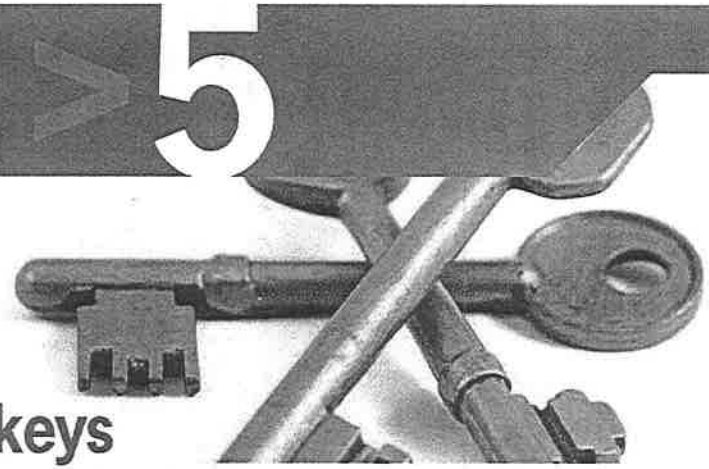
The designs are fairly robust with respect to daily disturbances. By opting for a slower growing chick, both systems are already much more resistant against pathogens and climatic fluctuations. The natural ventilation and the generation of renewable energy on the farm, make both designs also less sensitive to failing climate control systems or to failure of the energy supply. In contrast, disease management in the Sum of Parts constitutes a new challenge because of the multiple ages of the chicks. For example, the nurseries must continually be kept under positive pressure and must be accessed via special routes. By integrating a series of values, the designs are also fairly robust with respect to changes in societal concerns.

The designs are certainly flexible in some ways. For instance, an (outdoor) free-range can be added to both designs. The Sum of Parts offers a subtle palette of options to respond to changing market demands. The system can also be easily converted into an all-in all-out system. The Cardinal Point can be easily extended in length.

In other aspects, the designs are less flexible. The Sum of Parts cannot be expanded in terms of animal numbers and is dependent on a specific building location. Both designs require building investments with a significant depreciation period and are not as easily replaced by something else.

9. Standing out in the landscape or not?

Some buildings fit better into a certain landscape than others: this depends on the quality of the building and what the specific landscape itself has to offer. And sometimes it is better when a building does not stand out or, quite the opposite, actually adds a distinctive quality. The Sum of Parts with a dimension of almost one hectare and an open roof-ridge height of 9.9 meters and with its distinctive shape, approachability and openness will certainly stand out in a vast open landscape. It is a barn that can fit well in predominantly agricultural areas and in some mixed landscapes. The Cardinal Point, also a distinctive shape, can fit well in an open landscape and in landscapes with scattered tree rows.



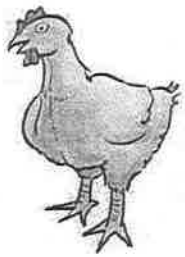
Ten keys to sustainability

With ten design choices – the keys to sustainability – the designs of 'Broilers with Taste' attain a far-reaching level of sustainability. As the two designs show, these choices can be combined in many different ways. This means that integral sustainable systems can, in practice, look quite different. The design choices will continue to play an important role, as they meet several sustainability objectives at the same time.

1. A slower growing animal

The rapid growth of the current broiler is very efficient but leads to a variety of undesirable effects. Fragile health, an important reason for the extensive use of antibiotics. A body shape and weight that limits them in their final growth stages and impedes their natural behaviour such as foraging and perching. A very strict diet for mother hens resulting in almost constant hunger because they are genetically inclined to overeat. But in order to produce (fertilised) eggs, they are prevented from doing so.

In all existing alternative systems, slower growing breeds are selected, presently almost always the Hubbard JA757. This is already a big improvement. Ideal, however, would be a broiler that can move around unrestrictedly (a gait score of 0), with slower growing parents and that is well able to use feed streams with a low environmental impact (such as structure-rich feed and by-product feeds). This allows compensation for the lower environmental efficiency of longer growth.



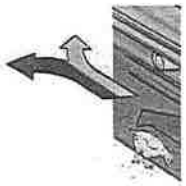
A longer living chick is not an end in itself. It is a means to prevent important undesirable effects and (for some) to produce tastier meat.

2. Foraging in fresh litter

Broilers have a need to forage. This requires a suitable space in which there is plenty of opportunity for foraging. Litter such as wood shavings, flax chips or chopped straw can provide for this. In current systems, however, litter is also used for drying chicken manure and storing this in the barn. The chicks, therefore, live and forage in their own manure. This is problematic because this manure is one of the most important sources for fine dust particles, ammonia and pathogens. And without proper drying, the litter layer turns into a moist, acidic plaque where chicks can contract footpad lesions and breast blisters. In the designs, the litter is therefore regularly refreshed to minimise the presence of manure in the barn.

The litter is refreshed in two ways. In the Cardinal Point, the entire foraging area is equipped with wide conveyor belts. At night when most of the chicks are perching, these can slowly remove the old litter while at the same time providing a clean layer of litter (see page 20). In the Sum of Parts, the foraging area is slightly sloped. The foraging chicks move litter and manure to the narrow conveyor belts in the middle part, which is then being removed during the night. The manure still dries in the barn but it is no longer stored there.

The conveyor belts also have a second function: in the end they are used to gently transport the chicks from the barn to a truck, without the intervention of human hands and crates. This prevents stress and damage from manual capture.



3. Clean litter

Refreshing the litter regularly does not mean more litter material. A much thinner layer will suffice, precisely because it is frequently refreshed. In addition, part of the removed litter can be separated from the manure in a special litter cleaning system and, after UV and fine dust particle treatment, be reused. Such a litter cleaner can use the difference in weight between manure and litter in a rotating drum or using moving air.

4. Climate zones

No two chicks have exactly the same need. The designs, therefore, leave climate control in part up to the chick by providing a variety of climate zones that differ in temperature and shelter. Combined with living areas at different heights, each chick has ample opportunity of finding an area that suits him or her best.

5. Separated functional areas

Eating, drinking, resting, foraging, playing and dust bathing: current broiler housing systems only have one area wherein chicks have to do all these things. The two designs offer spaces that provide specific areas for specific functions. This is good for the natural needs of the chicks, requires less surface area containing litter and minimises contact between chicks and their own manure.

6. More height means more space

To meet the needs of the broiler, almost twice the amount of space is needed than in conventional systems. This extra space is, in part, provided for in the designs by adding height. The building footprint, therefore, does not necessarily have to be twice as large. Elevated areas fit well with the natural behaviour of the chick. At night she prefers to roost on higher ground.

7. Various ages in one system

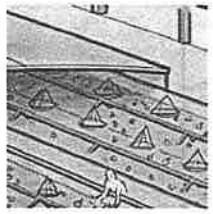
In the Sum of Parts chicks of all ages live together in one system. This ensures efficient use of the available space. In addition, the excess heat generated by the older animals can be used to keep the younger ones warm. Moreover, this enables a weekly delivery of fresh chicken. At the same time, such a 'multi-age system' is challenging from a veterinary point of view and has, therefore, completely vanished from the Netherlands. After all, it is hardly possible to thoroughly clean such a system all at once and there is a risk that the vulnerable young chicks contract diseases from the older chicks. In the Sum of Parts the young chicks are kept in the nurseries situated in the inner core. With highly filtered and controlled incoming fresh air and a slight positive pressure with respect to the perimeter. Also, nurseries and segments can be properly cleaned individually.

Keeping different ages in one system may have its advantages but is not required for integral sustainability. In the Cardinal Point, therefore, the conventional *all in all out* principle was applied.

8. Eggs hatch on the premises

For a healthy chick it is essential to have fresh water and food available immediately after hatching. This is not the case in conventional breeding systems because not all chicks are hatching at the same time in the incubator. Several solutions exist already: the *Hatchbrood*, where the eggs hatch in a mini-barn with food and water, which can then be transported to the farm. Or the Patio™ system where the eggs hatch in the barn, directly above the final living area. The latter system offers the additional advantage that the eggs are transported and not the young chicks. In both designs, a similar approach is opted for. The eggs arrive on trays at the Sum of Parts nursery or at the Cardinal Point incubator hood several days before they hatch. Once they hatch, the chicks are just a small jump away from fresh water and food.

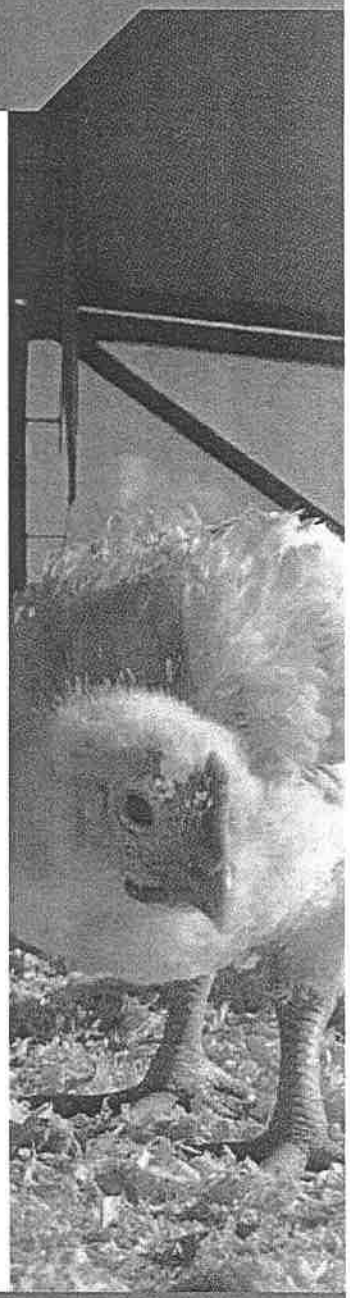
9. Younger and older chicks in different areas



Young broiler chicks do not yet need much space but they do need heat and this requires energy. In both designs, therefore, they are kept in a small, well-insulated area during the first weeks. This saves considerably on heating and ventilation costs since only a much smaller volume needs to be climate-controlled.
Older chicks, on the other hand, need much more space and need to lose their excess heat. At that age, both designs offer much larger, higher and naturally ventilated areas. In the Sum of Parts the excess heat can even be reused in the nursery.

10. As much natural ventilation as possible

Both designs are as open and transparent as possible to the public. And they both ensure that the broiler chick experiences the natural variation in weather outside as much as possible, even if they do not have a 'real' outdoor free-range. Natural ventilation technically fits this approach of transparency better than mechanical ventilation and also consumes – if well thought out – less energy. A major obstacle is that less expertise has been developed in natural ventilation because installers make less money than with mechanical ventilation systems.



6

Where do we go from here?

We started with the chain. And we showed you that integral sustainability requires changes in all parts of this chain, from breeding company and feed, to processing and consumption. 'Broilers with Taste' focuses on the broiler housing system and on the market. So, where do we go from here? It's time to take the next steps: an invitation to continue.

Tastes change

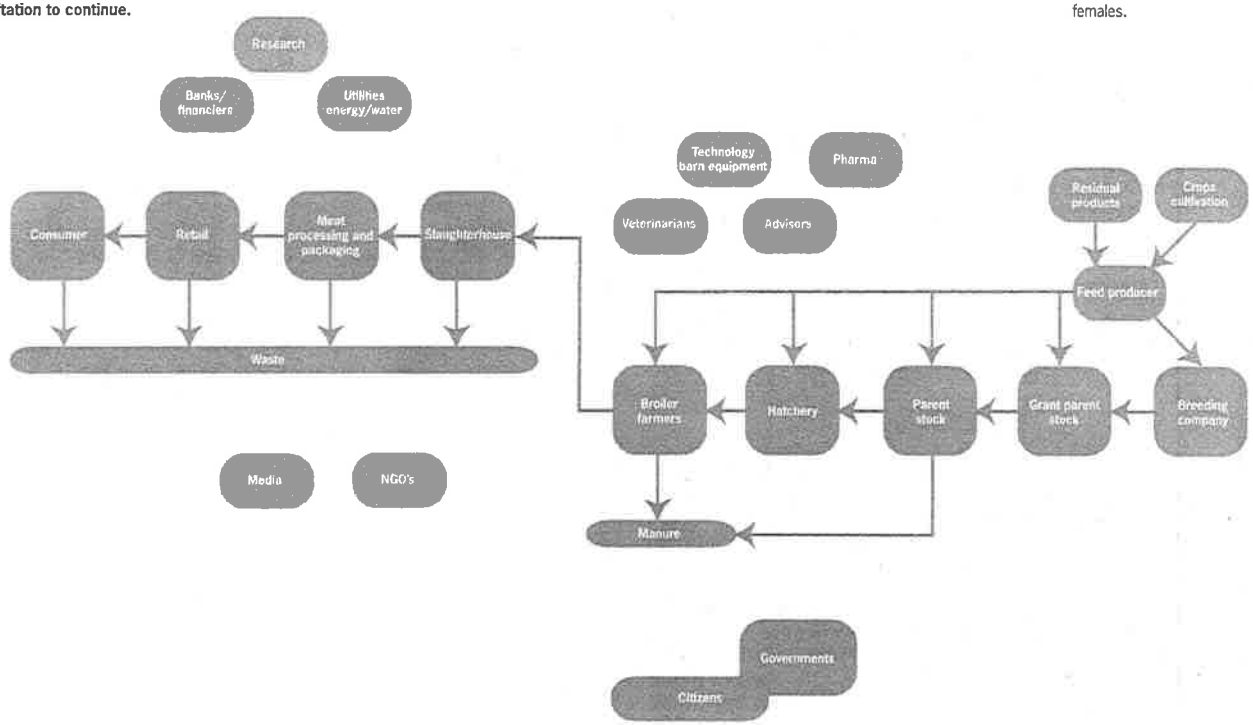
Two generations ago, chicken was a luxury product that was only eaten on Sundays. Today, this is no longer true. It is actually the ease of preparation that makes chicken appealing to consumers. In the Dutch food culture, bones are not popular anymore, the tender pieces of meat are now preferred. Tastes change, although it often takes some time. While bone parts are less popular today, we believe that, if offered in an attractive way, they can become quite 'trendy'. What helps is if the consumer will become more aware that a sustainable chicken is more than just a fillet. Retail and societal organisations can play an important role.

Develop product concepts and make them marketable

Preparing a tasteful concept meal is an art, but to produce a product concept on a large scale and market it is an immense task. If we want more than just a 'fillet-with-a-label', much work needs to be done.

Implementing one or more housing systems

The two designs are not blueprints that can only be implemented one way. On the contrary: experience shows that such designs must be iterated several times, whereby the ingenuity and practical insights of new parties are added. We happily welcome interested parties and support this process.



Managing the housing system

Even if the new more sustainable housing systems are in place, much can still be learned. All parts of the broiler housing system can be fine-tuned into a well-balanced composition. How often should the litter be removed to ensure good environmental and health conditions and acceptable costs of the litter? And will it be feasible to keep all the animals in a multi-age system healthy?

Innovate feed production

To create a healthy diet based on the least environmentally harmful raw materials is a challenge in itself. In the short term, it would be good to include meat and bone meal in the diet again and to experiment with more high-fiber materials and field beans. In the long term, algae and grass refinery offer opportunities.

Continue developing specific innovations

The designs contain various parts that must be further elaborated on and developed. Just consider a floor that consists entirely of conveyor belts, a litter cleaner, natural ventilation in the Cardinal Point according to the Coandă effect, the transport of chicks out of the barn on conveyor belts, and the generation, storage and release of energy. Not exactly high-tech but not exactly ready yet for implementation either.

To breed an even better chick

A chick that has complete freedom of movement to perform its natural behaviour in a challenging environment. A chick that can easily handle new, less environmentally harmful feed raw materials. And whose parents do not feel hungry anymore. And chicks where the males can easily be distinguished from the females.

Together we are strong

A tasty piece of chicken is the result of a joint effort of various parties throughout the entire production chain. Working together, from breeding company to retail, ensures the best quality. Solid partnerships also make it possible to tell the consumer a transparent story. This, in turn, reassures the consumer where the product comes from and that it is produced with utmost care.

What is happening already?

Earlier in this brochure, we praised the innovativeness of the broiler sector. And since many of the ideas of 'Broilers with Taste' have originated from the sector itself, it is not surprising that already many activities are taking place that will bring this approach a step closer. Below are a few striking examples.

Reducing the environmental impact of feed

The poultry sector is lobbying at the European level to allow meat and bone meal in broiler feed again. The Dutch feed industry also takes part in the 'Round Table on Responsible Soy'.

To make the chain more transparent

The recently introduced Broiler ID that includes data on the chick's origin is available to the broiler farmer and helps in reducing the use of antibiotics. The 'Food Supply Chain Information' (FCI) provides information on the housing conditions, including the health status of the chick, to the slaughterhouse.

Better animal health & fewer antibiotics

The poultry sector strives to ensure that not only the poultry farmer bears the financial risk in order to improve animal health, and that entrepreneurs who are making extra efforts for the prevention of diseases are being rewarded. The use of antibiotics is already being reduced by the Dutch 'Masterplan Selective and Correct Use of Antibiotics' wherein antibiotics use is centrally registered and monitored. Subsequently, those farmers that use large amounts of antibiotics are reprimanded in cooperation with the 'Animal Drug Authority'. Presently, a one-to-one relationship with an IKB ('Integrale KetenBeheersing' - Integral Chain Control) qualified veterinarian is required.

Less energy consumption

Several clever barn adjustments and systems, like the Terra Sea system, reduce energy consumption. Heating and cooling of incoming fresh air takes place using geothermal heat and recovered residual heat from ventilation air. The Smart Air Wall is an air-filled wall, which reduces the volume of air that needs to be heated in the barn during the early life of the chicks.

Slower-growing chicks

There are several types of slower-growing brands of chicken on the Dutch market: Volwaard, Puur & Eerlijk, free-range chicken, free-range foraging chicken, Onze kip, Gildehoen, organic chicken, Kemper Kip and Label Rouge.

Chicks into space

Robert Nijkamp, broiler and dairy farmer in Raalte, Overijssel, has made an important contribution to the designs in 'Broilers with Taste'. His search for improvements in the broiler housing system had actually started earlier: He experimented with an extra living layer in the barn to provide more living space for his animals. And with success, as he now added a second platform. His drive for innovation continues – he wants to participate in the creation of a Cardinal Point.

"When you are an entrepreneur, you want to take the necessary steps forwards, not to wait until legislation tells you what to do. For my business and for the entire sector, I see real opportunities for sustainability. This is already possible with simple adjustments, but sustainability always involves different aspects: animal welfare, barn climate, lower emissions etc. And sustainability should also be economically interesting and viable for entrepreneurs, otherwise it cannot be done by an individual. This is why partnerships are important. As an entrepreneur, I see real potential in the Cardinal Point and I would like to develop this concept on my land.
An attractive feature is that costs are kept under control, especially because of reduced energy consumption. The natural airflow makes ventilation simple, while heating and insulation are limited and are only applied where needed. On the other hand, keeping less chickens per square meter means higher costs for animal welfare. In the Cardinal Point these added costs are manageable. So, I would not be surprised if this barn concept can be really competitive."

Stress-free, antibiotics-free

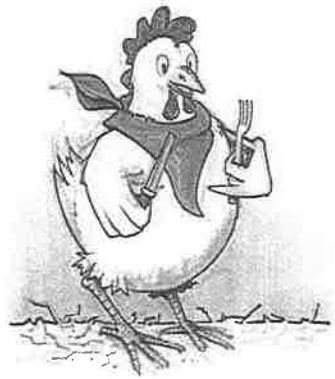
The use of antibiotics in livestock farming – and broiler farming in particular – has been under heavy fire in public opinion for some time. Within a short time, this has led to various initiatives in the broiler industry. And with success, it seems: antibiotics use has declined by 38 percent in 2010 compared to 2009. But this is still not enough. One of the initiatives is the project 'Antibiotics-free Chains' of InnovationNetwork.

Veterinarian Goossen van den Bosch on his role as coach in this project:
"Recently I visited a poultry farmer who was able to reduce his antibiotics use by 60 percent within one year. I asked him if he was happy with that. His reaction was that while he used to enter the barn whistling, he now often wonders what he will find there. Antibiotics have become standard; its use just crept in. If you stop using antibiotics, everything becomes more critical. As a farmer, you need to manage things right, clean your barn better, keep the barn warm. You need to focus on the chicks. If the chick can fulfil its needs in a natural way, it will be healthier. There will be less stress, which increases resistance and the chick's immune system will become stronger. 'Broilers with Taste' offers the opportunity to investigate and design several housing systems that will reduce this stress."

A star or not?

The 'Gildehoen' chicken was the subject of fierce debate, including on foodlog.nl. Because the chicks do not have any open foraging area. They do, however, have more space and some enrichment, and a slightly longer life. This is why it was possible to drastically reduce the use of antibiotics. Feed manufacturer ForFarmers, hatchery Morren BV, slaughterhouse Esbro BV and packer InterChicken developed the concept. For InterChicken, the carcass value optimisation of this new concept was a challenge. Also the parts of the chicken that are more difficult to sell must be marketed with sufficient added value.

Yolande de Vries of InterChicken is trying to find a solution.
"Marketing sustainable products is quite a challenge. The issues are price and recognisability. Price, because the consumer wants to pay for animal-friendly meat (the environment is less important) but up to a certain limit. And recognisability: how do you know as a consumer, which chicken has led a sustainable life.
For a more sustainable product, InterChicken buys whole flocks from poultry barns, so we actually buy the entire chicken: filiets, legs and wings. To be able to sell the legs and wings as well, with added value, you need product development as well as marketing. This means that you need to listen to the consumer.
We have looked for partnerships within the chain – with the breeder, slaughterhouse, feed producer – in order to develop sustainable products and to ensure high-quality trajectories. This Cardinal Point housing system is certainly very interesting.
'Broilers with Taste' speeds up these kinds of thinking processes, provides much knowledge and lowers the threshold to seek collaboration and to push the limits."



Many have contributed to 'Broilers with Taste'!

'Broilers with Taste' has been an exploration in which many have contributed their ideas and enthusiasm, in different stages of the project. Parties within and outside the sector that are sympathetic towards sustainable broiler consumption. We are extremely grateful to all these people. Also in the future, we hope that these and others who think alike will meet again to further explore what sustainable poultry farming will look like in the future.

'Broilers with Taste' has been conducted in several phases. Special thanks to:

Interviews
Henk Hulsbergen, PPE (Commodity Product Board for Poultry and Eggs) - Gerard Albers, Hendrix Genetics – Leo den Hartog, Nutreco - Hans van der Vleuten, Probroed and Sloot - Gert-Jan Oplaat, NVP (Dutch union of poultry farmers) - Martine Onderdijk, Storteboom – Peter Poortinga, Plukon - Dirk Dreschler and Johan Nap, InterChicken - Rob van de Straat, Albert Heijn - André van Straaten and Maartje Oonk, Dutch Ministry of Economic affairs, Agriculture and Innovation (EL&I) - Paul Vermast, Natuur & Milieu (environmental ngo) - Marijke de Jong, Dierenbescherming (Dutch Society for the Protection of Animals)

Collective Workshop Systems Analysis
Gerard Albers, Hendrix Genetics - Paul van Boekholt, Hubbard Nederland - Hans van der Vleuten, Probroed & Sloot - Jan Brok, NVP - Peter Poortinga, Plukon - Jan Workamp, Dutch Health Authority - Ellen Hambrecht, Nutreco - Cor van de Ven, Vencomatic – Dirk Dreschler, InterChicken - Ben Hermans, Natuur & Milieu - Koos van Wissen, Ministry of EL&I - Jef Pleumeekers, Poultry Veterinary Practice 'de Achterhoek'

Platform
Goossen van den Bosch, Goossen van den Bosch Consultancy - Koos van Wissen, Ministry of EL&I - Maartje Oonk, Ministry of EL&I - Françoise Divanach, Ministry of EL&I - Marijke de Jong, Dierenbescherming - Ben Hermans, Natuur & Milieu - Jan Brok, NVP - Jan Wolleswinkel, NOP (Dutch organisation of poultry farmers) - Peter Vesseur, NEPLUVI (Association of Dutch Poultry Processing Industries) - Jan Zijderveld, ANEVEI (Dutch Association of Egg Traders) - Jacco Wagelaar, Dutch Poultry Centre - Bart Jan Krouwel, PPE – Simone Hertzberger, Albert Heijn (Dutch retail corporation)

Design Studio I
Ronny Graat, poultry farmer - Robert Nijkamp, poultry farmer - Arian Oostvogels, poultry farmer - Paul van Boekholt / Henri Bel, Hubbard Breeders - Yolande de Vries, InterChicken – Hans van der Vleuten / Johan Kollenstart, Probroed & Sloot – Bart van Opzeeland, Foodwatch Netherlands - Masja Lensing, Agrifirm InnovationCentre - Henk Hupkes, Meyn - Erik van Geloof, Veterinary Centre Someren - Peter Vingerling, TS-consult

Public final presentations
Koos van Wissen, Ministry of EL&I - Marijke de Jong, Dierenbescherming - Jan Wolleswinkel, NOP - Fabian Brockötter, poultry farmers' magazine 'Pluimveehouderij' / Reed Business - Fred de Jongh, ZLTO (Southern Agriculture and Horticulture Organisation)

Market Channel
Samuel Levie & Geert van Wersch, the Green Peas

Design Studio II
Robert Nijkamp, poultry farmer - Erik van Geloof, Veterinary Centre Someren - Erik den Besten, Jansen Poultry Equipment - Jasper van Ruth, JvA Architecture

Brooding session
Yolande de Vries, InterChicken - Johan Kollenstart, Probroed & Sloot - Arian Oostvogels, poultry farmer, Ernst Beitler, CAH Dronten (higher education) – Roland Bronneberg, AviVet - Ronald Kuijken, Vencomatic

Images & Communication
Fabian Brockötter & Hans Bijleveld, poultry farm – Wouter Boog, JAM (visual thinking) - Jelle van der Vegt, JAM - Thomas van Daalen, JAM - Jeroen Meijer, JAM - Jefta Bade, JAM - Tulsa Caupain, JAM - Joost Fluitsma, JAM - Barbara van Male (video's and newsletter Design Studios).

Knowledge extension with experts of Wageningen UR
Ingrid de Jong, animal welfare - Sander Lourens, animal welfare and health - Cindy Hoeks, BoR Broiler - ACT-team, environmental impact feed - Marinus van Krimpen, animal nutrition – Jan van Harn, animal nutrition - Peter Groot Koerkamp, emissions and design, WLR/WU - Albert Winkel, emissions - Bart van Tuijl, opportunities for combination with plant crops - Izak Vermeij, economics - Peter van Horne, economics - Eddie Bokkers, animal welfare/ BoR Broiler - Bas Rodenburg, animal welfare - Ellen van Weeghel - Karel de Greef - Jan ten Napel - Ferry Leenstra - Henri Holster, Hendrik Kemp, MSc student design requirements local environment, WU - Rik Verhoijsen, BSc student animal capture

Commissioned by
Ministry of Economic affairs, Agriculture and Innovation – Koos van Wissen and Maartje Oonk

Join in and fly with us!

'Broilers with Taste' is not nearly finished. This brochure is an invitation to parties within and outside the sector to spread their sustainable wings and to continue along this flight path. From within the project, we like to help along. For instance, by setting up follow-up projects and seeking funding. Or by offering advice and guidance to professional networks. Or by bringing parties together and to experiment in practical situations and to learn from each other.

This brochure describes the main issues of what has been achieved during the project 'Broilers with Taste'. More information and background is available via: www.pluimveemetsmaak.wur.nl

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Colophon

This brochure is part of the results of the project 'Broilers with Taste', which has been carried out by Livestock Research of Wageningen University and Research Centre (Wageningen UR) and was commissioned by the Dutch Ministry of Economic affairs, Agriculture and Innovation within the research programme 'Verduurzaming veehouderij door keteninnovaties' (BO-12.02-001-050.02).

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Broilers with Taste at a glance

What?
'Broilers with Taste' is an exploration towards sustainable broiler production as well as consumption.

Who?
This exploration is a joint undertaking of representatives from the entire sector and societal organisations who are searching for an integral design, a coherent whole. The ball for sustainable broilers does not lie in the court of just one party. Changes and shared values are needed in the entire chain – from breeding company to retail – so that all parties together can seize the opportunity for sustainability and set the chain in motion.

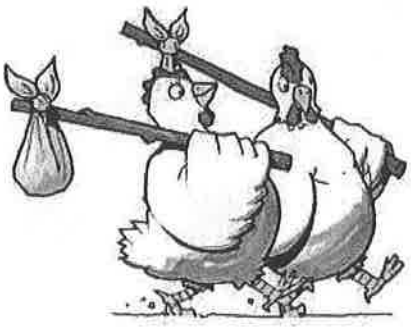
How?
With the help of surveys, meetings, interviews and two design studios, various parties in the chain have been brought together and were inspired by the team 'Designs for System Innovations' of Wageningen University UR. Participants explored obstacles and needs, established sustainability objectives, formulated definitions, created designs. The essence lies in joint exploration. Livestock farming appears to be full of contradictions. When searching for solutions rather than tackling existing problems, much more appeared to be possible. And shared responsibility became much more evident.

Whereto?
The participants in 'Broilers with Taste' broadly agreed on the objectives. Sustainability in the broiler sector needs to continuously benefit the broiler itself, the poultry farmer, the consumer and the environment. A valued, future-proof and profitable production system in which healthy animals are being raised under ideal animal welfare conditions in a very environmentally friendly way, rooted in a transparent production chain in which people like to work.

And the results?
The report of the learning process of 'Broilers with Taste' contains the following:
1. Sustainable objectives
2. Chain in motion
3. The market, with product lines that include more than just the chicken fillet
4. Design according to need: chick, broiler farmer and consumer
5. Detailed designs: the Sum of Parts and the Cardinal Point. What does a broiler farm look like that is good for man, animal and environment?
6. Ten keys to sustainability
7. Now & Later: Where to go from here? What is already happening?

The results show that sustainable broiler production is possible!

What is 'Broilers with Taste'? An approach, a project, an exploration, a vision, a learning process ...? 'Broilers with Taste' is all of that, with a focus on integral sustainable broiler production. The results are meant to inspire and eventually put ideas into practice.



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Ministry of Economic Affairs, Agriculture and Innovation

Avian Influenza Monitoring in The Netherlands

Visit Dr. Chang to Animal Sciences Group of Wageningen

12 February 2014, Ivo Claassen

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INFLUENZA VIRUS

- Family Orthomyxoviridae
  - Three types influenza A, B and C
    - A infect many animal species
    - B in humans and seals
    - C only humans
  - Pleomorphic to spherical particles of 80-120 nm
  - Negative sense RNA
  - 8 unique segments

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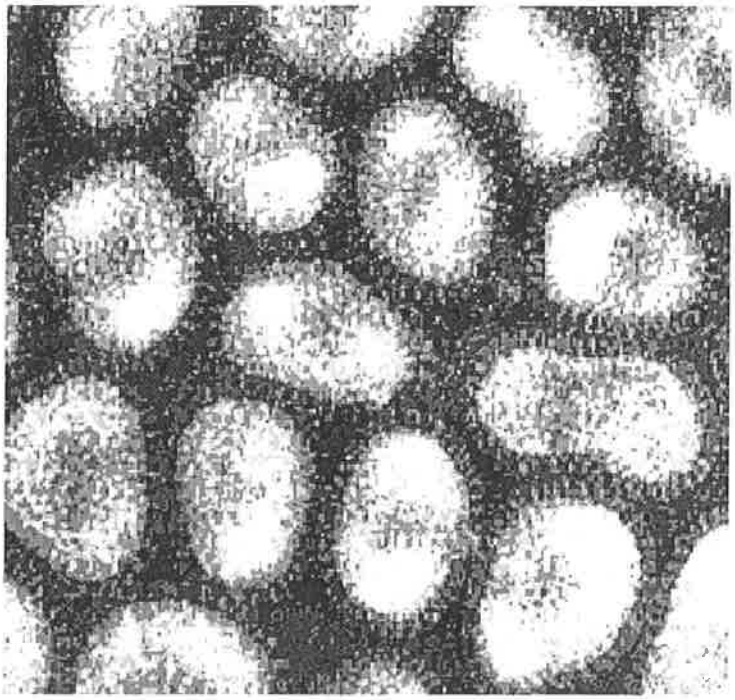

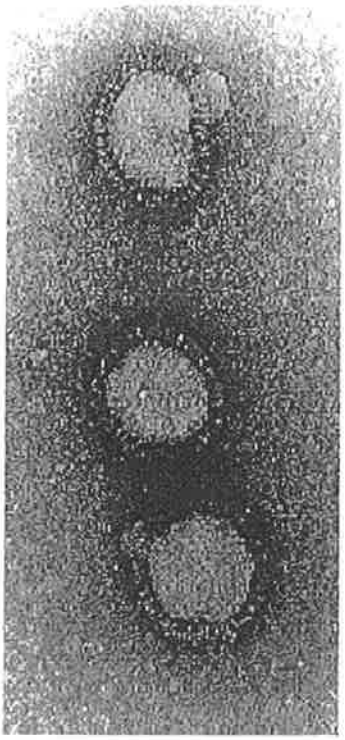

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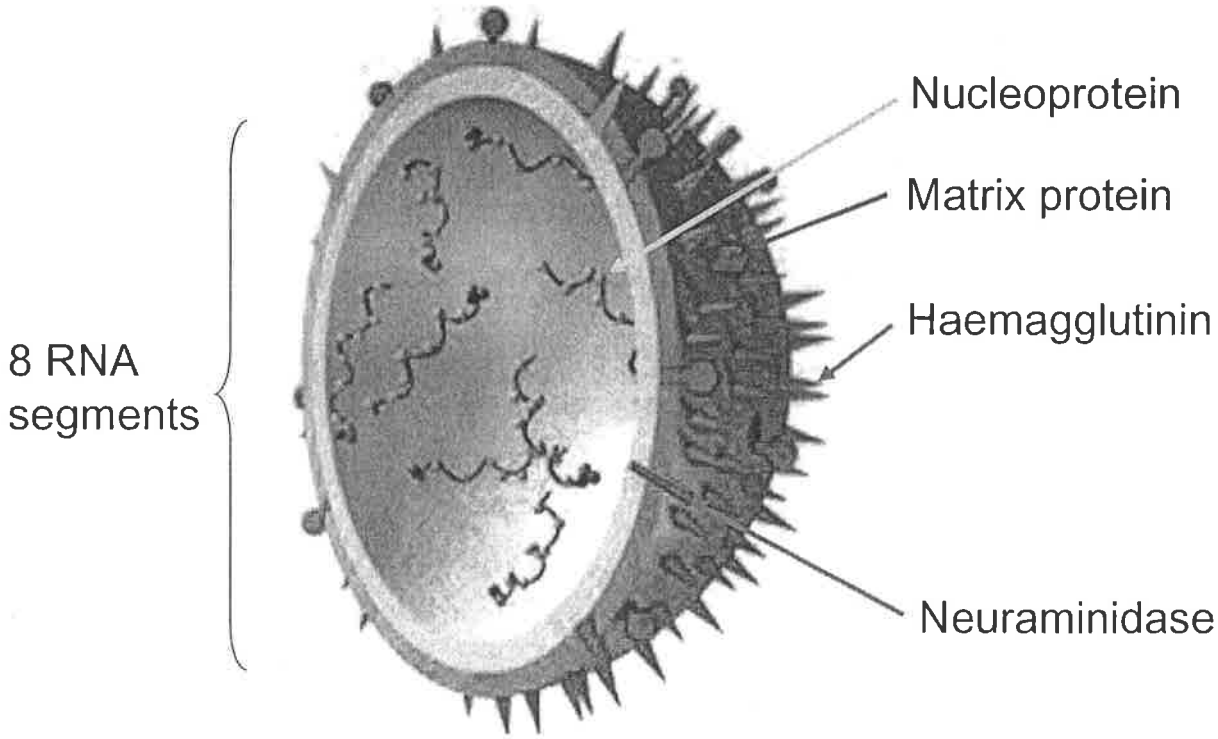
INFLUENZA VIRUS STRUCTURE



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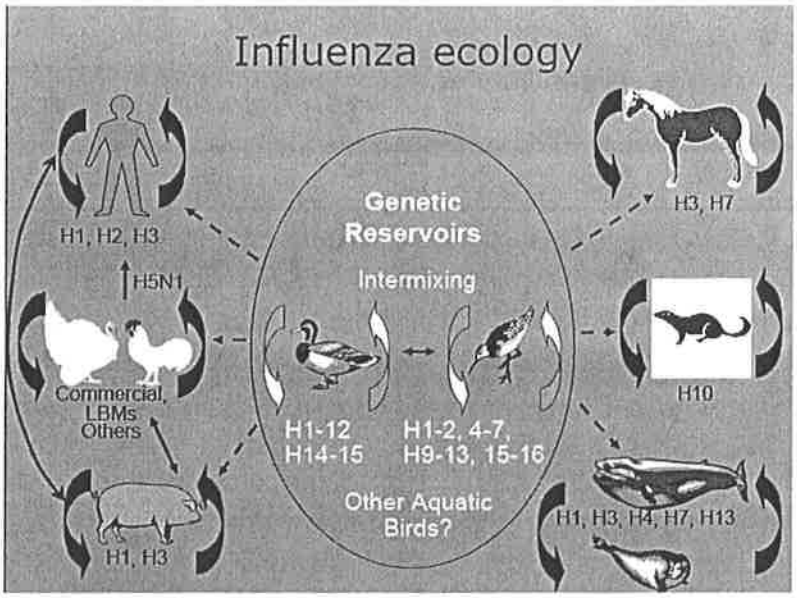
RESERVOIR OF INFLUENZA A VIRUSES IN NATURE

Infect variety of animals

- including humans, pigs, horses, sea mammals and birds

Phylogenic studies:

- Aquatic birds are source of all influenza viruses
- Interspecies transmission depends on animal
- Species specific lineages of viral genes

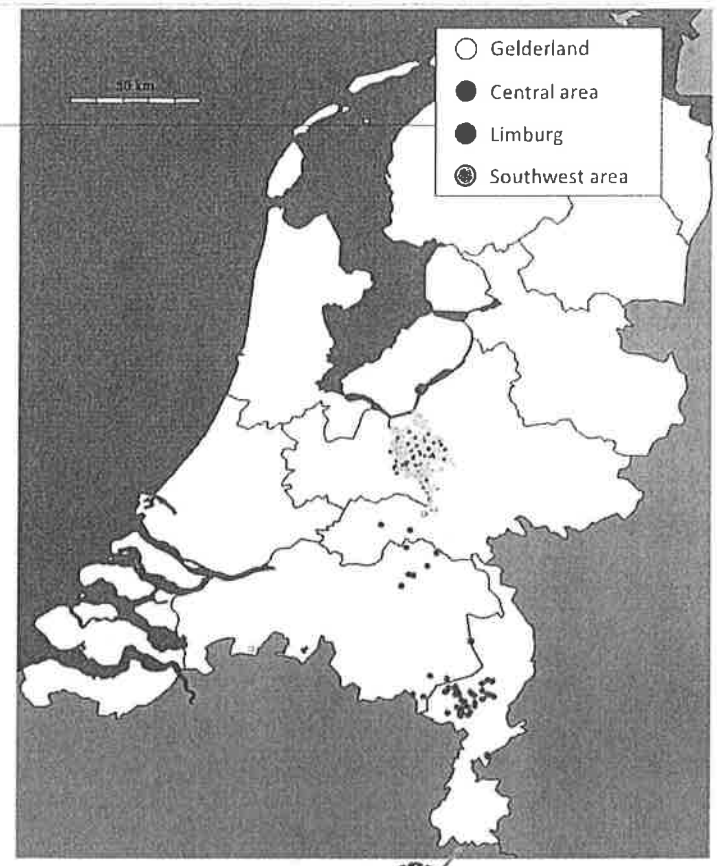


INFLUENZA VIRUSES IN WILD BIRDS

- Influenza viruses isolated from
  - Wild ducks
  - Shorebirds including gulls, terns, shearwaters, guillemots, sandpipers
- Replicate in intestinal tract
  - Faeces can contain up to $10^{8.7}$ EID_{50}/g
  - Isolated from non-concentrated lake water
- Generally avirulent for wild ducks

Dutch H7N7 HPAI Epidemic

- First report on 28/02/2003 in poultry-dense area in Gelderland
- Ban on transport and culling started on 01/03
- Transmission to farms out of infected area despite control measures (25/03)
- Transmission to poultry-dense area in Limburg (03/04)
- End of outbreak on 7/05
- Total of 255 farms infected, over 30 million birds culled
- Transmitted to 89 persons, 1 died



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Universiteit Utrecht

Dutch H7N7 epidemic 2003: Control

- 3 km surveillance zone
  - Culling of infected farms
  - Pre-emptively culling of farms at risk to be infected
- 10 km protection zone
  - Stand still
  - Clinical inspection
- Buffer zone:
  - Emptying region of all poultry

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Leasons learned of HPAI control in 2003

- Influenza viruses are to stay in wild birds
- Risk factors
  - High density is risk factor
  - Free range farms
- Early diagnosis ~~in~~ is required

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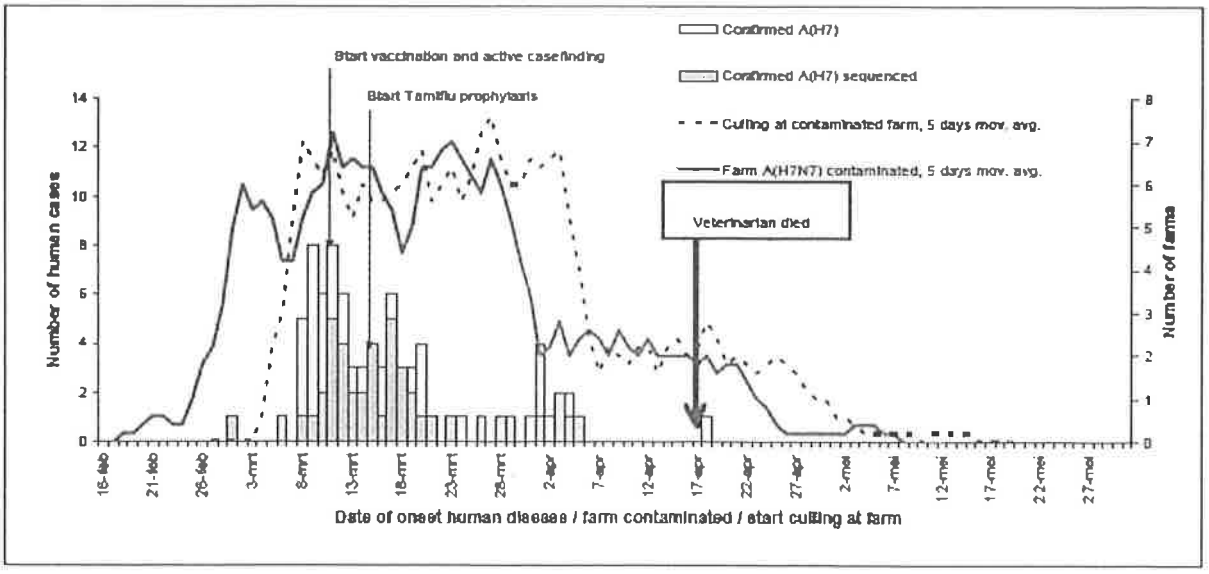
Outbreak 2003

H7N7 outbreak, Netherlands 2003



255 farms and 89 human cases; > 30 million poultry culled

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Costs

- Direct costs: 270 million
- Indirect costs: 1 milliard
- Other animals (pigs) are susceptible
- Consequences for public health
- Increased risk for new pandemic (re-assortment)
- Damaged image of the poultry industry

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Problems with control of AI

Clinical signs are not pathognomic
Confirmation in the laboratory is required

AND

No or mild clinical signs LPAI
Mutation LPAI to HPAI is a risk

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Avian Influenza prevention, monitoring and diagnosis in the Netherlands

- Syndromic surveillance: virus detection
  - Acute infections mainly of HPAI
  - LPAI infections that cause mild disease
- Early warning: virus detection
- Monitoring programme: antibody detection
  - Detection of LPAI introductions that remain subclinical

Syndromic surveillance

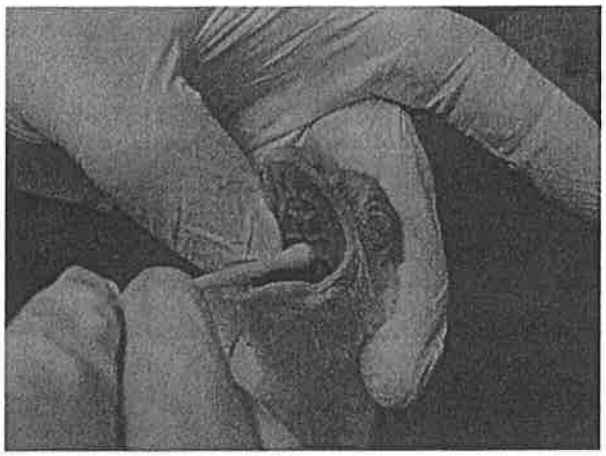
- Increased mortality more than 1-5% per day
- Reduction of egg production more than 5-10%
- Reduction in water and feed intake
- Sample submission to laboratory to exclude AI
  - Notify veterinary services (NVWA)
  - AI in differential diagnosis -> direct submission to CVI

Samples

- 5 sick or dead birds per farm (only possible in case of clinical signs)
    - Trachea, lung, (spleen, brain)

OR

- 20 choanal and cloacal 20 swabs per house (LPAI)



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Early warning system

- Some clinical signs but not likely caused by AI
- Practitioner or Animal Health Service
- Sample submission to laboratory to exclude AI

- Main difference with syndromic surveillance
    - No consequences for the farm
    - Exclusion diagnostics

- Samples: 5 choanal & cloacal swabs

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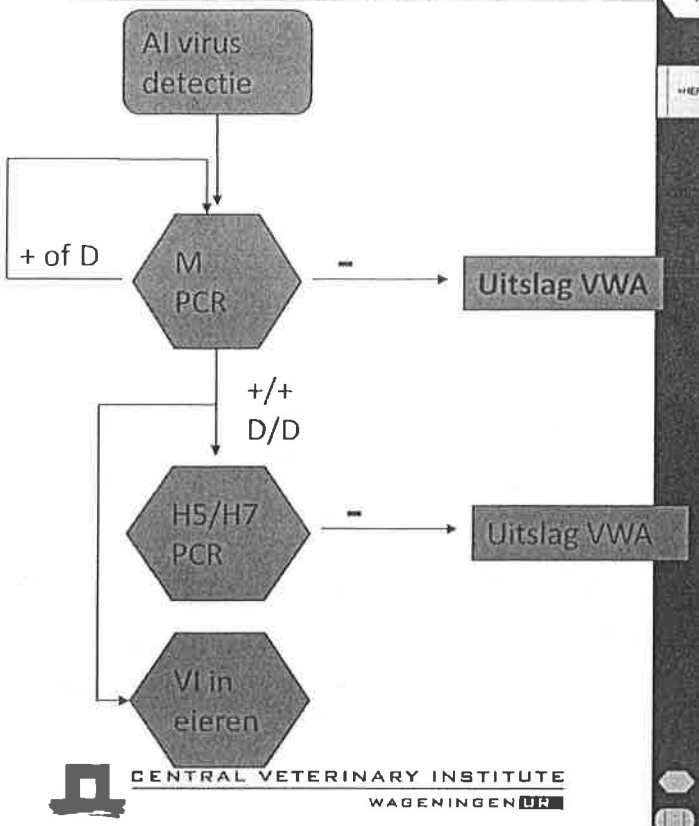
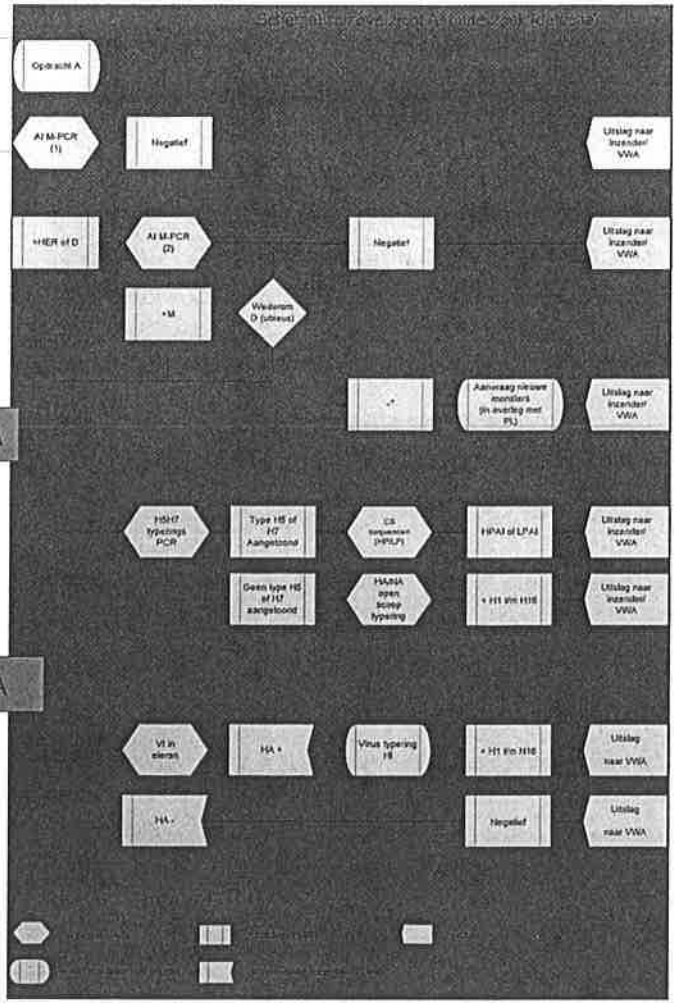
Antigen detection





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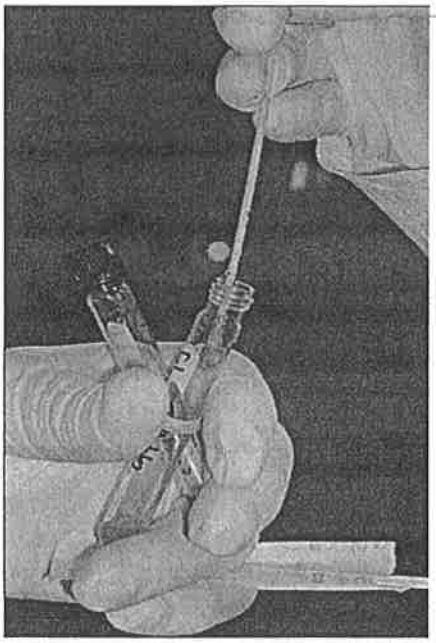
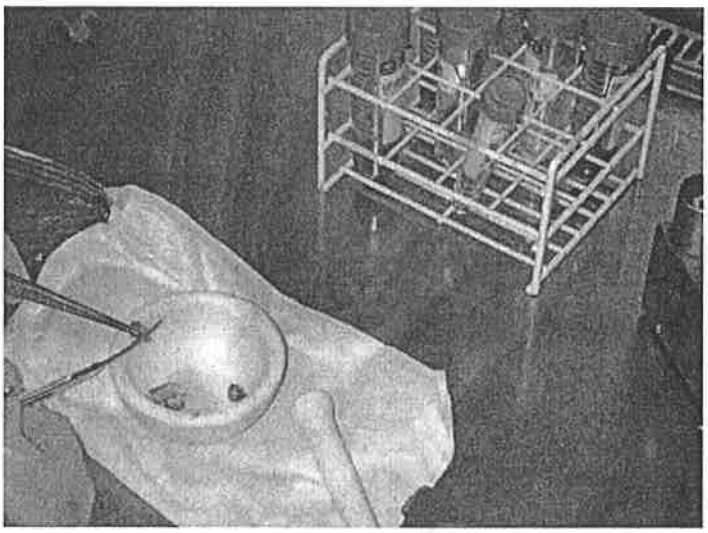
Samples for agent detection





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