Laying Hen Husbandry

Towards a happy hen life, proud farmers and a satisfied society

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Houden van hennen

New designs for hens and sustainable husbandry

WAGENINGEN UR
for quality of life

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For quality of life

landbouw, natuur en voedselkwaliteit

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Verantwoorde Veehouderij

Colofon

This brochure is one of the results from the project *Laying Hen Husbandry* ('Houden van Hennen') carried out by Wageningen University and Research Centre (WUR).
Further information about this project and subsequent activities can be obtained under www.houdenvanhennen.nl or from Peter Groot Koerkamp (tel. nr. +31 320-238 514, Peter.GrootKoerkamp@wur.nl).

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Contents

In the Netherlands around 35 million hens produce nearly ten billion eggs a year. How can these hens be kept in a way, which makes them, farmers and citizens happy? A research team from Wageningen University and Research Centre worked on this question for one year. The aim was to design new socially desirable husbandry systems to keep hens for the production of eggs.

Towards two designs for new husbandry systems for hens.

No blue prints, but inspirational examples

Laying Hen Husbandry

Towards a happy hen life, proud farmers and a satisfied society

New husbandry systems are necessary as today's existing systems lack in important aspects. The current most frequently used husbandry system – the battery cage system – will even be outlawed in 2012. Further, beak trimming will be forbidden from 2006 – this is a process whereby the sharp beaks of hens are trimmed. This practice has always been accepted as necessary because hens in cramped conditions and restricted space can cause considerable injury to each other through aggressive pecking. More and more traditional poultry farmers are switching to alternative systems, such as free range husbandry. However, it is questionable, whether these alternatives are the most ideal replacements for the battery cage system. Barn systems do provide hens with greater freedom of movement than battery cages, allowing foraging behaviour. However, the high population density still poses a problem for the well-being of the hens– for instance due to the high incidence of feather pecking– and occasionally also of humans: in some alternative systems a lot of dust is thrown up into the air causing damage to the health of the poultry farmer. Furthermore, the outbreak of the fowl pest (Avian Influenza) has stimulated further discussion on how poultry are kept as there were some indications that the disease was spread by the droppings of wild birds flying over free-range poultry areas.

To be clear, we define husbandry systems as the combination of the housing unit (indoors and outdoors), technical equipment, animal management and the animal itself. Thus, a husbandry system is much more than just the housing system. The animals are laying hens, which are kept for the commercial production of eggs. However, in this brochure we refer to them both as 'hens' or 'chickens'.

At the end of this brochure *Laying Hen Husbandry* presents two designs of new husbandry systems for hens. In these designs the wishes of men and animals have been integrated as much as possible. These are not blue-prints but inspirational examples. That's why we begin by detailing the process which has led to these designs.

The Dutch Poultry Industry

The Dutch poultry industry consists of a range of businesses: a few breeders organizations, which through selective breeding produce hens with the preferred qualities; a number of breeding stations which produce eggs for hatching; poultry farms which hatch these eggs and sell chicks and finally around three thousand farms which raise layer pullets to the age of 17 weeks old and laying hens to the age of 72 weeks. Amongst the ancillary industry are egg packing stations and egg or hen processing factories, slaughter houses and feed manufacturers. In addition service providers and suppliers are active in areas such as livestock feed sales, transport and logistics (for animals, feed, manure and products), veterinarian support, advisory or consultancy businesses and banking. In 2002 around 35 million laying hens were kept in The Netherlands, of which two thirds were housed in traditional battery cage systems and one third in welfare friendlier free-range systems. This number has risen to 50 % in 2003. Farms with outdoor runs, indoor barn systems and battery cage systems have an average of 5000, 15 000 or 30 000 animals respectively. Farms with outdoor free-range systems have less chickens than farms without outdoor access. Many farms with battery cages keep more than 50 000 animals. All together, these hens lay around 10 billion eggs per year.

Around two thirds of the Dutch production is exported, primarily to neighbouring countries. One third of the eggs remaining in The Netherlands, is sold as table eggs. The rest is processed for ingredients in products, ranging from pasta to shampoos.

It is quite something to develop a system that covers both the wishes of humans and animals. The project team first collected the experiences and opinions of a wide range of people inside and outside the poultry industry. The latest literature on the needs of hens was reviewed as well. From this, the project team distilled three main challenges for the project.

The three challenges

1. Developing a socially desirable system with a truthful and positive image as well as happy chickens.

The first challenge was to design a husbandry system which was socially desirable. Such a system does not only incorporate the needs of the hen, but also the needs of the poultry farmer and the needs of society. Why is that? Historically, our agricultural practices originate out of the dire need for food after the Second World War. The motto then was 'hunger – never again'. Agriculture was given the task to produce as much food at the lowest possible costs. And farmers excelled themselves, with the help of scientific knowledge, applied agricultural research and education. Intensive livestock husbandry was born. However, unchecked growth turned out to have its bad sides as well. Problems with animal welfare, food safety and the environment popped up, and society and its regulating bodies became increasingly aware that something had to change. At this point the production process came under societal scrutiny. Livestock industry had to adapt: from socially tolerated to socially acceptable. Within the project *Laying Hen Husbandry* we have set even higher standards. We wanted to develop a *socially desirable* husbandry system, in which the animals are happier, through which the farmer can make enough money, and around which society feels comfortable – for instance, because it can be ensured that the animals are having a good life and that resulting products are healthy and safe.

2. A husbandry system with special attention for robustness and naturalness

The second challenge for the project was to design a system which gives actual shape to the concepts of robustness and naturalness. Like the previous challenge, this wasn't our private idea. These terms derive from the social debate about intensive livestock husbandry. They point to values which many people identify with and want to be realized in this context. But what do they actually mean?

NATURALNESS: The project team gave the term *naturalness* three different, but related meanings. First of all naturalness implies that the system has to satisfy the natural, ethological needs of the laying hen. These can be largely defined according to current scientific knowledge. But for most people naturalness is more than just natural behaviour – so how does the public perceive naturalness and how would they like to see this take shape? We asked their opinions and so came to a second meaning for naturalness: Naturalness is society's wish to produce in a way which resembles the processes in nature.
Yet, the team added a third element: naturalness as an ordering principle. Today's livestock husbandry systems try to control nature by using ingenious technology. Nothing is left to the animals themselves. *Laying Hen Husbandry* left this approach behind. The project team chose instead to look for cooperation between nature and technology. Then, the natural behaviour of hens forms the basis for the production system. One problem in this approach is that we still do not know everything about this behaviour. A system that allows for much greater natural behaviour of the hen, will then also teach us to find out more about just that. This knowledge can later be used to further adjust to the natural qualities of the hens.

ROBUSTNESS is also such a complicated term. In a few words, robustness means that the husbandry system can survive setbacks. This always concerns the whole: it's the good combination of buildings and

Methodical design, the way to a solution

A task as complicated as the design of a husbandry system which complies with many needs and wishes – and with all their associated complications – requires a well considered plan. The project team 'Laying Hen Husbandry' chose a method, known as 'Methodical Design'. This is a very systematic approach. The first step is an inventory and exact definition of all demands, wishes and requirements. What exactly does a hen require? What is scientifically proven, or is just believe or gut-feeling? What are the demands and wishes of the public, the farmer and the government? Such an inventory does not only help greatly in the thinking process, but it also proves useful in conversations with those involved. It is a great tool for explaining what the system designers are trying to do and why. And that's not the only benefit. The method helps to bridge initial opposition by finding common grounds. This first step results in a 'Programme of Demands' (PoD), a complete list of requirements for the new designs. The second step is the actual design of a husbandry system, in which these demands have to be met. This starts with the search for partial solutions, which will be combined into complete systems afterwards. Special attention is given to the most pressing problems, where the systematic use of creativity is of great importance. Especially those solutions which fulfil the wishes of all are welcome. Finally the design is tested against the Programme of Demands and presented to the relevant parties: poultry farmers, the public/consumers, scientists and other experts.
Laying Hen Husbandry involved a variety of stakeholders in many different ways during the process which had to result in the design of a socially desirable husbandry system for laying hens – a husbandry system which complies with the requirements of laying hens, poultry farmers and the general public. Poultry farmers, policy employees from the Ministry of Agriculture, Nature and Food Quality, the animal feed industry, veterinarians, egg processors, egg distributors, animal welfare organisations and citizens – including children – all had the chance to give their viewpoint and thus to contribute to the end result.

Technical Equipment or the Animal?

You can use or adapt equipment or management techniques to make a system robust, but you can also make use of animal qualities. In current systems we often apply the first alternative, for instance in order to keep disease out or to regulate the indoor climate. But if the hen herself is allowed to cope with and adapt to changes, the system may be even more robust. Generally, a laying hen can cope well with changes in temperature and she can build up resistance against certain diseases. Thus, we do not need to pamper them or treat them like a plant in a greenhouse, fed at exact times and kept in a completely controlled environment. However, it is important that we provide the right conditions. For example, a hen can cope well with low temperatures, provided there are shelter areas, where she can protect herself.

equipment, the qualities of the animal, and the skills of the poultry farmer that make a robust system. Thus, robustness should not be limited to a quality of the animal.
If defined more precisely, robustness is the extent to which the husbandry system is *independent* of internal or external influences. Examples of internal influences would be changes in requirements between animals, wear and tear on buildings and equipment and pollution in the husbandry system. To what extent can the system adapt to these changes?
Examples of external influences could be climatic changes, diseases, vermin, loss in profit, new legislation and temporary transport prohibitions. The robustness of a system tells us to what extent the husbandry system can cope with such small and great disturbances.

3. A husbandry system with free range areas – outside..., or inside after all?

Finally the project team had to tackle a third challenge. They wanted to create a husbandry system for laying hens which has free range facilities, an outdoor space, where hens can forage, explore the area and enjoy the fresh air. But for whom is this important? At least for the general public. The market – especially the German one, where most of Dutch exports go to – asks for eggs with a 'natural touch'. Many consumers find it important that hens can go outside to feel the sun, the wind and rain. However, this isn't that simple. Allowing hens to run free outside complicates the matter for the poultry farmer.
For instance, the price difference between standard eggs from battery cage systems, and special eggs – for example from hens which have outdoor access– is getting smaller, while the production costs of these eggs is actually higher through increased labour and space requirements. The poultry farmer also has to carry out more checks, both in the hen house and in the outdoor area, and look for so-called mislaid eggs, eggs laid out of the 'official' nest boxes. Therefore, the very small profit margin per egg implies the need for an increasing number of hens to earn a living.
In addition a free-range area outside can increase a variety of health risks, both for men and animals. The current systems with an outdoor area consist of a hen house with an adjacent field area. In this area hens can pick up all sorts of parasites and infections: through their own excrements and that of other wild birds, or through the ground. They can ingest toxic substances, such as dioxin, which then can be passed on to the consumer via the egg.
Finally, the poultry farmer wants to have a good overview of his business. Current free range and aviary systems are not very easy to assess, especially not those with an outdoor run. In a battery cage system the farmer knows exactly how many hens a cage should contain, and he can see much quicker when an animal is sick or dead. He can check all hens by simply walking through on a daily basis. This is impossible in an outdoor run. One can not tell whether 5, 10 or 30 layers are missing after a day. An additional complication is, that the farmer cannot survey all his animals, especially when the outdoor area is made attractive for the hens by lots of vegetation.
For these reasons poultry farmers are not all too keen to convert to outdoor free-range farming. And the chicken, what does the chicken itself find best? From behavioural research with hens we know that they have a requirement for foraging and exploring, but it is not known whether this has to be done outside. A hen might not be unhappy at all if she remains indoors, but she might well be a lot happier if she can go outdoors.

It is all about the wishes of men and animals

Choosing or sharing?

These three challenges are already a good reflection of the tensions which arise if production is not the only viewpoint anymore, but the wishes of society and needs of the hen have to be counted as well. Some wishes seem to contradict each other, such as outdoor free range and the limitation of health risks. One might think we have to choose which is more important. But are these real dilemma's, leaving room for just two, partly undesirable alternatives? The project team did not think so and decided not to take current husbandry systems as its starting point. Instead, the starting point was: let's first listen carefully to all parties involved and find out what their real needs are. What does the public exactly mean, if it wants more naturalness? Why exactly does a farmer need precise daily overview of his stock? What is essential for the exploration requirements of a hen? In short, let us share before we choose.

Join the ‘think-tank’ on *Laying Hen Husbandry.* This invitation was published by the project team in the specialized magazine for ‘Poultry Husbandry’ and resulted in around 140 reactions, of which the majority were poultry farmers (80 %), but also veterinarians, feed producers and others working in the poultry industry responded. The project team asked these to set out their three most important challenges towards innovation in the poultry industry.

The projectteam of ‘Laying Hen Husbandry’ did not do it alone!

An open process
Economy (financial sustainability) and public acceptance were mentioned as the most important challenges, which was not surprising, given the majority of responses came from within the poultry sector. In the past ten years laying hen farms have actually made an acceptable profit, but the margins also have been lowered considerably. The public demands have increased, but the price which is paid has not. Beside this, ‘welfare’, ‘vulnerability to diseases’ and ‘food safety’ were mentioned repeatedly as challenges.

Detailed discussions
Meetings with 15 representatives from the different corners of the poultry and ancillary industry and related stakeholders were arranged for further in depth discussion. The aim was to help define the priorities of the project and to gain from their knowledge and experience. Some representatives were quite reserved (‘is this really necessary, all this new stuff’), but most of them shared their thoughts enthusiastically and gave their own ideas and solutions.

A designer day... or otherwise at least an e-mail
In February 2004 a ‘designer day’ was organised. Again interested parties from all walks of life, both in the sector and outside, were present to think about hen’s happiness, public demands and farmers’ needs. The Programme of Demands (the combined list of wishes of hens, farmers and consumers) was presented for examination by those present. They could comment upon, or even add or remove things if they thought necessary. This process resulted in a complete and tested Programme of Demands. On the same day clever solutions for complex problems were considered and even whole possible designs for socially responsible husbandry systems were sketched out. Three illustrators made drawings of the new possibilities as they were developed and discussed. The drawings were hung up and this clarified the discussion and led to new inspiration. A picture just does say more than a thousand words! The drawings in this brochure give a good example of this.

Several interested persons could not make it to our ‘designer day’. They were informed via e-mail reports, so that they nonetheless could contribute to the design process. Finally, people could be kept informed by the website www.houdenvanhennen.nl, where they could also give their response.

Three creative workshops
A number of stakeholders participated further in actively and creatively thinking about solutions for the most complex problems, which could not be solved at an earlier stage. These problems arose either because demands were contradictory or because simple solutions were not at hand. This became clear during and after the designer day. For three such challenging demands/problems the project team organised creative workshops to work more intensely on solutions. In one workshop the problem of mislaid eggs was tackled. A second workshop looked at the question of how more spacious husbandry systems –as demanded by the public– can comply with the need of the farmer for good overview and large numbers of hens. In the third workshop solutions for health issues in open air systems were mulled over.

Because of the clear structure and the enthusiasm of the participants all three workshops led to a series of inspired sketches of possible husbandry systems. These incorporated creative elements such as waterfalls, egg ‘shoots’ and moveable units, which give the soil a chance to recover. All together a treasure of ideas was created. The illustrators were once more present at these sessions. They managed once again to illustrate successfully with pictures what was otherwise difficult to ‘picture’.

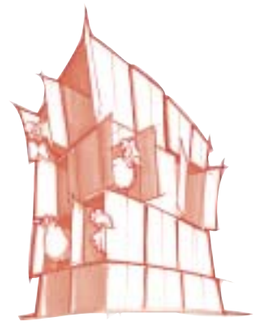
Citizens’ sessions…
Unique with *Laying Hen Husbandry* was also that the general public was involved in the design process. And this was not just taken lightly, through some superficial interviews in the supermarket, but it was done intensely in sessions where citizens were interrogated lengthily about their ideal pictures of laying hen husbandry systems. Apart from a list of wishes for hens and poultry farmers, a list of wishes could also be made for citizens. At least, for some citizens, as you will find when you read on.

Three wish lists as the basis for the design
Questions and more questioning, was the motto when putting together the list of wishes of citizens and poultry farmers. But with the hen that will not get you far. What the laying hen needs can only be read from her behaviour. Only then is it possible to establish the needs of hens, although of course we can never be quite sure what will make a hen really happy. Luckily, this was easier with farmers and the public.

Thinking about chicken happiness, wishes of citizens and farmers desires

A good house for chickens – source of inspiration: Workshop with children

Own nesting area and play garden – source of inspiration: Workshop with children



Stacked boxes – source of inspiration: Workshop with children

Cosmopolitans, traditional citizenry and post-materialists

For *Laying Hen Husbandry* citizens were distinguished according to their orientation and values in daily life. For this a proven categorization model was used, called *Mentality*. The eight types of citizens this model distinguishes have a good predictive value for consumer behaviour. Three types were chosen for participation in the intensive sessions for this project. These were chosen because they are more than averagely interested in what's happening around them. Together they make up 38 % of the society. Although *Mentality* distinguishes five other types, it was decided not to approach these with critical questions about the poultry industry, as this falls too far outside their line of interest.

Cosmopolitans

Chuck, chuck I am a chicken
Today I'll go and have some fun
and when I come home from the trip
I want to rest, inside my nest
Without disturbance from fellow pecks
That's what helps to lay the eggs…

What does the public want?

In a densely populated country, with critical citizens, every business has to fit within the context of that society. Poultry farmers would like to be respected and accepted by the public and wish to supply a valuable service to society. With today's image of intensive livestock farming this is not always the case. Social acceptance is therefore an important issue for the future of poultry farming. But what good does it do the poultry farmer if he produces eggs in a manner, which the average citizen approves of, when the same citizen is then, as consumer, not prepared to pay accordingly? A stale-mate, so it seems. The citizen may well be critical, but consumers are even more critical and they vote with their wallet.
The project team *Laying Hen Husbandry* chose not to begin from this stale-mate point of view. The approach was to take citizens seriously and listen to them. Ask them what they know and what they want. What ideal picture does the public have of poultry husbandry? What does the average citizen mean by animal welfare and 'naturalness'? 'Keep asking' was the motto, instead of uncritically taking the first best answer which uses these terms – terms, which are so ambiguous that a discussion quickly runs out with good intentions. When asking more, it quickly becomes clear that the average citizen does not exist. However, certain groups could be distinguished. Three groups of public opinion which were willing to contribute their bit to the process of developing a socially acceptable laying hen husbandry system, were questioned about their viewpoints on the poultry industry.
Perhaps not completely unexpected, but nevertheless nice, was that the participants ideas on what is a good life, were reflected in what they thought the needs of chickens were. They wished a life for the hen as they would wish to live themselves.

Cosmopolitans
This group is open-minded and critical. Cosmopolitans believe it is important to express and develop themselves, they are career minded and materialistic. According to this group laying hens require a dynamic life. The housing system should therefore provide enough variety and stimulation so that the hen can be busy all the time if she wants to. But, to get rest after all this action, the hen also has to have enough resting places. To fulfil the need for privacy there should be enough laying nests. She needs protected shelter areas in case she wants to be alone. Moreover, the individuality of the hen should be recognized. This implies an environment in which the laying hen can carry out her sort-specific behaviour. Finally a hen has to simply feel good and for this she needs to be healthy, strong and fit. Cosmopolitans make up around 10 % of Dutch society.

Traditional citizens
The traditional citizen is dutiful. He clings to traditions and material (family) property. This group believes strongly in caring for and looking after animals. The poultry farmer needs to avoid stressing the hens, needs to ensure that animals are not sick or unhappy and get healthy food. Animals need to be treated with respect. This implies that the sort-specific needs of the animal are fulfilled. But also, that slaughter methods should be appropriate, and animal transport as short as possible. Abuse and hormonal treatments are not acceptable. This citizen group has a strong sense of 'back to the past'. Today's husbandry systems should include elements of woodland, a pond in the middle, some fencing, and land with free ranging hens – just like in the good old days on farms.
Traditional citizens make up around 18 % of Dutch society.

Traditional citizens

Chuck, chuck I am a chicken
I deserve a lot of respect,
Enough to drink, and healthy food
Not to mention, a little attention
Watch out for me and take good care,
And lots of eggs come to the fare…

Post-materialists
The post-materialist is critical towards society. He is against social injustice and stands up for the environment. According to post-materialists the hen needs to be in a natural environment. This includes running water, and plenty of soil with life in it. On the menu then is natural, living food. Freedom is also an important requirement. Hens must have the possibility to go outside.

Post-materialists

Chuck, chuck I am a chicken
I love it out in the fresh air,
Having a bath in the pond,
Catching a fly up in the sky
Eating a worm and sleeping in trees
Laying eggs as busy as bees…

According to the post-materialist ideal, the livestock industry should be based on natural principles as much as possible, allowing for a minimum of human interference. Around 10 % of Dutch society comprises of post-materialists.

Citizens and Consumers
Citizens are also consumers and vice versa. We therefore not only had to ask ourselves what citizens want, but also what consumers, or rather, what citizens in their role as consumers want. Will consumers be led by their 'civilian' beliefs and ideals on laying hen husbandry systems when buying eggs? If yes, then marketing of eggs would have to be aimed towards these beliefs, while keeping in mind that different consumer groups exist, each with different beliefs for their own life and that of the hen.
First back to basics. Eggs are bought in the first place because we like to eat them. The product therefore has to fulfil the standard requirements of an 'egg': it has to be egg-shaped and sized and the shell has to be a nice full colour. It should smell nicely, stay fresh for a long period, and be easy to peel. Contamination with bacteria or medicinal supplements is unacceptable of course.
But what about some dirt or feathers on the eggshell, or eggs that vary in size and colour? That depends on which type of citizen you are. One will find it desirable because of the natural ambiance, while the other may feel sick from the idea alone. These are qualities that tell more about the production process than the product itself, just like the packaging and the story which comes with the egg.
Such a story is necessary if we

wishes of citizens: dynamic hen

wishes of citizens: ZEN hen

wishes of citizens: privacy and peace as requirements for hens

wishes of citizens: good food

wishes of citizens: happy and free hens

The poultry farmer: worker, businessman and animal keeper

want the consumer to pay more for an egg, for example because it comes from a better husbandry system that is producing at higher costs. Our research amongst citizens showed that such a story should not be told to the public in general ('Now with even more welfare!') but that it is more accurate to target upon the values of specific groups of citizens. Let us thus not only show that this is about an egg which has come from a hen, which had a good life – a 'hen-worthy' life as she would wish herself. Let us also show that her life was in accordance with the values people cherish for their own life, as citizens and consumers. For example – turn the hen into your 'egg-laying' friend. For marketing specialists this is not such a weird step. Food is no longer just fulfilling the role of nutrition. Many products are bought because of their nice taste, or because we wish to identify with the image that they portray. Our choice of products is also guided by emotion, apart from rational considerations like price. These emotions are strongly connected to what we find important in life, our values. If we can home in on these, and make sure that the facts are correct, it should be possible to earn more money from eggs coming from ideal husbandry systems.

What do farmers want?

The poultry-farmer – a threesome?
The poultry farmer has to fulfil three roles. He is the worker (or has workers in his service), businessman (or –woman), but also the animal keeper. In each role he approaches his activities from a different perspective. Depending on each poultry farmer, these roles have different priorities. One farmer puts animal care at the front, while another is more interested in the business side, while a third one wishes to concentrate on the husbandry techniques – the work process. Therefore not every design will suit every poultry farmer. Just like the citizen, the average poultry farmer does not really exist.

Worker
For workers it is important to be paid for their work and to obtain the necessary results of their labour without excessive effort – with pleasure in their work and pride in their skills. In the case of poultry farming this means that the climate within the animal house is suitable to carry out the work, that hens and men are in mutual contact, that the hens are healthy, that no mislaid eggs have to be collected, and that eggs are clean. Next, there are a number of requirements to be fulfilled, that derive from health and safety regulations (machinery operation, dust), environmental (emissions of ammonia) and hygiene regulations (anti-disease measures).

Entrepreneur – Businessman
For the businessman the first priority is the continuity of his business. Product quality and sustainability (profit) are of great importance as well. For the businessman in the poultry farmer it is therefore important that laying hens are healthy, produce lots of eggs and remain in good condition. This requires a healthy environment for the laying hen. Next to this the businessman needs space for a good deal of entrepreneurship, a certain lifestyle and a positive image. In this case, demands for a husbandry system would be things like innovativeness, reliability, openness and transparency, animal friendliness, co-operation and trustworthiness.

Animal keeper
For the poultry farmer as the animal keeper other needs play the main role. The animal keeper likes to work with animals, pays attention to them, he works and lives with them and 'experiences' them. He is in contact with nature and is part of it. The caring for animals is central to his work. This includes protection of animals from negative influences. On the other hand the animal keeper wants to be socially responsible. Openness about the system is necessary for this but the keeping of animals must remain 'farm-worthy'. One of the themes of the project was that a new husbandry system must *supply good working conditions for the entrepreneurial animal keeper*. In such a system, the poultry farmer is not just somebody who keeps a giant egg machine or egg factory going. He is an animal manager who makes the husbandry system, within which both he and the hens are functioning, work for him. Not only the hen should flourish, but the poultry farmer as well, as the worker, the businessman and the animal keeper.

Hens like to keep an overview of their surroundings, in order to explore later on.

The basis for a comfortable chicken life is to be free of hunger and thirst.

How much space does a hen need?

A laying hen needs the following space to carry out her natural behaviours:

eating	446 cm^2
drinking	446 cm^2
scraping ground/foraging	799 cm^2
cleaning	1076 cm^2
dust bathing	1076 cm^2
egg laying	1055 cm^2
resting	538 cm^2

If we take into account the time that a hen spends on these behaviours, the extent to which hens 'synchronize' their behaviour (i.e. the extent to which they wish to carry out a behaviour at the same time) and the necessary space between animals for these behaviours, then we arrive at a husbandry system which supplies 2214 cm^2 per hen – or 4.5 hens per cm^2 living space.

What do hens want?

A laying hen cannot talk. Therefore, we cannot ask her exactly what she wants. What we can do is study her behaviour and decide together how this should be interpreted. Many animal ethologists (behaviour specialists) have done detailed research into this and have together managed to 'understand' the hen a little better. A hen is originally a wood animal. Much of her natural behaviour, such as sleeping on a perched place at night and looking for 'cover' to hide originate from this. Did you, for example, know that:

- A laying hen needs 2214 cm^2 in order to carry out her ethological (behavioural) requirements?
- A laying hen in a battery cage has only 550 cm^2 of space – a little less than an A4 sheet of paper? This is a quarter of the required area!
- Laying hens in our new design will each have 2214 cm^2 available to them in order to carry out their natural behaviour!
- This comes to around 4.5 laying hens per m^2 and can approximately be compared with 6 laying hens per m^2 in current organic husbandry systems, 9 laying hens per m^2 in free range barn systems, 13 laying hens per m^2 in an enriched cage system or 18 laying hens per m^2 in traditional battery cages!
- A laying hen needs a 18 cm wide perch in order to rest comfortably – this is three centimetres more than they get in current free-barn systems.
- Laying hens are like people living under one roof? They prefer to sit together in a laying nest, rather than alone while they are laying eggs! In our design there will be one nesting place for every five hens, while in current free-range barns only one nesting place is available for every 7 hens.
- Laying hens spend the greatest part of their daily time on foraging, even if they are not hungry? Therefore more than half the total space available should be suitable for foraging, and should provide variation and diversity.

We can of course continue to explain all the background to every decision we made but this will be boring. Our message is: we want to incorporate the ethological needs of the laying hen in our designs. That means to arrive at a scientifically proven minimum level of requirements, through which we can say that the hen will definitely not be 'unhappy'.

This is obviously not only about the *amount* of space. The *quality* of space is at least as important. Consider factors such as variation, dynamic, distraction, safety, comfort and others. This is not just required by the hen but also by the public, and the consumers and actually also by a lot of poultry farmers. Thus a number of important requirements are highlighted below.

A laying needs a **'living environment'** which gives her space and facilities to fulfil her ethological needs – her full behavioural repertoire. To put it simply: a laying hen needs a living environment within which she can do everything she wants to do and needs to do. This applies also for a large group of hens, as they often want to carry out their behaviour simultaneously. But does this living environment have to be outside? Our feeling might affirm this. Why should a hen not feel the fresh air and nature's elements, if we ourselves need it so much? However, there is yet scientific proof to be given that a hen misses something, when it is only indoors. We therefore assume for the moment that being outside is an optional extra – rather than a basic right, although it is probably enjoyable.

An adequate living environment implies good healthy air. The air which the hen breathes in, should not be too dusty, the air humidity should be optimal and there should not be too much ammonia or other gasses in the air. The ventilation and temperature must be adequate.

Laying hens can survive quite well in colder environments, but they will need some extra food, in order to keep themselves warm. They feel best when the temperature (inside or outside) is between 18 and 27° C.

Laying hens further need **light** of the correct quality and at the correct time. For instance, they prefer to dustbathe or sunbathe in daylight. Artificial light is fine during eating and drinking, but it has to be bright enough. They prefer to forage in a light environment. It should not be too dark – also in order to recognize each other. Laying eggs and resting is preferably done in a darker environment, but if it is completely dark laying hens will become nervous.

Laying hens like to keep a **good eye on their surroundings**, so that they can explore it later. They orient themselves via the sun and through set recognition points, which have to remain visible. They require good space for foraging and exploration. For scratching and digging with their claws the ground needs to be dry and loose, but not dusty. The bedding layer should be thick enough, mixed with interesting bits to explore and peck at.

Obviously being **free from hunger and thirst** are basic requirements of an animal's life. Food and water, therefore, must be of an adequate quality. This is not only important for physical health of the animals but also for healthy behaviour: feather pecking decreases considerably when hens spend adequate time on searching for food (foraging), and this may for example also contain roughage feed such as corn-silage. Further they need enough space to eat and drink comfortably. The food needs to be supplied in a manner which causes minimum disruption amongst the animals.

A laying hen has a range of different movements – her 'movement repertoire': She wants to be able to **flap wings, turn round, run, forage and clean herself (preening)**. She has to be able to stretch her wings and to flap them and also dustbathe or sunbathe. The amount of space laying hens need for all these activities also depends on group size. The necessary space changes per activity, and per amount of hens wishing to carry it out simultaneously. Just like humans hens like to keep their own *personal space*. This personal space is fairly small with hens sitting on a perch (around 5 cm), while walking or foraging hens prefer a distance of 30 centimetres. During preening hens only need a space of around 15 cm between them. The wing flapping takes up the greatest area. If a hen feels threatened she should be able to flee and hide, therefore the necessary space and **shelter** must be provided.

Although hens will occasionally chase each other, they are essentially **social beings.** They want to have contact with each other. In nature they live in groups of around fifteen hens and in such a group a social hierarchy exists – based on the pecking order. In that case, they recognize each other easily. In larger groups of hens, personal recognition has become impossible, but

A laying hen has a large range of movements: her 'movement-repertoire'. She wants to be able to flap her wings, turn around, run, forage and clean herself.

If a hen feels threatened she must be able to flee or shelter. For this adequate space and shelter area has to be provided.

Although hens will chase each other away occasionally, they are nevertheless primarily social beings.

A hen likes to lay her eggs in a comfortable, safe place.

they can estimate their social position on each others' exterior signs, such as the height of the comb. The higher the comb the higher the status.
A smaller group thus means a more familiar, recognizable surrounding for the hen. The environment should, therefore, be designed in such a way that **small groups can form.** If that is not possible, then it is important to make the group very large, because in medium large groups (30-100) hens still try and form a social order as they do in small groups, while this is impossible because of the high numbers and their failure to recognize each other. This may lead to confusion and aggression.
Laying hens would like to determine themselves how much distance they keep from their fellow hens. On the other hand they also **wish to carry out behaviours together – at the same time**. Generally they eat together at the beginning and at the end of a light period and they like to forage at the same time. They lay an egg around once a day, during the same time period. At the end of the day all hens get on the perch at the same time. Then they value a dark period of around 6 continuous hours.
Nesting behaviour also needs space. A laying hen wants to **lay an egg comfortably**, in a suitable, sheltered place. The nest needs to be recognizable and easily reached. Hens prefer to lay on bedding rather than grids, so they can make their nest. Equally important is the presence of other hens, as even when nesting hens are very social.
A laying hen needs to be healthy. This is a basic requirement for a happy hen life. For this it needs a good immune system as well as minimal exposure to pathogens.
A husbandry system therefore must not only minimize the number of possible pathogens to an acceptable level, but it must also provide an environment which strengthens natural resistance. If laying hens do get sick, it is necessary to move them in time, as these quickly become victims of feather-pecking. But beware – not total isolation but separation is required, as total isolation leads to high stress levels in hens. So a **healthy living environment** includes that the temperature, light, air, food and water are adequate, and that the animal has the ability to self-clean, dustbathe and sunbathe. These activities help the hen to keep its feathers healthy. Sunlight instigates this behaviour and also triggers other physiological processes, such as vitamin production.

Do you want to know the specifics? That is possible!
You may experience the above described list of wishes as not very detailed. But most of these requirements are actually exactly determined. We know, for example, exactly the maximum allowable ammonia concentration in the air for a comfortable hen life, or the ventilation requirements. We also know exactly how much light a hen needs, in what temperature it feels best, how its food should look like and how much space she needs in order to forage, turn round or dustbathe.
In the 'Programme of Demands' – the 'wish list' – of the hens, these exact details are described. These specific details are then also incorporated in our designs. If you are interested in this complete Programme of Demands, you can look it up under www.houdenvanhennen.nl, or contact the project team.

Looking for common ground

At first glance the wishes of the laying hen, the citizen and consumer and the poultry farmer as a businessman, animal keeper and worker seem to be in conflict with each other. But on deeper investigation and when looking exactly at the nature of the wishes, some surprising insights surface. A poultry farmer may mention in the first instance, that the cost of production of the eggs should be as low as possible. Then, any extra requirement for the hens or citizens leads to extra costs, which the consumer would rather not pay. But what the poultry farmer actually means is that he has to be able to earn a good living for himself and his family from the business. This can also be achieved by selling 'special' eggs for a little more money.
With citizens we can see a similar pattern: in the first instance some (the post-materialists) will for example say that hens should be kept as naturally as possible. Does this then mean an idyllic picture of a few hens in the grass or by the woods? If you ask in more detail you discover that what they mean is that the animals should be able to do what they wish, and that this will also benefit us in the end, for instance because hens will be healthier. This does, therefore, not require a prehistoric Asian forest (where hens originated from). If these citizens start designing they will draw fantastic combinations of trees, bushes and high-tech buildings. Just as they themselves aim for a more natural lifestyle, while at the same time making use of all kinds of technological tools, they also find it acceptable and challenging for hens to live in a cleverly designed husbandry system, in which nature and technology are integrated.
In other words: without delving deeper into meanings, we are left with one-sided images which create some of the contradictions themselves. If we would take these 'half-truths' as acceptable (you want more welfare – that's it; you want more nature – that's that; but it will cost you this much) then we miss chances to combine the wishes of different stakeholders. Wishes can, therefore, be united at a deeper level. Through deeper investigation and thinking it turns out that there are many common wishes, which can form the basis for a design of a laying hen husbandry system.

On closer investigation it is apparent that there are many common wishes which can form the basis for a design of a hen husbandry system.

The project team has combined the wishes of hens, poultry farmers and the public into two designs. Why did we come up with two designs? Because there is no such thing as a single ideal husbandry system. In the Netherlands there is a place for very different husbandry systems, which address the wishes of different citizens, different poultry farmers and different types of chickens. Some of these find access to the outdoors necessary while others do not.

Two designs for socially responsible laying hen husbandry systems

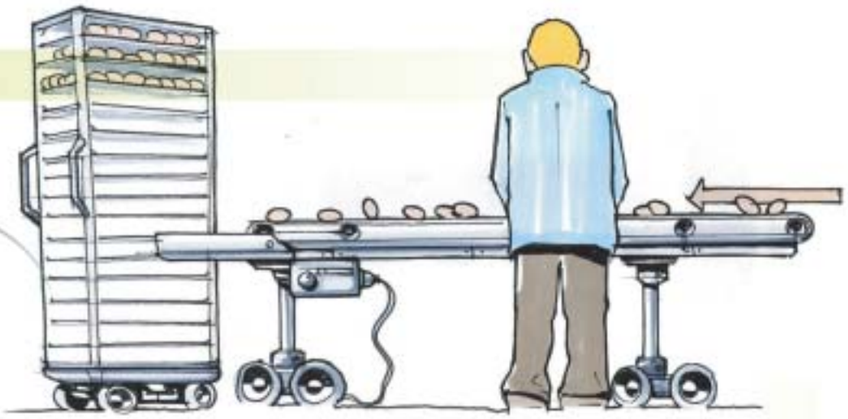
A laying hen may well *not be unhappy* without outdoor access but she might well be happier if she had outdoor access. Moreover, outdoor access seems an important factor for public acceptance of the poultry industry. On the other hand, not everyone is happy with outdoor ranges, as they could be dangerous for public health when hens ingest all sorts of harmful substances from the environment and pass them on into eggs. Further, the animals are much more exposed to diseases and predators.

The project team *Laying Hen Husbandry* solved this dilemma by producing two designs. Two designs, which in their own way both fulfil the ethological needs of the hen, which will each address a specific group of citizens and which are both offering the opportunity to make a satisfying and sustainable business for poultry farmers. In both designs contact with the outside (sunlight and wind) has been achieved, but in one case this is with roof cover, while in the other animals can actually forage in the open air, be it within quite different zones.

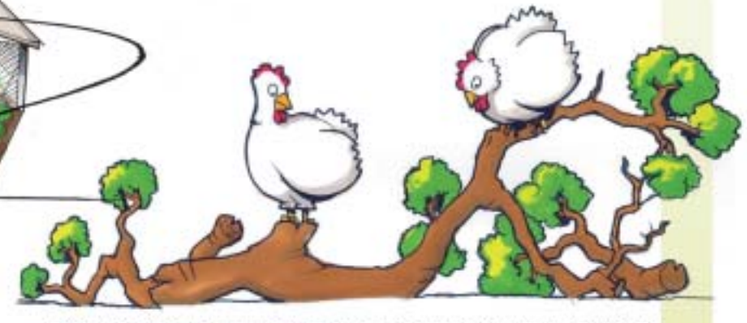
This is why we present not one, but two new designs for socially desirable laying hen husbandry systems – not because we doubt which one is the best, but because we think that there is a place for a variety of husbandry systems in The Netherlands – for different poultry farmers, different citizen groups and different hens. Just as is the case with cars, numerous brands and types are present in the market. The designs should be understood analogous to 'concept cars': they outline a pattern and they inspire. One design is more like a lofty Smart cabrio – which combines freedom and protection, the other more like a sturdy 'Volvo' with 'side impact protection system', for more security.

Both designs fulfil the needs of the hen, leading to prevention of feather pecking. This will be the *proof of the pudding*. Both designs are a carefully balanced combination of equipment, animal needs and management. They meet the requirements of a flock of hens to carry out their normal behaviour and will, therefore, prevent the development of unnatural behaviour. Thus the beaks of the hens do not have to be trimmed. In practice this means enough space with a well designed foraging area, separated functional areas and good logistics (access to different functional areas). Both designs offer space for around 30.000 laying hens. This shows that a poultry farm of reasonable size can be compatible with the demands of the hen, the farmer and the public. The egg does not have to cost that much more: the cost price of eggs produced in these designs shall be around 20 % more than of eggs produced in barn systems or enriched battery cages.

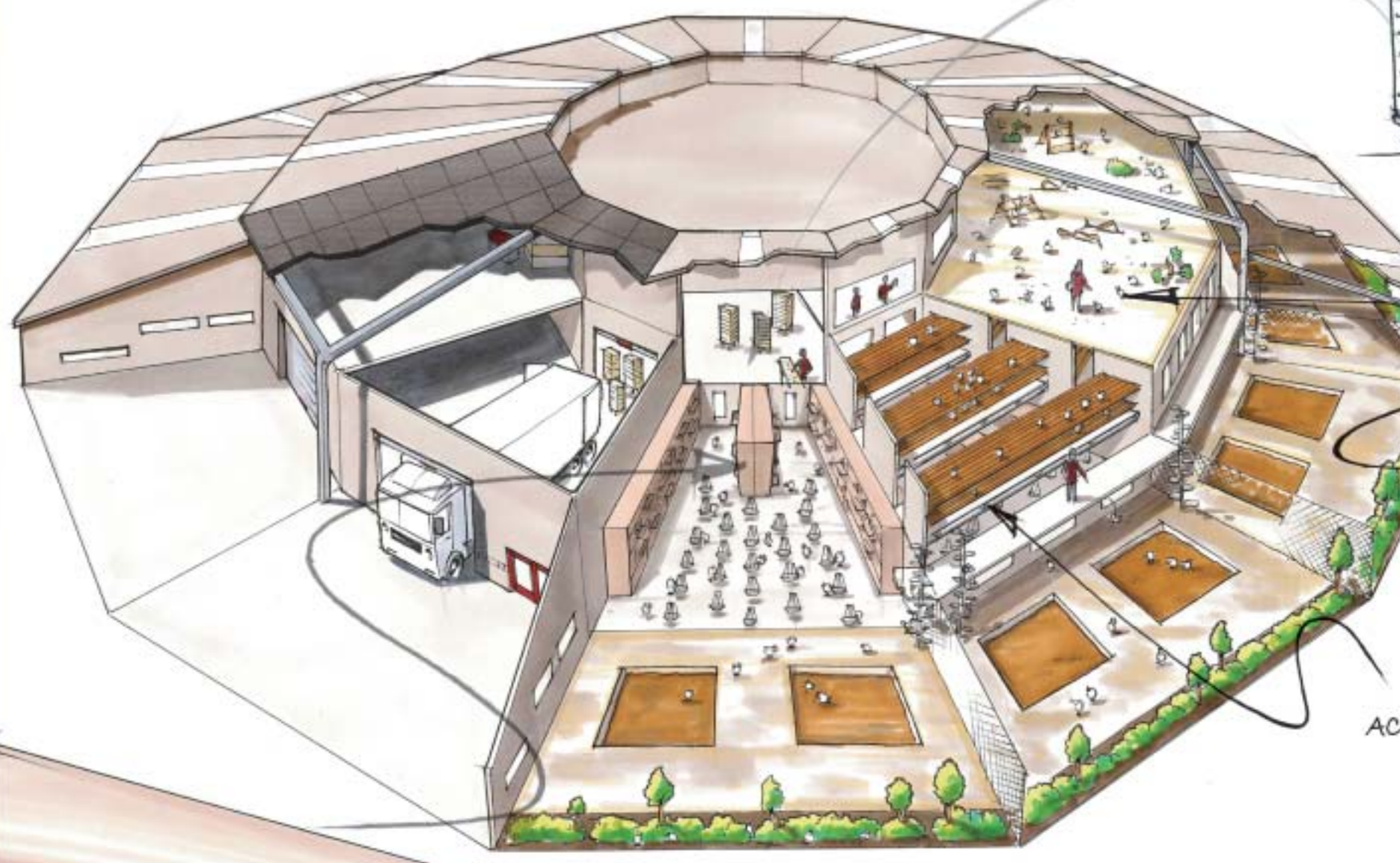
THE ROUNDEL



EGG COLLECTION FACILITIES IN THE CENTER

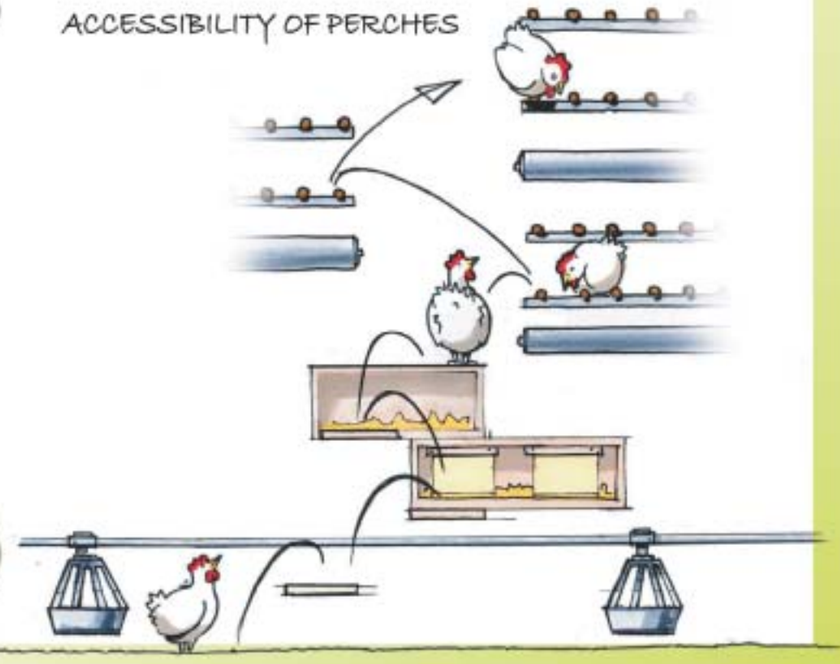


EXPLORATION IN THE FORAGING AREA ABOVE



GROUP LAYING NESTS

ACCESSIBILITY OF PERCHES



DUSTBATHING IN THE FORAGING AREA
ON THE GROUND FLOOR

Houden van hennen

New designs for laying hen and sustainable husbandry

Illustration: JAM/Visueeldenken.com

The Roundel

Just like a large round cake a building rises out of the ground – a tasty cake obviously as a large piece is already missing. From whatever side you look at the building you see chickens between green bushes and trees. Beams of sunlight fall through the roof, and where they hit the floor hens are dustbathing comfortably. Others are foraging around: on the ground or on top of the unit with the rest, or in feeding and laying nests facilities, which are situated towards the central core of the building. We enter the building via the 'missing cake-piece' area: in this central area we are greeted by a relaxed poultry farmer. Here all the controlling lines of his farm merge together and from this point we are shown all the details of this husbandry system.

This design is called the Roundel, like the round towers in an old town wall. The Roundel is clearly visible, gives overview and conveys robustness and security. The **compact use of space** is characteristic for the design: a central core area, which gives access to all technical equipment, a ring around it with enclosed pens which houses drinking, egg laying and resting facilities and around this a ring with an undercover foraging area, which also gives access to a foraging area on top of the pens. Furthermore the building radiates with a strong sense of safety for the hens. The separation of functional areas, being easily accessible for hens, and the accessibility and clear overview for the poultry farmer lead to an attractive design for the public and consumers.

The Roundel has a **central functional core area**, with space for the egg collecting system, as well as storage of the eggs, feed and other items. This area also provides a platform from which the poultry farmer can overview the whole husbandry system and the general public has the opportunity to pay a visit and look around. Further, the Roundel is a circular building composed of 12 segments, of which 10 are used for the housing of hens. The two other pens are used for storage and collection of eggs, feed and waste. Each segment houses 3000 hens and consists of a pen area (or living unit) and a foraging area.

The pens or **living units** for the hens are partially separated from their surroundings. There are closed walls between the living units. The living units are 5.5 meter high and offer lots of separated areas for hens to rest at night or lay eggs in during the day. Along the side and back walls of each pen lots of laying nests are situated. These are group nests which provide space for 5 hens. Perches, where the hens can rest, are located above the laying nests in the middle of the pen. These perches can be reached via 'take-off' shelves in front of the laying nests. Conveyor belts underneath the perches enable removal of the droppings. The floor area below this is used for drinking nipples and feeding pans. Through this clever design laying hens can utilize all areas of the living unit without getting in each others way.

The **free-range or foraging area** is split between two levels for each segment: first there is a foraging area in the outer ring of the Roundel, which is separated from the neighbouring segments. Second, the hens can also spend their time foraging, dustbathing, food searching and exploring in the area above the living unit. The laying hens can jump 'into the loft' or flap up via climbing ramps, and here is an opening into the neighbouring segments. Beacons and recognizable signs help them to find their 'own segment' again. Both foraging areas are enriched with a thick layer of dry litter material and all sorts of planting, playing-material and grain seeds, which are automatically distributed. So there is more than enough to do for the hens and there is no danger of murkiness, as both the loft area and the ground segment have high ceilings, with windows through which plenty of daylight gets in and sidewalls made of netting, through which plenty of ventilation is secured.

In the Roundel **two climatic zones** are created, one in the living unit and the other in the foraging areas on the ground and in the loft. The hens can choose their preferred 'climate'. There is a natural outdoor climate in the foraging areas, but the bedding cannot get wet, and solid blinds besides the netting walls can be lowered to keep out extreme cold and rain. The temperature in the living unit is even better regulated with help of ventilators to achieve a constant temperature of 20º C.

Clean but not sterile – that is what stands out in the Roundel. Technical equipment and nature both help with the removal of dirty bedding and the provision of new bedding. This is very important, as dirty bedding can increase disease pressure, and it does no longer provide the qualities needed for foraging behaviour. Along the inside core of the loft area fresh wood shavings and other material are added daily via openings. Through the foraging of the hens this bedding will be moved on to the outer edge of the area, and will drop down from there via shoots into the ground foraging area. Here it will fall through a grid under which a conveyer belt removes the dirty bedding. In this way the bedding can be renewed gradually, but also completely at once.

Bushes, small hedges and small trees are growing in the ring of the ground foraging area, creating a **natural environment**. They get enough light and fresh air, and can survive the environmental challenges to which they are exposed: ammonia gases and hens, which like to explore and pick on their environment. Further on the outer edge of the free range area rain water is caught and stored for spraying down and watering the plants. But it also makes a nice change for the hens and they can have a lot of fun!

The Roundel gives a lot of protection for the hen but also for the poultry farmer and this makes it a **safe and robust** system. Extreme temperatures do not occur. There is a maximum level of removal of droppings and dirty bedding by conveyer belts. The hens have no contact with birds outside the system and foxes as well as vermin can be kept outside easily. In addition, good hygiene measures prevent diseases to develop. The hens in the Roundel are thus not exposed to extreme situations, and therefore do not need to be prepared for them. This means they may be a little more prone to diseases, they do not need to watch out for predators and they will experience the changing of the seasons to a lesser extent. Even stronger, the hen must not have a need for a strong varying environment. But in order to prevent feather pecking, they do have to be raised in an environment (up to the age of 17 weeks) within which they learn to use the space and bedding material available to them to the full. A type of laying hen which has a slightly lower requirement for foraging and exploring, but which prefers resting, continuity and which prefers behaviours such as preening or dust-bathing is best suited to this system.

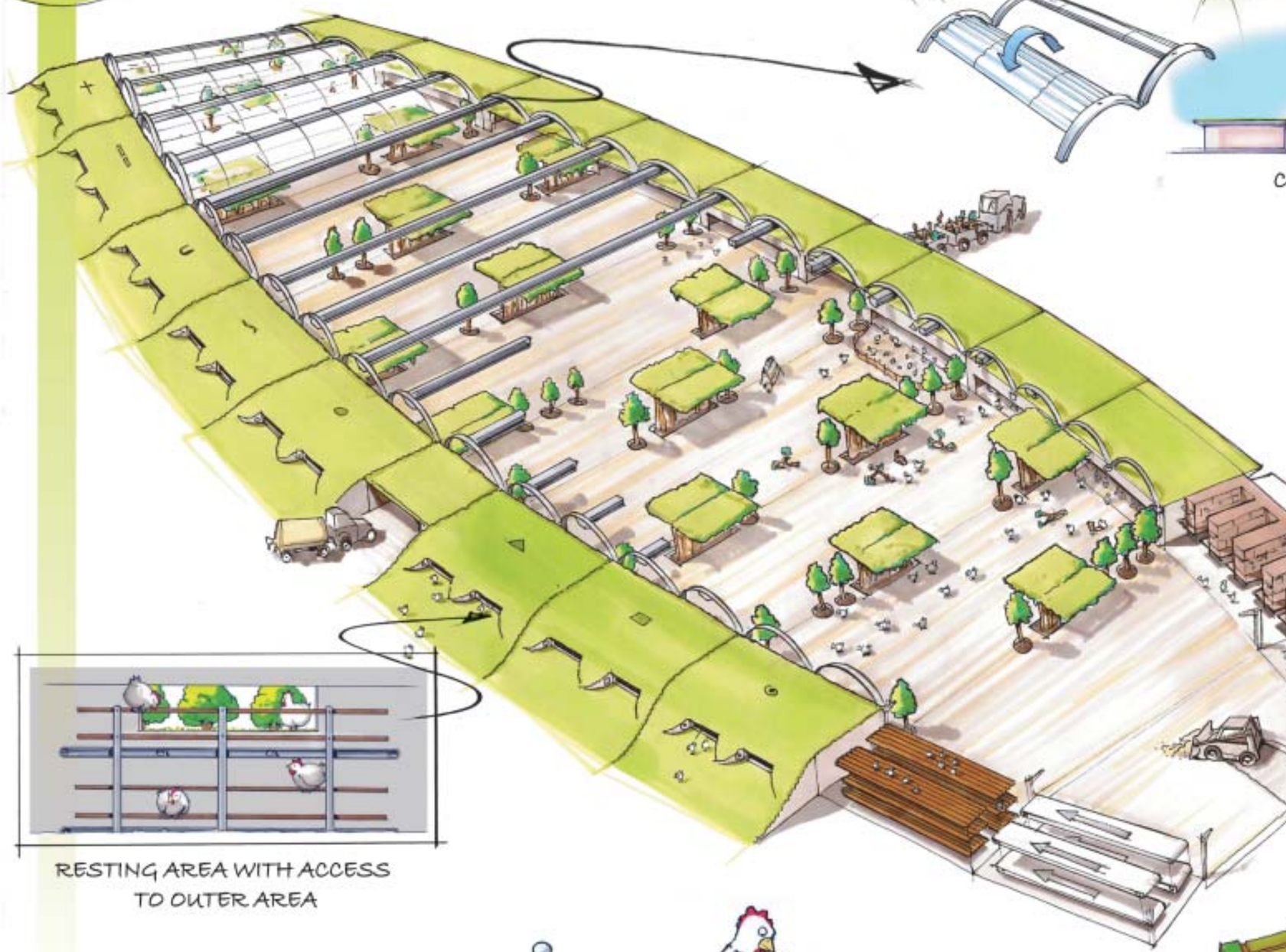
The design of the Roundel offers a good basis for new types of housing systems. A number of attributes, however, are essential:

- **everything is under one big roof and there is no contact with outside birds**
- **there is a central egg collecting, sorting and overview area**
- **the foraging area offers adequate challenges**
- **the pens provide areas for resting, laying eggs, feeding and drinking – smartly brought together**
- **two climate zones have been created**

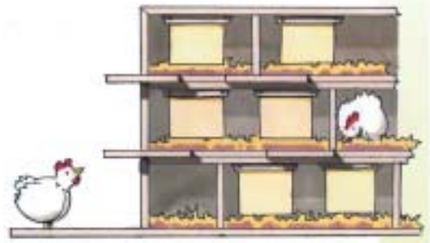
What about the poultry farmer in this husbandry system? Of course we did not forget him. In this husbandry system the logistical aspect and access are well designed. He has a clear overview from the core area of the house, and good access to the living units and foraging units. The amount of and placing of laying nests ensure that hens lay all their eggs in the nests, and eggs are transported by conveyer belts in the central area. Conveyer belts transport droppings and litter from the pens to the two storage units. The automation and mechanization reduce the workload for the poultry farmer considerably, enabling him to spend more time looking after the animals.

And the citizen and consumer? This system can be particularly acceptable for two of the three citizen groups we have interviewed: the **traditional citizens** and the **cosmopolitans**. The combination of overview for the poultry farmer and the protection of the laying hen with little to no stress, will satisfy the traditional citizen. The Roundel does provide safety while still respecting the laying hen. The cosmopolitans will also be able to identify with this design: on the one hand there is sufficient 'privacy' and shelter and on the other hand there is plenty of variety in areas and possible activities – a dynamic space, within which the hen can choose what to do.

THE PLANTATION

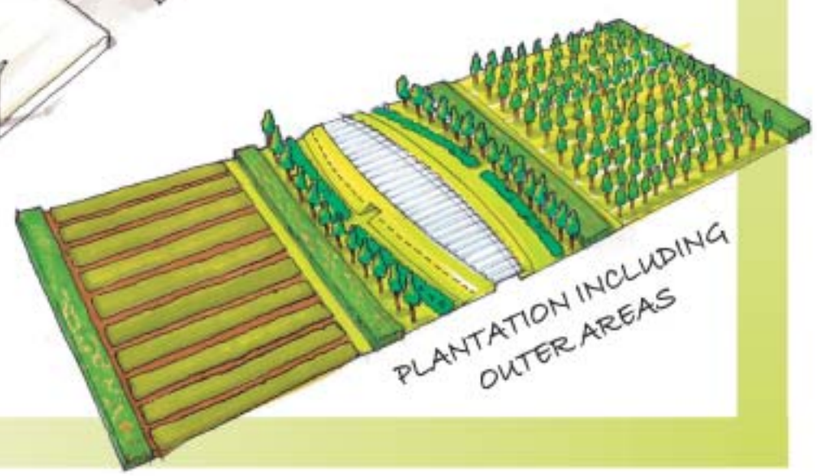


COVERAGE IN OUTER AREA



WATER & FOOD SUPPLY
UNDERNEATH NEST BOXES

RESTING AREA WITH ACCESS
TO OUTER AREA



PLANTATION INCLUDING
OUTER AREAS

RAISING LAYER PULLETS ON THE SAME FARM

Houden van hennen

New designs for laying hen and sustainable husbandry

The Plantation

Step into the hot air balloon and fly with us southwards. Two lightly bowed lines of buildings cut into the landscape, which enclose a large inner yard area. There are many thousands of chickens about. They are clearly in their element. They forage, flap their wings, preen themselves and some are dust bathing. As we fly across the inner yard we see on both outer sides several hectares of land with fruit trees, willows and corn plants. We look again a little closer: can we see even more chickens in there? And there? Yes – between the greenery even more hens run around, barely visible through the vegetation. The poultry farmer is standing on an earthen elevation, overseeing the whole area. Hectares of trees, shrubs and corn plants live in harmony with thirty thousand hens, together producing eggs, fruit, corn and wood. This is their plantation, an estate where living, working and recreation are combined. Nature and green, ratio and order are here naturally connected with each other.

The Plantation has an inner yard and two outer areas. The inner yard is surrounded by two narrow long stretching buildings. This inner yard is the central area of the Plantation and in case of rain it can be covered within minutes by a sliding roof in order to maintain a suitable meeting place for chickens. This inner yard and the buildings satisfy all ethological needs of the hens.

The work takes place in the large outer areas, on the left and right side of the Plantation, both by the poultry farmer and by the chickens. He (the farmer) grows trees and corn, they (the chickens) pick out the weeds and hunt after insects. Furthermore, the outer areas provide the hens with ample opportunity for exploration and discovery. Under the safe cover of the plants, the hens can move far away from the inner yard and buildings.

The buildings surrounding the inner yard each have their own function. On the one side there is a covered rest space– divided into units, for ten separate groups of 3000 hens each. On the other side each group has its own space to eat and drink as well as lay eggs in peace. The hens know their own area and nest from birth – they arrived as eggs here. This diversity of places is a key-design of the Plantation. Activities such as resting, eating, egg-laying, foraging and exploring all have their own spot, but are interconnected by logical routes according to the daily time budget of the chicken.

The **resting units** have a simple design. There are adequate numbers of perches to allow laying hens to sleep or rest side by side in comfort. Conveyor belts underneath enable the removal of droppings. The resting unit has openings on each side, which can be shut. One side leads to the inner yard and the other to the outer area. In the morning the opening to the inner yard opens. Once the eggs are laid, access to the outer area is opened. But first, after waking up, it is time for breakfast (eating and drinking) and then off to lay an egg. That takes place on the other side of the inner yard – in the **egg laying units**. Small trees and lamps providing light encourage and make sure that chickens cross the yard safely. In the egg laying unit laying nests are available in large numbers above the ground. This is the place to be if you want to lay an egg, and the chickens have learned that during their puberty age. On the floor, under the nests, there is the feeding and drinking area. As chickens like to eat at the same time, a large scale group breakfast is served. In this area the droppings and dirt are also removed by conveyor belts.

The **inner yard** between the resting units and egg laying units is designed for foraging and exploration. This area is generally open air. The laying hen can therefore fully enjoy the great outdoors. However, the inner yard can be covered up within a few minutes if necessary, for example if it rains or there is an outbreak of fowl pest. This prevents the forming of mud-pools which inhibit foraging, and the risk of contamination with diseases passed on via the air, for example at times of bird-migration. The yard can also be cleaned up easily and new bedding material added, because it is accessible for machinery and has a concrete floor. The yard is one open area, accessible for all chickens, which makes for lots of exploring. A lot of greenery and distraction is available for the chickens, such as grains, green waste and cut wood from the outer area. Chickens are furthermore relatively safe from predators like foxes and from other enemies – such as pathogens. A laying hen is very habit-forming and will find and return to their own resting place and egg laying place. In order to make it easier for her to recognize her own place the units are marked on the outside with different signs, symbols and colours. Within any enclosed area chickens have a very strong sense of orientation. Despite the large number of chickens in this system, there are thus clearly defined sub-groups with their own places.

An additional natural element are the two large areas on the other side of the egg laying and resting units – the **outer areas**. These are pieces of land of at least 3 ha (total of 2 m^2/laying hen), which have a double-function. They are large enough to use for profitable crop production, and are designed in such a way that laying hens can go on adventure-trips – they can explore. Here they can enjoy the natural elements completely, there is no artificial roof and the area gives even more variety than in the inner yard. Close to the buildings there are bushes, corn and maize plants and trees. The crop production is situated a little further away. The hen can look for her own food. There is, however, no protection against foxes or birds of prey, but of course that is part of nature. Cockerels would be very welcome in the Plantation, as they are very good guards and they can protect hens against birds of prey. The laying hens are alternatively allowed in one or the other outer area, so that the ground can recover from all the digging, and grass and weeds can re-grow. By growing different types of crops in the two outer areas, it can be avoided that maintenance work needs to be carried out in both areas at the same time. And seeds of new crops can grow undisturbed. Suitable crops for the outer areas are small decorative trees, fruit trees (apples or pears) and general biomass crops (e.g. willows), of which cut wood and wood shavings can be used excellently for diversion in the yards and as exploration material.

A type of hen which is more inquisitive and less easily frightened but remains alert will fit best into this concept. Such qualities will enhance the use of the outer areas. These animals may be a little heavier and will have a greater feed intake to compensate for the natural variation in their environment. The laying hens have a strongly developed immune system, in order to fight off pathogens.

The Plantation offers not only space for the adult hen. The brooding of eggs and raising of hens for future laying hens takes place on the farm. Inseminated eggs, rather than young chicks, arrive at the farm. The young animals will be separated from the adults and get gradually more space in the yard. The **raising and keeping of chickens in one poultry farm** has many advantages and makes this a very robust system. There is no transport stress for the hens, nor stress from a changing living environment. We teach them how to use the yard at an early stage, so that their pecking behaviour is concentrated on the ground rather than each other. And finally, these hens are gradually exposed to diseases which are inevitably around, and thus will build up a strong immunity at an early age.

Of course we can also think of all sorts of variations for the Plantation. The resting and egg-laying units do not have to run along opposite ends of the outside areas. The buildings can also be placed together in a square, with space for storage, processing of eggs and possibly visitor areas.

But once again there are a number basic requirements which have to be met for this design:

- **The husbandry system has an open yard, which can be covered in case of emergency**
- **The units and the yard supply all natural requirements of the hen**
- **Apart from the yard, there is an outer area, which is made up of several parts with crop production**
- **The food and water supply is adequate, but the chicken also has to find some of its feed through foraging**

The Plantation is nice for the chicken. But how about the poultry farmer? His list of wishes has also been incorporated into this design. The Plantation offers the poultry farmer a system which combines large scale egg production with optimal facilities for natural behaviour for the hen. This system is only marginally more expensive through the minimalist building style and the double-use of the outdoor areas.

And the citizen or the consumer? Research shows that this system will be particularly favoured by two of the three citizen groups: the post-materialists and the cosmopolitans. Post-materialists will value the combination of fresh air, free-ranging, the natural elements, the variation in food and the good integration with nature, through the combination of planting, division of units and breeding units. Cosmopolitans will find the choice-freedom for the hen particularly attractive – she can go and do as she pleases, to many different areas and carry out many possible activities but also keep the choice of privacy. For these types of citizen this provides a good and believable story, fitting with reality: the active, healthy chicken with a varied life in a natural environment, which can spend the day in a chicken-'worthy' manner.

How can we keep our laying hens in order to make sure the chicken, the poultry farmer and the general public are satisfied? This was the question at the beginning of this brochure. With the two designs of husbandry systems – The Roundel and the Plantation, we have shown that an economically viable production of eggs can be united with happy chickens, health for animals and men and an image which identifies with the ideal picture of citizens and consumers. Beware: these designs are a guideline, not a final blue-print for a construction plan. We say – 'it should be possible like this' – and not 'this is the only way to do it' '.

To whom can we pass the baton?

The project team of *Laying Hen Husbandry* hopes that the designs from this booklet will give inspiration to all those involved in the poultry industry. The process of defining these designs was just as important as the designs themselves, because it became clear from the beginning that different opinions were not always in conflict with each other – but this only became clearer when delving deeper into the require-ments of humans and animals. To look differently at the general public, and to take them seriously – that was possibly the key to arrive at the new husbandry concepts. When investigating further it became clear that there was no such thing as the 'general citizen' and that not every-one thinks the same. However, many citizens have ideas, which the poultry industry can utilise. To fulfil the requirements of the animal, in this case the laying hen, does not always mean an unworkable system for the farmer or an unaffordable system. To fulfil the requirements of the laying hen can mean producing an egg with extra value and there are plenty of consumers, who are prepared to pay a little more for this.

What we still miss in The Netherlands is a socially desirable husbandry system in the poultry industry With this brochure we hope to put some change in motion. This is why we ask you: do you feel involved with or addressed by the issues and results of this project? Or would you like to react in some way to this brochure? That is possible! We would really welcome it, because a socially desirable husbandry system in the poultry industry in The Netherlands requires the input and energy of many! Not only the poultry farmers and interest groups, but also people from outside the sector. There are still lots of possibilities to take part, because the project *Laying Hen Husbandry* is not yet finished. With the financial help from the Dutch Ministry of Agriculture, Nature and Food Quality we can further actively support new initiatives in the laying hen industry. Will you take the initiative – will you take on the baton?

You can react or contact us in many ways, look at www.houdenvanhennen.nl or check out other details at the beginning of this brochure.