Facilitating a dialogue for designing sustainable poultry sectors

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1 Concerns about sustainability in the poultry sectors

Animal production is at stake because of its role in global warming and the competition between the production of food and animal feed. About 18% of the production of green house gases is related to animal production (FAO, 2009). In a number of countries not only the effects of animal production on the ecological foot print are of concern, but ethical and esthetical aspects of animal production as well: welfare of the animals, effects on landscape, risks of animal production for human health, etc. Notwithstanding these concerns, worldwide the demand for animal products is expected to rise due to the increase in the human population and a growth in consumption of animal products per capita (FAO, 2009).

Poultry production has a relatively low environmental impact per unit of product, because of the efficient utilization of feed (De Vries and De Boer, 2010). Yet, the welfare in poultry production is questioned, because of a.o. housing conditions. In addition concerns about human health exist, which are related to the dust produced by poultry, zoonotic diseases (Avian Influenza, Salmonella, Campylobacter), and the increasing impact of bacteria resistant to antibiotics (MRSA and ESBL).

A typical barrier for integral sustainable egg and poultry meat production is the negative relation between animal friendliness of housing and emissions to the environment. Housing systems with more possibilities for natural behaviour (outside runs, material for foraging and dust bathing) produce significantly more dust and ammonia than cage systems. Moreover, feed intake and related emissions in alternative systems in general are higher than in cage systems. Another wicked link is that non cage systems provide a higher risk for diseases and feather pecking among the hens.

The concerns on animal welfare and human health are reflected in European and national policies. From 2012 conventional cages for laying hen are forbidden in Europe (EU, 1999). The EU also has regulations on housing of broiler chickens (EU, 2007) to increase animal welfare. In the Netherlands and in Germany, enriched cages will be forbidden as well. The EU is working on zero tolerance policies for Campylobacter and Salmonella in poultry products (EU, 2003). In the Netherlands a target has been set to have an integral sustainable animal production in 2023. Lastly, Dutch national law prepares a ban on removing the tip of the beak of laying hens from 2011 onwards. These 'touched' beaks are common practice to prevent feather pecking and cannibalism.

The economic viability of the sectors is under pressure as well. Eggs and broilers are globally uniform products on a global market with competition on price mainly. Consequently, in countries with expensive production factors (labour, capital) the viability of the sectors is threatened. In the Netherlands the viability of the poultry sectors is a matter of great concern, because of the contribution of these export-oriented sectors to the Dutch economy (PVE, 2010).

This complex situation of little societal support and low farmers income, while being important for the Dutch economy motivated the Dutch Ministry of Agriculture, Nature and Food Quality to start a project on a radical redesign of mainstream poultry production.

2 Redesigning for system innovation

If the development of a sector or geographical area is to be 'sustainable', it must simultaneously reduce the environmental burden, be economically viable, socially acceptable and – where applicable – improve animal welfare. Innovation generally focuses on just one element at a time. It encourages agricultural entrepreneurship, for example, or reduces hazardous emissions. The multiple ambitions of sustainable development imply that a single change is insufficient.
Likewise, more is required than technological innovation alone. Currently existing systems have never been planned, but have arisen historically because the individual actors – each working from their own perspective – have aligned their activities. Specific technical solutions, ways of acting and institutions with their formal and informal rules have become self-evident. Such a self-perpetuating system is known as a lock in situation. It is difficult for innovations to break through a lock-in, particularly if things have to change in several places at once. Resistance to innovation can appear at a number of

different places. Changes thus are also needed in terms of social and institutional aspects. The value chains may have to be configured differently, or there may be a need for new actors to participate; perhaps new rules and relationships between the actors will need to change. This is what is referred to as system innovation (Elzen and Wieczorek, 2005).

Processes of system innovation are unpredictable, highly complex, surrounded by uncertainty and have a long time horizon. They can not be planned but are the emergent result of numerous intentional and unintentional actions and interactions of plentiful actors. They are by definition out of reach of innovative endeavours by single actors. What can be done is to stimulate learning towards system innovation in networks of actors who are willing to work on sustainable development. There is still little empirical research and evidence on how learning towards system innovation comes about. However, many plans and projects emerge that seek to stimulate change in a specific sector in cooperation with heterogeneous actors that are willing to work on change towards sustainability. In order to stimulate learning towards system innovation in a network, initiators with this particular aim, also called systemic instruments (Smits & Kuhlmann, 2004), stimulate communicative interaction in a network.
In the agricultural sector many systemic endeavours are undertaken. This paper reports on experiences with a design approach, including collective system analyses, for the Dutch poultry meat and egg sectors carried out by researchers of Livestock Research Wageningen UR by order of the Ministry of Agriculture. Previous projects proved to deliver positive results using a design approach, in which needs determine the requirements for the design of new sheds (Groot Koerkamp & Bos, 2008). Over the last decade the scope of the projects has widened. Whereas the design for Comfort Class (pig production) combined the needs of farmers and animals, Loving Laying Hens also took citizens' needs into account, while Cow Power (dairy production) additionally incorporated environmental needs into the design. The premise of the current projects is that sustainable production is not obtainable at the farm level alone; the whole value chain has to change.

In the project Reflexive Interactive Design is used as methodology (Bos, 2010). A first step is to analyze the system of production and consumption and the relations between the actors involved to get insight in wicked problems, lock-ins and germs of niches. Secondly, the needs of actors operating in the system are analyzed and translated into requirements for the production system. The information is used in a systematic and structured design process with stakeholders from the value chain and other interested actors. Based on the needs participants search for integral sustainable solutions. Niche

development and structural change is anticipated by strategically choosing sustainability issues and partners in the design process.

3 Aim and questions of the paper

To support communication in networks aiming for system innovation the collective system analysis has been developed (van Mierlo & Arkesteijn, 2009). A tool, called the innovation system framework is used in a dialogue to analyse barriers for a sustainable development in the incumbent systems of production and consumption. Earlier research has shown that integrating a system analysis into an innovation network's activities helped to generate new knowledge, and to give focus to subsequent collective action, although the transformation of this knowledge into actual action was limited (van Mierlo et al., 2010).

So far the framework has been used for collective analyses during meetings of a project team and occasionally in an innovation group or network of diverse interdependent actors. In case of the poultry sectors it was deliberately chosen to organise a workshop for all actors in the value chain.
The complete system analysis consisted in this case of various activities. It started with an internal collective system analysis with researchers who are experts in poultry production. In addition, desk research and interviews with over 20 actors from the sectors, the Ministry and NGOs were conducted by livestock researchers. These researchers then facilitated two, one for poultry meat and one for eggs. Finally, the participants (22 in total, 7 attended both workshops) were called by phone to get their feedback on the workshop after which the complete project team evaluated the overall process with the aid of the timeline method.

Based on the interviews the researchers had serious doubts about the willingness of the chain actors to discuss collective activities, let alone engage in them, because their problem definitions diverged largely. The interviewees from the poultry sectors were mainly concerned about the economic sustainability of their activities. The industry saw the relatively small carbon footprint compared to other animal products as an opportunity to positively market itself. The poultry meat sector indicated some possibilities to reduce environmental impact, while the chain actors in the egg sector asserted that improving animal welfare would be a threat to the low emissions related to the cage system. NGO's and the government were much more concerned about the effects of egg and broiler production on the environment and animal welfare.

The process aim of the workshop therefore was to try and create a sense of urgency about the sustainability issues and their interrelations to help to build trust for cooperation. The substantive aim was to explore and define possible solutions in the form of collaborative actions based on an analysis of the factors and actors in the current system that are working against a transformation to a more sustainable system.

It was decided to invite actors from the whole value chain and other parties like NGOs and the government for several reasons. First of all, it was expected that it would add to the quality of the system analyses. With all actors at the table discussing the barriers for innovation towards a sustainable development, participants had the opportunity to ask each other critical questions and to integrate their different perspectives. The researchers would triangulate the workshop results with the interviews and in this way come to an in-depth analysis. Secondly, it was assumed that to reach the aims for integral sustainability in the mainstream of the poultry sectors the diversity of actors in the value chains had to be involved. It was hoped that some of the larger actors would show willingness to put effort into an innovation process, thus motivating more reluctant parties, the farmers especially, to come on board too. Other parties like the ministry were expected to learn along with the chain actors.

The purpose of this paper is to explore the value of collective system analyses with actors of a whole value chain with regard to system learning. To start, we discuss different types of system analyses and describe the methodology of collective system analysis and its presumed value in an innovation process. Then, we will show to what extent the participants in the poultry workshops changed their thinking about barriers for innovation and sustainable development and whether a perspective on action taking emerged in the course of the interaction. Because the success was limited, we end by analysing what hurdles for innovation the participants bring into the workshops by the very fact that they represent the existing value chains.

4 Expert and collective system analyses

4.1 Methodologies for system analyses

By defining the systemic factors that are the causes of persistent problems a system analysis may help focus activities on those factors. Various analytical tools and frameworks are used to conduct these analyses. Some have been developed specifically for a system analysis involving sustainability issues.

Well-known models are Integrated Sustainability Assessments (ISA or IA) which provide a scientific way of modelling cause and effect relationships (Rotmans & de Vries, 1997). They stem from complex system thinking and were developed in response to mono-disciplinary ways of explaining the causes of sustainability problems. When used in a collective setting (van de Kerkhof, 2001), it is a valuable tool to unlock ecological and economic expertise for stakeholders, while simultaneously revealing the stakeholders' perspectives that are relevant for public decision making. It is, however, too complicated for our purpose of conducting a system analysis together with chain actors, since an Integrated Assessment requires a considerable degree of expert knowledge on the specific domain and modeling in general.

Other frameworks, originating from innovation science and used to identify general barriers to national or regional innovation, have been translated for use for sustainable development. Most of these system analyses are conducted by scientific experts (Hekkert et al., 2007). These methodologies do not seem to allow the involvement of 'non-experts', given the indispensable time and expertise in the specific technological-scientific domain. The numerous innovation initiatives in Dutch agriculture can not be expected to invest the large sums needed for this.

There is a call from scientific and policy domains for participatory or interactive analyses from an innovation perspective, to enhance the quality of the assessment by incorporating diverging and conflicting perspectives, in that way also enhancing the effectiveness of policy measures which need the cooperation of stakeholders (see for instance Quist and Vergragt, 2006). We presume in addition, that a joint analysis might help develop mutually supportive ideas and desires for future developments. If a system analysis is conducted in a dialogue it may stimulate reflection on the relation between current practices and their embedding in systemic features. Critically examining structures and underlying values instead of taking them for granted may thus create opportunities for learning and coherent structural changes by helping participants to design collective plans of action and to redirect their planned activities if needed in the light of systemic barriers. Such a reflexive approach fits well with the emergent character of system innovation.

4.2 The Innovation System Framework

A valuable tool to stimulate such a dialogue is the Innovation System (IS) framework (Klein Woolthuis et al., 2005, Klein Woolthuis, 2010). It is grounded in a thorough overview of the systemic factors hindering innovation, known in innovation science as 'system failures'. These system

imperfections block learning by actors and innovation while slowing down the innovation system as a whole. In our view barriers to sustainable development are a specific type of barriers to innovation in general. We endorse the main ideas underlying the IS approach. Innovation (towards integral sustainability) does not take place in isolation but is embedded in a context of institutions and a market structure, that form the 'rules of the game' which reduce uncertainty for the actors involved in a dominant system (Edquist, 1997). All these rules are actively shaped, reproduced and adapted by actors, even though they may be perceived as structures by other actors. In evolutionary processes variety in novelties is generated across which selections are made, and there is feedback from the selection process to the creation of variation (Nelson, 1993). This process of novelty creation is the result of constant interaction among heterogeneous actors, whereby cooperation and interactive learning are important processes (Lundvall, 1992).

The IS framework can be used as a matrix to visualise the system features of an incumbent system that provide a hindrance to innovation. A main strength of the framework is that it not only addresses the barriers but also the actors that act upon them in their daily practices, in this way reproducing and adapting them. The framework offers a good perspective for action, because determining which actors are involved in the main perceived barriers may lead to actions to either involve them in the innovation network or to try to influence them as outsiders.

The system features are placed in the rows of the matrix:

1) Physical infrastructure, such as railways and telecommunication systems;
2) Knowledge infrastructure, the way the creation and use of knowledge is organized;
3) Hard institutions, formal laws, regulations and norms;
4) Soft institutions, values, implicit rules of the game;
5) Interaction, a too strong or too weak interaction between actors;
6) Externalities; undesirable effects elsewhere in place or time, of economic activities that are not included in market prices;
7) Market structure, the positions of and relations between market parties, e.g. monopoly and transparency.

In the columns of the matrix are the actors involved in a sector and the relevant 'third parties'. The identified system barriers are placed in the cells at the intersection of the related system feature and actors.

The framework was developed for analysing the hindrances to innovation and, because of that, to evaluate interventions, since interventions need to address these system failures in one way another. It also helps to give focus the design of policy interventions. The IS framework was given a twist, when it started being used as an instrument to stimulate a collective process of system learning and designing joint actions (van Mierlo & Arkesteijn, 2009).

4.3 Dimensions of system learning

A collective system analysis may help actors to challenge and redefine the very structures that hinder their aspirations for more sustainable practices; that is to regard the relationships between the structures in which they operate and their own practices in a new light: system learning (Senge, 1990, Loeber et al., 2007). Collective system analyses are expected to add value in three dimensions of system learning specifically (see van Mierlo et al. 2010):

1) Help participants to define the main systemic barriers to innovation towards sustainability and their interrelationships, and hence to recognize complexity, multi-causality and unexpected results.
2) Stimulate reflection on systemic barriers and the actors that reproduce them in order that , participants question these ‘given’ conditions and start seeing them as changeable; i.e. as windows of opportunities.
3) Give focus to project activities: to design ‘radical’ options, check intended activities, or reorient the directions chosen previously.

5 The workshops and their results

In two workshops participants were invited to explore “the opportunities for redesigning the production system towards integral sustainability and to share their visions”. First, they were introduced to the aim of the workshop, the main results of the interviews and the working of the IS framework. Before the collective analyses started the participants were asked to choose one of the four presented questions that would serve as the guideline for the analyses. These questions were supposed to represent the diverging problem definitions of the chain actors (as was concluded from the interviews), although most participants did not have a clear preference for one issue over the others. In this way, the participants were divided into four subgroups that worked on separate analyses. First, all participants contemplated individually on the barriers for the problem to dissolve and wrote them on post-its. They put these post-its in a large matrix, while explaining them to the rest of the group. Then, all participants reflected on the barriers listed trying to conclude on the main underlying causes.

In a next round, the same was done for external windows of opportunity that could support innovation. Finally, one of the group members presented the results to the other groups in a plenary discussion.

To discuss the results of the workshop, we start with the three dimensions of system learning, and then show whether it motivated the participants to take action along the lines of the learning process.

Recognizing the integral nature and multi-causality of current problems. All but two participants stated in the feedback calls after the workshop that it had provided them a better understanding of the problem domain, or at least a structured overview. Most participants explained this in general terms of more insight in the structure and relations in the sector or “a deeper understanding, because people had to ground their statements”. Some participants explicitly referred to the integral nature of the sector and how the workshop had helped to gain an understanding of the perspectives of other actors in the value chain. One was urged to “think out of the box” and realized that his entry point was too technical. And two participants mentioned that the workshop had helped to stop shifting the responsibility to the outer world, consumers or the government. One of them realised e.g. that it is not just the “angry” outside world that puts pressure on the margins, but the internal competition as well.

Redefining dominant system features from barriers into windows of opportunity. The dialogue and the feedback calls provided little evidence of this type learning. Although in all sessions time was spent on exploring and discussing windows of opportunities after the barriers were defined, these opportunities were little related to the barriers. Only one participant explicitly mentioned that the system analyses had provided substantive reasons to act. However, a clear success of the workshop in the egg sector was that at the end of the plenary discussion industry actors who had hitherto attacked the government on taking the wrong decisions and conflicting regulations asserted that they should “take up the gauntlet” and become involved in defining what makes a sustainable egg sector.

Designing radical options for collective actions. Each workshop ended with a plenary listing of the foci for possible actions. In the poultry meat sector most of these had a quite radical character, in the sense that they divert from the current structures and rules in the sector, like having ‘free range’ as the norm, to stimulate research on the integration of animal welfare, public health and environment, and to seek more links between government, research and the industry. In the egg sector the formulated foci were more conservative, like to educate society in order to get rid of the bad image of the sector and base regulation on ‘facts’ instead of political reasons. The most radical option was to define with all

parties what a sustainable egg sector is, which was well in line with the above mentioned conclusion of the plenary discussion.
A few participants gave as feedback that they see more possibilities to cooperate in general, but concrete ideas, let alone appointments on collective actions were not an outcome of the workshop.

After the workshop the researchers made a list of directions in which the follow-up trajectory could proceed. These were:

1) "Holland frontrunner", to export the knowledge on sustainability in the broiler and egg sectors
2) Integral redesign
3) Improve the image of the sector by actions towards consumers and citizens
4) Address the government on conflicting regulation and a fair level playing field in Europe
5) Stimulate transparency in the chain with a quality assurance system

Except for two, the participants claimed during the feedback calls that they wanted to be involved with and at least be informed about further steps. The integral redesign and addressing the government were considered important by half of the participants, exploiting the knowledge in the Netherlands and working on an improvement of the sector's image by about a quarter of them.

Taking action. Neither the workshops nor the feedback calls gave the impression that the participants were going to take action themselves. Because of this, but also because they were used to do so and the Ministry of Agriculture expected them to do so, the researchers took the lead in the next phases of a reflexive interactive design project, i.e. the formulation of the needs, the selection of a focus for the redesign, and the organisation of design workshops with interested actors. Some participants in the system analysis workshop are invited to the design workshop. With regard to content, the link with the results of the workshops and earlier steps was rather weak..

6 The potential for change in the value chains

A simple and straightforward reason for the partially lack of success of the workshops is that a single gathering can not be expected to be sufficient for in-depth learning and turning new insights into action. Earlier evaluations of these collective system analyses confirmed that they are best used in a cyclical step by step approach (van Mierlo & Arkesteijn, 2009).
To come to a more in-depth analysis of the reasons for the limited success we turn to the potential for innovation in the specific sectors. The choice to invite actors from the value chains meant bringing in

actors with vested interests. The system features externalities, network interaction and market structure help to explain whether the institutionalised relationships within the different parts of the value chains provide hurdles for change towards sustainable poultry sectors.[1]

6.1 The broiler value chain

The broiler sector in the Netherlands consists of about 250 farmers with broiler parent stock, 20 hatcheries, 700 broiler farmers, 16 slaughterhouses, and 300 companies that process and prepare the meat and supply it to retail, restaurants and catering (PVE, 2009, PVE, 2010). Worldwide there are only 3 large breeding companies, on which all poultry farmers are dependent for the types of chickens they can choose from. 70% of the meat produced in the Netherlands is exported. The meat is primarily sold to large wholesalers and purchasing organizations for supermarkets, restaurants and catering. (Van Horne and Achterbosch, 2008).

Animal welfare problems and emissions to the environment are undesirable effects of the poultry meat production that are not included in the market prices. Thus, there are no financial stimuli to invest in a more sustainable development. Added value markets do exist (organic, the UK Freedom Food label, Label Rouge in France) and their prices tend to be higher rather than lower. These externalities are an obvious hurdle that need to be overcome for a sustainable development. Innovation is hindered even more because the actors who are supposed to invest in sustainable development are not the ones to benefit from it. In the case of animal welfare the animals would benefit from the improvements made by the farmers and other producing actors. In the same manner there is no incentive for Dutch farmers to decrease soil depletion and erosion which is the result of soya production for feed, because it occurs far away in South-America. The low price of antibiotics stimulates its use as a preventive measure to keep the birds healthy, while the external risks of use for human health are high but not accounted for in the market prices.

Another obstacle for innovation is the close interaction between the Dutch actors from the production side of the value chain. The farmers with broiler parent stock and farmers with broilers are independent entrepreneurs, with in general only short term contracts with feed suppliers and slaughterhouses.[2] All chain partners (from hatcheries to slaughterhouses) know each other well, which

[1] This analysis is part of the complete system analysis.

[2] This Dutch market structure of live birds is exceptional . In most countries large integrations, either controlled by feed suppliers or slaughterhouses, are the standard. The scale difference might reduce the competition among the producing actors and consequently provide more room to invest in innovation.

seems to cause a a blindness towards societal concerns. The ‘producers’ regard the bad image of the chicken sector related to animal welfare and environmental issues merely as a consequence of a lack of knowledge in the rest of society of their contributions to innovation in these fields.

The farmers are expected by the Dutch government to initiate sustainable development; more specifically to invest in more animal friendly housing systems with less emissions, in types of animals with less welfare problems and in compound feeds that rely less on imported soy. Subsidies and tax measures are supposed to stimulate them to invest in new production systems, but do not seem to provide sufficient room to manoeuvre. Farmers are dependent on a small number of companies to deliver the input for their farming activities and a small number of slaughterhouses to sell the broilers to. This leads to fierce competition on price between the many primary producers. The farmers often sell the chickens below production costs, although a small part of them (the largest farms), is able to earn a good living. Because of the low prices they get for their products, farmers have little money to invest in additional sustainability measures. As the interviews turned out, they do not take risks because they expect that the slaughterhouses will not select more expensive chickens, kept in a more sustainable or otherwise added value system. In the same way the slaughterhouses expect that the retail sector is not willing to buy this meat because the majority of end consumers would not be willing to pay more for sustainable chicken meat[3]. The lock-in of price orientation and low margins in the production part of the chain thus seems to reinforce the defensive attitude of the producing actors.

Although the number of certified hatcheries and slaughterhouses is still rather high, about 3 hatcheries and 3 slaughterhouses dominate the market (PVE, 2010). Other powerful actors in the value chain are the retail parties (supermarkets, restaurants, catering) and their purchasing organisations. Supermarkets often use meat as a traffic builder, selling it at low prices, sometimes even below purchase price, to increase the total number of customers in their stores. The resulting power imbalance between producing actors and retail puts pressure on the financial margins in many parts of the production chain, and thus on the room to invest in innovation.
The relations between retail and the producers are kept quite weak, since supermarkets want to be free to turn to other suppliers to get the lowest price. The relations are currently too weak to stimulate cooperation on a sustainable development of the mainstream poultry meat production. Bearing in mind

[3] Nevertheless, in 2010 an agreement between an NGO, supermarket, slaughterhouse and about 40 farmers arranged to produce broilers in between the organic and the conventional system

the key role retail has played in some of the recent ‘niches’ around local meat and other added value segments in the Netherlands, they are significant for any sustainability innovation.

The near monopoly in the breeding industry provides them the power to decide on the genetic make up of broilers. The current fast growing breeds have inherent animal welfare problems, like a lack of walking ability. All breeding companies have slower growing birds in their package, which need more time and feed to reach slaughter weight than conventional broilers. Because this is more expensive, the farmers only want to produce birds of such slower growing strains if there is a guaranteed demand for them. This demand is limited throughout the cost-oriented chain.

The popularity of chicken is increasing because of its low price and easy and diverse preparation. Although some consumers turn from other meat to chicken for reasons of price, the relatively low price compared to other meat types may leave room for a small increase in price for a more sustainably product. There is however no active large demand for sustainable chicken meat from consumers Societal concerns about animal welfare and environmental effects are expressed in public debates and via actions of NGOs. In a recent campaign e.g. the low price of chicken and other meat when used as traffic builder is shown by comparing it with the (higher) price of cat food.

6.2 The value chain of eggs

Eggs are produced for two markets: a business to consumer market for table eggs and a business to business (B2B) market for egg products. The production chain is to a large extent the same: the breeding companies, hatchers and most laying hen farmers produce for both markets; only farms with cage housing produce mostly for the B2B market. About 100 packing stations buy the eggs from the farmers, sort them on weight and colour and sell the eggs that are not suited for direct consumption to the processing industry. This is a specialized industry that has emerged to separate the contents from the shells in this way turning them into the egg products (egg yolk, egg white or whole eggs in either dry or liquid form). Two to three processing companies dominate the market. The egg products are sold to the European or international food industry mainly to use them in bakery products, mayonnaise, soup, ice cream and fish and meat products. 80% of the Dutch egg products are exported.

The overlap in stakeholder composition of the production chains for table eggs and egg products suggest that towards sustainable development should focus on both sectors simultaneously.[4] The hurdles for a sustainable innovation of egg products production are partly similar to those of table egg production, but since egg products face some additional hurdles we focus on egg products in the following.

Because of the B2B market for egg products the relations between the primary producers and the processing industry are quite weak. The links between the producing actors thus are weaker than in the meat sector. While only parts of the value chain are familiar with one another, the trust in each others willingness to innovate is quite low.

The farmers with laying hens receive low prices for their eggs which reduces the financial room to invest in sustainable development, although they could make use of the same subsidies and tax measures as the broiler farmers. The reasons are very similar to the broiler sector such as the large number of farms causing internal competition and too much production. Another factor is related to the small scale of the farms compared to the size of the purchasers putting pressure on the production chain to keep the price low. The majority of the buyers of egg products (the food industry) are large companies with much market power.

The links between the producers on the one hand and supermarkets, restaurants and catering on the other hand are very weak, while the latter are a key actor as the entry point to the majority of end consumers, who might appreciate a ‘plus’ on sustainability. Even though the retail sector puts pressure on the prices for egg products, because of their dominant position in the market, it is essential for a sustainable development of the mainstream egg markets.

In the Netherlands the supermarkets do not sell table eggs produced in cages any more; 89% of table eggs sold in Dutch supermarkets are of an added value type (free range, grass eggs, cereal eggs and organic eggs). Because table eggs can be stamped consumers can be informed about the production process (transparency), the housing system and the feed for the laying hen.

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[4] There is hardly an overlap with poultry meat. Types of birds, housing and companies involved are mostly specialized. The markets are different as well: for poultry meat there are substitutes (other meats, fish, vegetable proteins), for eggs and their functions few alternatives are available.

Poultry meat and egg products lack this transparency. For egg products the share of added value eggs is slowly increasing, often by pressure from animal welfare groups on the large food companies.
A higher price in table eggs does not have to be a large barrier for end consumers, because the price elasticity of table eggs is extremely high. People consume the same amount of eggs whether they are cheaper or more expensive. In the same manner a general conversion to products in which more sustainable eggs are processed is conceivable without an active demand from Dutch end consumers. But, as with poultry meat, the Dutch market is mainly an export market. This might increase the uncertainty for producing actors and thus provide a barrier to innovation.

6.3 Learning in the value chain?

Effects of 'producing' broilers and egg products on animal welfare and the environment are not integrated in the price and the market structure in both sectors limits the financial space for investing in sustainable production even more. The strong interaction among some of the actors leads to blindness towards the need and potential for improving animal welfare and to a lesser extent environmental impact (broilers), while the strong competition in general, whether the interaction is strong or weak, urges all actors to have negative expectations about each others readiness to innovate (broilers and egg products). Yet, in this context, representatives of the value chain actors joined voluntarily to discuss a radical redesign of their sectors.

Did the workshops have the potential to overcome these hurdles or run the risk of reproducing them? In hindsight, we realize that the workshop risked strengthening the negative expectations about each other's willingness to innovate since the interviews had not indicated that at least one of the participants wanted to innovate and would show this intention to the others in the workshop. Bringing together the actors in the egg (products) chain could certainly have helped to think 'out of the box' and to build trust, given their weak interaction in general. The blindness in the broiler sector however could be expected to be reproduced rather than solved since no 'new insights' were brought in. Unfortunately, the supermarkets, essential for breaking through the institutionalized relations, did not join the workshop.
Finally, our analysis confirms our assumption that investments towards integral sustainability can not be expected from individual farmers alone, given the small margins on their products and the fact that they do not experience the undesirable effects of poultry production directly. Creative options need to be explored and designed to find financial room for change. By bringing the chain actors together the

workshop had the potential to be a first step towards a collective sense of responsibility and willingness to share the risks related to the uncertainty of system innovation.

7 Conclusion

The dialogues with actors from the value chains of poultry meat and egg products aimed a.o. at designing actions that need the dedication of diverse actors. Although the participants gained new insights through the workshops in which they analysed the systemic hurdles and opportunities for sustainability together and their commitment increased especially in the egg product sector, this ultimate goal was not reached. The workshops were insufficient to counterbalance the institutionalized context in which the participants operate, partly, so it seems, because of the invitation strategy and the background of the invitees that decided to participate.
As a research method the collective system analysis was quite effective. The researchers gained the subtle insights they needed in the relationships between the chain actors to proceed with the redesign trajectory for which they had also gained support from half of the workshop participants.

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