Governing sustainable system innovations in livestock farming

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A study to the feasibility and moral adequacy of the policy for integral sustainable animal housing systems

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Summary

This thesis researched the feasibility and the moral adequacy of the policy for system innovations in the livestock sector, which is part of the policy program for sustainable livestock farming. The aim of this study has been doing recommendations for the governance of system innovations. To this end, the program theory that underlies the policy for system innovations has been assessed on its feasibility and its moral adequacy. The feasibility of the program was in addition examined in a case study to the application of the Rondeel system, an integral sustainable animal housing system for layer poultry. The policy for system innovations aims at the large scale application of such integral sustainable animal housing systems. The program theory that underlies this policy appeared to show several weaknesses. Overall, it lacked internal consistency. Whereas stakeholder and societal support for the program is sufficient, its enforceability is poor due unfeasible goals and objectives and a not completely adequate allocation of resources to the program. In addition, the program can not be regarded as morally adequate since avoidable suffering in the form of animals suffering from is still a policy consequence. The policy improves however animal welfare strongly and it is thus a moral improvement. Despite the weak feasibility of the program theory, the case study on the Rondeel system revealed factors of success for the development of integral sustainable animal housing systems and their application in practice. From this, recommendations for the governance of system innovations could be done. Factors of success are: extensive research to stakeholder demands; stakeholder involvement in the development and realization process; the presence of an organization that is deeply committed to make the product marketable, entrepreneurial courage and a good presentation of the new product to the consumer. These lessons can be taken to similar cases where a new sustainable system needs be developed that is marketable and/or where such a system needs to be brought in practice. With the recommendations this study gives, it will still be a challenge to realize new concepts in practice, but they should be sufficient to overcome the obstacles. A next challenge is the large scale application of sustainable animal housing systems, that is the development from niche market to mainstream. This study provided some suggestions from innovation literature. The conclusion of this study is that the policy for system innovations is not feasible, but that there is nevertheless perspective on feasibility. To this end, the policy should make two major improvements: (1) establishing time-dependent instruments with clear goals and (2) making more financial and knowledge resources available and allocating them to the program activities.

Keywords: livestock farming policy, system innovations, integral sustainable animal housing systems, feasibility, moral adequacy

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1. Introduction

1.1 Background of the research

1.1.1 Livestock farming and global problems

Intensive livestock farming is one of the top three most significant contributors to the most serious social and environmental problems, at every scale from local to global. The livestock sector is worldwide one of the largest contributors to problems of land degradation, loss of biodiversity, water issues (shortage and pollution), climate change and air pollution. For example, 18 percent of global greenhouse gas emissions measured in CO_2 equivalent comes from the livestock sector; a higher share than transport. The sector is furthermore the main global contributor to deforestation and land degradation. Livestock production accounts for 30 percent of the land surface on the planet. This high percentage is caused mainly by the land that is used for feed crops. Of the previous forested land in the Amazon, 70 percent is now occupied by feed crops and pastures (FAO, 2006).

Livestock's contribution to global problems that affect humans and the environment is massive and will only increase when the sector will not be managed in a more sustainable manner. The global production of meat is projected to more than double from 229 million tonnes in 1999/01 to 465 million tonnes in 2050, and that of milk to grow from 580 to 1043 million tonnes. The impacts of the sector are so significant that they need to be addressed with urgency (Ibid.).

1.1.2 Livestock farming in the Netherlands

The Netherlands has a relative big livestock sector. It has the highest livestock density in the world. The most important sectors are cattle (dairy and meat), pork and poultry (laying hens and broilers). Small sectors are the horses, turkeys, ducks, rabbits and mink (Os and Gies, 2011). Almost 3,9 million bovine animals are kept in the Dutch livestock sector, of which 2,7 million for dairy production and 1,2 million for meat production. The pig population has a volume of 12,4 million. For the egg industry 45,7 million poultry animals are kept and for the meat industry 51,2 million, which makes the total number of poultry animals in Dutch livestock farming 96,9 million (CBS, 2012). By far the most of all these animals are kept in the intensive farming sector. More than 95% of all livestock farming enterprises are in this conventional sector (Os and Gies, 2011, p. 21).

Intensive livestock farming is in the Netherlands subject to the political debate for years, amongst others due to concern for livestock diseases. Due to the high

livestock density, the country is very vulnerable for animal diseases. In recent years, Dutch farmers have repeatedly been startled by disease outbreaks. The most known are swine fever in 1997, hoof-and-mouth disease in 2001 and avian flu in 2003 (Alsemgeest-Helleman, 2011, p. 4). Many (also healthy) animals are culled in case of an outbreak, which is cruel to the animals and leads to economic losses to farmers and causes social resistance. In the case of the outbreak of swine fever in 1997, 1,8 million pigs were culled. The direct economic loss of the epidemic was €2,2 billion and the consequential loss was €2,5 billion (Bruijnen, 2008, p. 35). Another problem with livestock diseases is that in some cases they are also a risk for human health.

Next due to its vulnerability for livestock diseases, the Dutch livestock sector is subject to the political debate because of environmental problems. Amongst others, manure surplus is a severe problem and a cause of (amongst others) eutrophication, soil acidification and pollution of ground and surface water (PBL, 2009). In recent years, also animal welfare in the livestock sector is an issue of growing concern. Since 2006 the Dutch parliament has a political party (Partij voor de Dieren, Party for Animals) which main objective is to defend the interests of animals.

1.1.3 A new livestock farming policy

The impacts of the Dutch livestock sector are severe and diverse. Because of this, the idea of a comprehensive policy towards livestock farming took root by policy makers. In 2008, Gerda Verburg, at the time Dutch Minister of Agriculture, Nature and Food Quality (Landbouw, Natuur en Voedselkwaliteit; LNV) announced in a letter to parliament her vision on the future of livestock farming in the Netherlands. The letter, titled 'Toekomstvisie op de veehouderij' (Vision on the future of livestock farming), calls for the development of sustainable livestock farming. The letter is an impetus for a new livestock farming policy and sets out the vision and ambitions of the Minister. It also describes the general approach the Minister will take to realize her ambitions. The core message of the letter is that within 15 years livestock farming in the Netherlands should have evolved into an in every respect sustainable livestock farming, with broad support in society. This is understood as livestock farming that produces with respect for people, animals and the environment all over the world (LNV, 2008, p. 1).

After presenting the core message, the document gives voice to the motives for the new vision of the Minister. These motives lay in several challenges that livestock farming currently faces. The Minister notes that livestock farming currently stands at an important crossroad. The main challenges for now and the future are summarized in four points:

1. The internationalization of the food chain and the world food problem. With a growing world population and increasing global wealth, the demand

for meat and diary products will increase, causing a growing pressure on global ecosystems. This in combination with a free world market, makes that Netherlands cannot evade international market competition and the necessity of sustainable production.

2. Global challenges in energy and climate. Due to global climate change and a scarcity of fossil fuels, livestock farming needs to move towards climate and energy neutral chains.
3. The trend from quantity to quality. In the Northwestern European society people are increasingly looking for quality of life. Concern for animal welfare is part of this. Livestock farming will have to meet the growing demand for quality of food and food production.
4. Demographic transitions in Europe as aging, population decline and the urbanization of rural areas. These transitions will result in new requirements for products and the methods of production (Ibid., p. 2).

Implicitly, the question is raised how to deal with these challenges. The Minister emphasizes the difficulty of these challenges by remarking that solutions for overcoming one challenge may conflict with solutions for overcoming the other challenges. For example, a high level of animal welfare is a societal value, but this value may conflict with other values: unilateral attention to animal welfare may have adverse consequences for the market position of the Dutch livestock farming sector (Ibid.). It is questioned in what direction the livestock farming sector should develop regarding the challenges it faces.

The letter continues with the vision of the Minister – i.e. her response to these challenges – which is defined as follows: a livestock farming that becomes sustainable in all its aspects: people, planet and profit. This does not imply a complete change in trend, but asks for a 'sustainability jump' (Ibid., p.3). A lot is expected from system innovations. The Minister sees within 15 years production systems that are based on the principle 'delivering quality products with respect for people, animals and the environment' (Ibid.). This principle, supported by an advanced technology, forms the base of solving dilemmas. The vision is further elaborated under the three aspects people, planet and profit. It is roughly outlined what is understood as sustainable regarding each aspect.

After presenting the vision, the document outlines the ambition of the Minister, which is a translation of the vision in more concrete terms. The ambition describes on which issues the future policy will concentrate. It is worked out in six focal points on which the Minister intends to achieve results:

- System innovations
- Animal welfare and animal health
- Social incorporation
- Energy, environment and climate
- Market and entrepreneurship
- Responsible consumption (Ibid., pp. 4-6)

The letter of the Minister, as an impetus for a new policy, reflects a change of trend in policy making for livestock farming. The aim for 'an in every respect sustainable livestock farming in 2023' reveals a holistic approach; a unique approach that had not been witnessed before.

1.1.4 The role of system innovations

Within the policy for sustainable livestock farming, system innovations are seen as crucial. The Minister aims to stimulate strongly the development of innovative animal housing systems and the operationalization and use of these systems in practice. The objective is that integral sustainable animal housing systems are widely applied within 15 years (Ibid., p.4). Integral sustainable animal housing systems are 'animal housing systems that strongly improve animal welfare and in addition are better for environment, animal health, energy, working conditions and fit better in the landscape' (LNV, 2010, p. 5). Following the ministerial letter of 2008, they form the core of the transition to a sustainable livestock sector.

1.1.5 The Implementation Agenda Sustainable Livestock Farming

The 2008 ministerial vision has been worked out in a specific policy program in the 'Uitvoeringsagenda Duurzame Veehouderij' (Implementation Agenda Sustainable Livestock Farming). The Minister of Agriculture, Nature and Food Quality by that time, Gerda Verburg, signed the implementation agenda in May 2009. This moment can be seen as the start of the implementation phase of the policy for sustainable livestock farming which set up was outlined in the 2008 ministerial vision (Uitvoeringsagenda Duurzame Veehouderij, 2009). A specific program for system innovations has been incorporated herein.

1.2 Problem definition

The document 'Toekomstvisie op de veehouderij' outlines the Minister's vision on the future of livestock farming in the Netherlands and the philosophy that is behind it and it forms the base for a new livestock farming policy. This policy is embodied in the program Implementation Agenda Sustainable Livestock Farming. The Minister clarifies that this policy will be aimed at the realization of sustainable livestock farming that experiences broad societal support. In 2023 the objective of livestock farming that produces with respect for people, animals and the environment all over the world must have been achieved. System innovations are regarded as crucial for reaching this objective.

There is a lack of knowledge on the feasibility of the policy for sustainable livestock farming, including the policy for system innovations. To have an effective policy in place, policy makers must, given an identified need, in the first place conceptualize a program capable of alleviating that need, and secondly, implement it (Rossi et al., 2004, p. 134). It is not known to what extent in particular this first step, i.e. the conceptualization of a program capable of alleviating the identified need, has been done properly. Because of this lack of knowledge, it might well be that the policy fails. Often, policies are not very convincing because of deficiencies in their underlying conception of how the desired benefits can be achieved (Ibid.). Therefore, an assessment on the feasibility of a policy program results almost always in recommendations for improvement of the relevant policy. It provides the knowledge on the strengths and weaknesses of the program; knowledge that can be applied to (re)design the policy in a more effective manner. Because the feasibility of the policy for sustainable livestock farming has not been assessed, knowledge on its effectiveness is missing. This is problematic, since this implies that it is uncertain if the policy is able to achieve the desired results.

The policy for sustainable livestock farming has also not been assessed on its moral adequacy. Policies include in their underlying conceptions normative argumentations, with a reasoning from a principle to a norm or vice versa, or with an assessment of an existing or expected situation in the light of a principle or norm (Hoogerwerf, 1990, p. 289). It can be questioned if the normative argumentations that underlie the policy for sustainable livestock farming are morally correct. Policy for livestock farming involves ethical dilemmas, as is also acknowledged by the Minister in her letter to the parliament, in which she elaborated on conflicting values and gave the example of the value of animal welfare that conflicts with the value of a good market position of the Dutch livestock farming sector. An ethical assessment may reveal that the policy results in morally unacceptable outcomes. This would imply that the policy is not the right policy and that there is need for another kind of policy.

1.3 Research objective

The core objective of this study is to provide policy makers with recommendations for the Dutch policy for sustainable livestock farming, by assessing the feasibility and the moral adequacy of the policy program for system innovations that is part of the program for sustainable livestock farming. The study aims for two types of recommendations:

1. Recommendations that follow from an assessment on the feasibility of the policy program for system innovations: these recommendations apply specific to the current policy program of which the 2008 vision of the Minister forms the core. The recommendations will be targeted at

improving the effectiveness of the program. They are relevant if policy makers stick to the current program.
2. Recommendations that follow from an assessment on the moral adequacy of the policy program for system innovations: these recommendations apply in general to a policy for system innovations and sustainable livestock farming. The recommendations will be on what kind of policy is morally the most appropriate.

The choice is made to focus on the policy for system innovations, because assessing the entire policy program for livestock farming would, due to time constraints, not lead to adequate recommendations. Following the 2008 ministerial letter, system innovations are regarded as crucial in the livestock farming policy. Assessing this policy is therefore of great value.

1.4 Research questions and strategy

The core question of this research, related to the research objective, is:

> *To what extent is the policy program for system innovations, that is part of the program for an in every respect sustainable livestock farming in the Netherlands in 2023, feasible and morally acceptable?*

Three central questions are applied to answer the core question adequately:
1. How does the program theory that underlies the policy for system innovations look like?
2. To what extent is the policy program for system innovations feasible?
3. To what extent is the policy program for system innovations morally adequate?

How these questions relate to the objective of the study is represented in the research framework in figure 1.1.

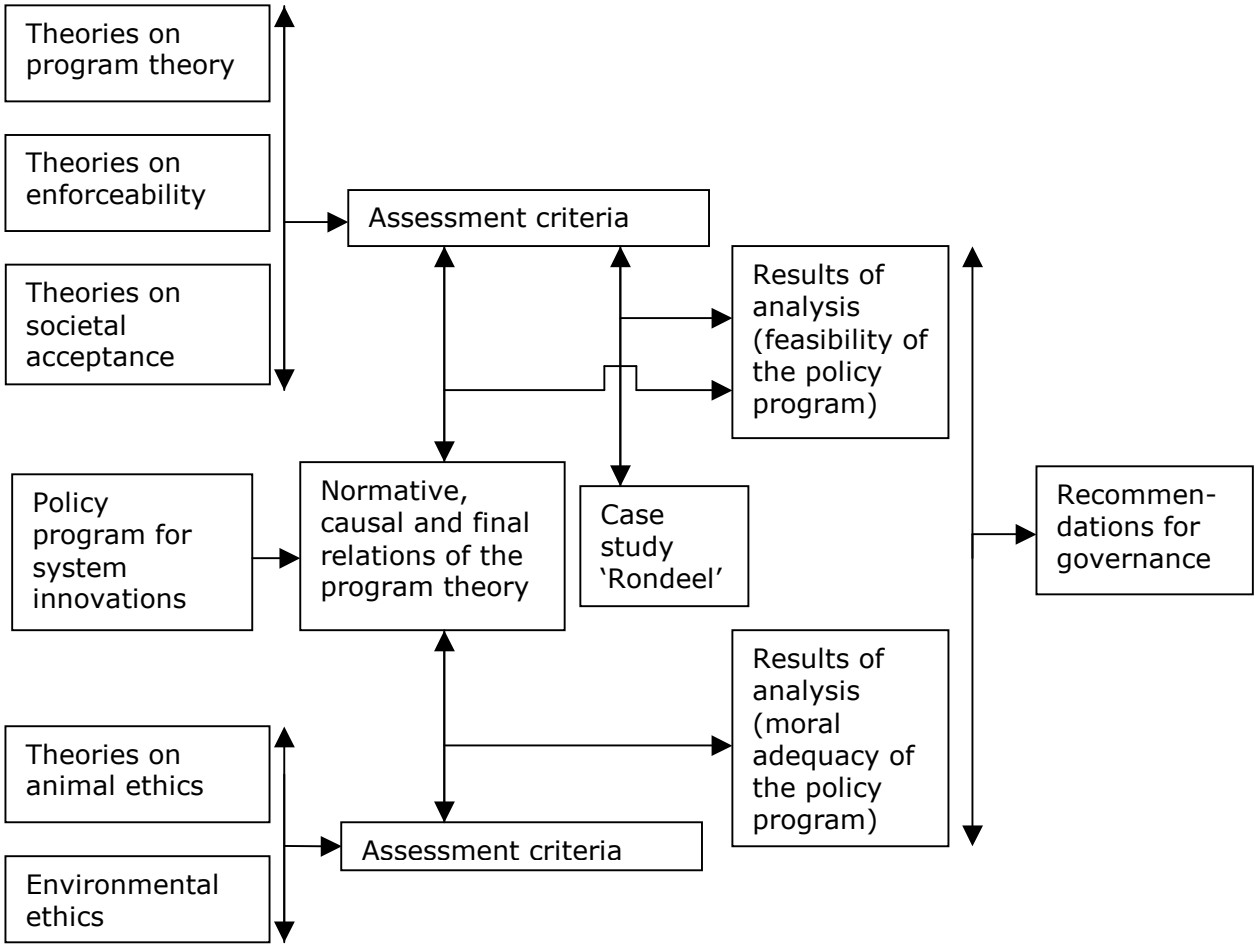

Figure 1.1 *Research framework*

The research framework in figure 1.1 shows the core objective of the study, which is doing recommendations for the governance for system innovations in livestock farming. These recommendations follow in the first place from an ex ante evaluation of the program for system innovations which is embodied in the program Implementation Agenda Sustainable Livestock Farming. The evaluation contains an analysis on the feasibility and an analysis on the moral adequacy of the policy program for system innovations. Despite the policy for system innovations is already in place, the type of evaluation can best be characterized as ex ante. The policy has only just been implemented (2009), whilst it already sets objectives for 2023. It has not been researched to what extent the conceptualized program is able of alleviating the need for which it was implemented. Researching this is therefore the main concern of this study. The program needs to be feasible in the first place – which means that its underlying program theory needs to be adequate – before its implementation can be successful.

The first necessary step in the ex ante evaluation will be the reconstruction of the program theory. Program theory explains why the program does what it does and provides the rationale for expecting that doing so will achieve the desired results. It comprises the conceptions, assumptions, and expectations that constitute the

rationale for the way the program is structured and operated (Rossi et al., 2004, pp. 134-135). Program theories are composed of three kinds of assumptions:

1. Normative argumentations, with a reasoning from a principle to a norm or vice versa, or with an assessment of an existing or expected situation in the light of a principle or norm.
2. Causal argumentations, with a reasoning from a cause to a consequence or vice versa.
3. Final argumentations, with a reasoning from an end to a means or vice versa (Hoogerwerf, 1990, p. 289).

The program theory will be reconstructed by identifying the underlying argumentations of all three types. This will be done by analyzing policy documents.

The second step in the evaluation will be the feasibility assessment of the reconstructed program theory. The feasibility will be determined by assessing the identified normative, causal and final relations. The program theory will be assessed on its internal consistency, its enforceability and its societal acceptance. Preliminary research on theories on program theory, the enforceability of programs and the societal acceptance of programs will provide the criteria and methodology for this assessment. The program theory will be examined against the derived criteria.

A moral assessment of the policy program will form the third step of the evaluation. Criteria for a morally adequate policy will be derived from theories on environmental ethics. It will be argued what things have moral standing and why and what determines the moral correctness of actions (or omissions). Criteria for a morally adequate livestock farming policy will be derived from the argued ethical position. The program theory will be tested against these criteria.

Next to the ex ante evaluation, recommendations for the governance for system innovations will follow from a case study on Rondeel. Rondeel is an innovative housing system for layer poultry which application appeared to be feasible. The 2008 ministerial letter mentions the Rondeel system as an example of an integral sustainable animal housing system which the policy for system innovations should aim for. The first Rondeel system was put into practice in 2010. The case study concentrates on an analysis of the process that led to the development of the Rondeel concept and its realization in practice. From this, factors for success (i.e. factors that make the application of system innovations feasible) will be derived, from which recommendations for the policy for system innovations will be done.

1.5 Scientific relevance

This research falls under the umbrella of the research program Environmental Governance for Sustainable Development of Utrecht University. This program has the objective to 'further the understanding of how and why different – often co-existing – modes of governance either do or do not result in (environmentally) sustainable outcomes' (Faculty of Geosciences Utrecht University, 2009). The object of this study is a national policy program, which is a form of governance. It is researched to what extent this form of governance results in feasible sustainable outcomes and why. As such, this research derives knowledge about the effectiveness of a governance tool in its contribution to sustainable development under certain conditions. This furthers the understanding of how and why the specific researched mode of governance results or does not result in (environmentally) sustainable outcomes. The knowledge this study derives can be a stepping stone for further research under the umbrella of governance for sustainable development.

1.6 Societal relevance

This research has its societal value mainly in its relevance for policy. The study provides a reconstruction of the program theory that underlies the policy for sustainable livestock farming. A program theory is almost always poorly designed. Knowledge on the quality of the program theory (and what its main weaknesses are) is required to improve a program. By providing this knowledge on the program theory that underlies the policy for sustainable livestock farming, a first tool for improving this policy is handed. The realization of sustainable livestock farming as such can come in closer reach.

Next, by assessing the moral adequacy of the normative aspects that underlie the policy for sustainable livestock farming, this research connects to the political and public debate on (the future of) livestock farming. Insight in the normative argumentations that underlie the policy and their consequences makes that policy makers can take better informed decisions about the involved moral issues.

1.7 Outline of this thesis

The following chapter describes the applied methodology of this research in detail. This is an extension of the methodology described in paragraph 1.4. After the description of the methodology, the policy theory for system innovations will be reconstructed. Next, the policy theory will be assessed on its feasibility and on

its moral adequacy. Then the Rondeel case study is discussed. A discussion and a concluding section finalize this research.

2. Methodology

2.1 Introduction to this chapter

This research consists of three steps, as elaborated in the introduction:

- Producing a reconstruction of the program theory that underlies the policy program for system innovations
- Assessing the policy program for system innovations on its feasibility
- Assessing the policy program for system innovations on its moral adequacy

Each of the three steps requires a sufficient methodological approach, i.e. a set of working methods that is capable to conduct the steps adequately. This chapter describes the methodologies that are applied in this research.

2.2 Methodology for the reconstruction of the program theory

Within scientific literature various methodological approaches for reconstructing program theory are described. The various existing approaches have their own possibilities and limitations. Their restrictions may be met by combing them. This is done by Hoogerwerf (1990, pp. 287-288), who describes the following method as effective for the reconstruction of policy theories:

1. Collect statements from the policy designers and decision makers about the policy at issue (for example policy notes, congressional records, and interviews).
2. On the basis of the collected statement, consider which are the social processes in the policy field (the relevant sector of society), with their inputs and outputs.
3. Trace the goal-means relations by constructing a goal tree with ultimate goals, intermediate goals, and means. Translate the explicit goal-means relations into (causal) hypotheses. Fill in the links that have remained implicit. The hypotheses may be formulated causally (A causes B), or not causally (the more A, the less B). If possible, also indicate the extent of certainty of the actor regarding these final causal relations (the chance of effects).
4. Trace the explicit cause-effect relations. Translate them into (causal) hypotheses. Fill in the links that remained implicit. If possible, also indicate the extent of certainty of the actor regarding the cause-effect relations (the chance of the effects).
5. Trace the explicit normative relations. Translate them, as far as possible, into (causal) hypotheses. Fill in the links that have remained implicit. As

far as the normative relations cannot be translated into (causal) hypotheses, they form the normative framework of the policy theory (policy ideology). If possible, also indicate the extent of certainty of the regarding the cause-effect relations (the chance of effects).

6. Reconstruct the total of the (causal) hypotheses (steps 3, 4, and 5) to a coherent total of causal hypotheses (the reconstructed policy theory).
7. If required, the total may be transformed into graphs and submitted to a graph-theoretical analysis.
8. If chances and values have been quantified by the actors, they can be reflected quantitatively.

This method of Hoogerwerf has inspired this study, which followed the following steps for reconstructing the program theory that underlies the policy for system innovations:

1. Collect statements from policy documents and other literary sources.
2. Trace the cause-effect relations and reconstruct them to a cause-effect, i.e. a problem tree. The problem tree provides an overview of the identified causes and effect to the policy problem which forms the motivation for the policy.
3. Trace the normative relations and reconstruct the normative framework of the policy theory. The normative framework provides the policy ideology – i.e. the idea of how reality should be – consisting out of principles and values.
4. Trace the goal-means relations and reconstruct them into a goal-means, i.e. a solution or a goal tree. The solution tree provides an overview of the policy means and the goals that should be achieved by implementing them (i.e. the policy strategy).
5. Reconstruct the total of cause-effect, normative and goal-means relations into a coherent framework. This is the reconstructed policy theory.

2.3 Methodology for the feasibility assessment of the policy program

2.3.1 Factors that determine the feasibility of a policy program

Assessing the feasibility of the policy program for system innovations forms a major part of this research. It is from the feasibility assessment that policy recommendations for improvement of the program for system innovations can be done, which is a core objective of this study. But what determines the feasibility of a policy program? This study distinguishes three important factors. In order to have a feasible policy program in place:

- the program theory should be internally consistent, i.e. it should have a proper logic

- the policy program should be enforceable, i.e. it should consist of plausible assumptions
- the policy program should enjoy sufficient stakeholder and societal support

This study focuses on the aspects program theory logic and program theory plausibility. These are the most important internal factors that determine a program's feasibility. The quality of the program theory itself is a key indicator for its success. Stakeholder and societal support is an important external factor. The extent of support for the program will however be assessed not in the same detail as the distinguished internal factors because of time constraints: the analysis will be based on secondary sources.

One can perhaps think of more factors that influence the feasibility of a policy program. The focus of this research enables nevertheless an adequate assessment. Time constraints make that a more detailed assessment lies not in the scope of this study. The importance of the three factors this study applies to assess the program theory is discussed in the following sections, in which the methodology is outlined for each factor separately.

2.3.2 Methodology for assessing the internal consistency of the program theory

A feasible policy program has a program theory with an adequate logic. When logic lacks (e.g. when concepts are unclear defined or means-ends relationships are incomplete), the program can not be feasible. Goals may be defined unclearly which makes it impossible to evaluate the level of goal-attainment or the impact theory may be deficient which makes that the intended results will not be attained. The importance of internal consistency of program theory should thus not be underestimated.

The internal logic of the program theory is assessed by a consistency check between problems, goals, intermediate objectives, proposed actions and activities, indicators and assumptions. Rossi et al. (2004, pp. 157-159) describes some general issues a critical review of the logic of program theory should address:

- The definition of the program goals and objectives. In an internal consistent program theory, goals and objectives are stated in sufficiently clear and concrete terms to permit a determination of whether they have been attained.
- The change process the program theory presumes. Program theories include an impact theory. This is causal theory that describes a cause-and-effect sequence in which certain program activities are the instigating causes and certain social benefits are the effects they eventually produce (Rossi et al., 2004, p. 141). The presumption that a program will create benefits depends on the plausibility of the cause-and-effect chain. In a

program theory that is internal consistent, the means-ends relationships are complete, i.e. it is clear how causes and effects are related to each other. The validity of the impact theory is the key to the ability of the program to produce the intended effects. Therefore, it is best if the theory is supported by evidence that the assumed links and relationships actually occur.

- The procedures for identifying members of the target population, delivering service to them and sustaining that service through completion. Program theory should specify procedures and functions that are well defined and adequate for the purpose, viewed both from the perspective of the program's ability to perform them and the target population's likelihood of being engaged by them.
- The definition and level of sufficiency of the constituent components, activities and functions of the program. A program should be operationalized in such a way that it permits orderly operations, effective management control and monitoring by means of attainable, meaningful performance measure. This means that its structure and process should be defined in detail. The most important is that the program components and activities are sufficient and appropriate to attain the intended goals and objectives.

This study will address these issues in its review of the logic of the program theory that underlies the policy for system innovations. They are applied as criteria for checking the internal consistency. The program theory has an adequate logic if the following criteria are fulfilled:

- The program goals and objectives are well defined
- The change process presumed in the program theory is plausible
- The procedures for identifying members of the target population, delivering service to them and sustaining that service through completion are well defined and sufficient
- The constituent components, activities and functions of the program are well defined and sufficient (Rossi et al., 2004, pp. 157-159)

2.3.3 Methodology for assessing the enforceability of the policy program

An enforceable policy program has feasible goals and objectives that can be achieved with the available resources as a result of the program's actions and activities. The enforceability of the policy program for sustainable livestock farming will be checked by an assessment of the plausibility of the program theory. Rossi et al. (2004, pp. 157-159) describes general issues an assessment of plausibility should address:

- The feasibility of the program goals and objectives. A plausible program has feasible goals and objectives, i.e. they can be attained as a result of the services the program delivers. A program theory should specify

expected outcomes that are of a nature and scope that might reasonably follow from a successful program. Unrealistically high expectations are characteristic of implausible program theories. A program theory's goals and objectives should involve conditions that lay in the program's influence, i.e. conditions the program might actually be able to affect in some meaningful fashion.

- The allocation of resources to the program and its various activities. Amongst other assets, resources include funding, personnel, material, equipment, facilities, relationships and reputation. A program theory that calls for activities and outcomes that are unrealistic relative to available resources is an insufficient theory. Therefore, there should be a reasonable correspondence between the program as described in the program theory and the resources available for operating it.

These issues are applied as criteria for checking the enforceability of the policy program for sustainable livestock farming. When the criteria are fulfilled, this study assumes an enforceable policy program:

- The program goals and objectives are feasible
- The resources allocated to the program and its various activities are adequate (Rossi et al., 2004, pp. 157-159)

When a policy program is not enforceable or partly enforceable, it is not entirely feasible. For example, when available resources are insufficient to realize the program goals and objectives, these goals and objectives become unattainable. This emphasizes the importance of a high level of enforceability.

2.3.4 Methodology for assessing the extent of stakeholder and societal support for the policy program

Without sufficient stakeholder and societal support the attainment of a policy's goals and objectives will at forehand be a hard challenge, if not impossible. Stakeholders are actors that have a significant interest in how well a program functions (Rossi et al., 2004, p. 435). When stakeholders do not support a policy, they form a barrier for successful implementation of that policy, because there is no willingness to cope with the policy. Also, they may have access to resources that other actors do not have, for which they are needed for a policy program to make it enforceable. In addition, the absence of societal support will lead to resistance against the program which makes its implementation a difficult task. Stakeholder and societal support is therefore of great importance for a policy program if it is to be effective.

Stakeholder and societal support is sufficient when it is such that it does not form an obstacle for the enforceability of the policy program. This means that stakeholders are willing to cope with the program and the general attitude of

society towards the program is predominantly positive (Freeman and McVea, 2001).

To examine the extent of stakeholder support for the program for sustainable livestock farming, the relevant stakeholders first need to be identified. This is the process of stakeholder analysis. From the reconstructed program theory all actors with an interest in the program (i.e. all the actors that are affected by the program) will be identified. After the identification of stakeholders, their attitude towards the policy program for sustainable livestock farming will be studied by literature review. Support for the program is operationalized as the desirability of it. Attitude towards the program is applied as the criterion for the desirability. The same operationalization of support is applied to examine the extent of societal support.

Attitude towards the program can be positive, neutral or negative. A positive attitude is characterized by identification with the program: the actor endorses the policy goals and means. Actors with a neutral attitude are indifferent to the program and actors with a negative attitude oppose the program and do not agree with the policy goals and/or means. When stakeholders have a negative attitude towards the program for sustainable livestock farming, this is problematic for the feasibility of the program. The willingness to cope with the program is missing, which forms a barrier for a successful implementation. A positive or neutral attitude of stakeholders enables a feasible policy program. The willingness to cope with the policy – and therewith also the feasibility of the program – however also depends on other factors (e.g. part of a program for sustainable livestock farming may be a subsidy for solar panels for animal housing systems. The attitude of farmers towards this measure may be positive, but they may still consider it as too much effort, too costly or too risky). Despite this would enable a more soundly based conclusion about the feasibility, this study does not directly analyze the willingness of stakeholders to cope with the program because this would involve in-depth research wherefore time and resources are too limited. By examining if the policy principles are supported by stakeholders, it is assessed whether or not the program can be feasible. Together with the assessment of the program's enforceability, this provides the knowledge to determine if the program is in principle feasible.

To examine the extent of stakeholder and societal support, existing literature will be analyzed. Because of time constraints, this research will not conduct its own empirical research, but rely fully on secondary sources. In recent years, several studies have appeared in which the desirability of stakeholders and society regarding the livestock sector is discussed (e.g. Alders, 2011; Bokma-Bakker et al. 2011; Verhue et al. 2011). The focus of their study is on how stakeholders and society would like the sector to develop in the near future. Since the policy for system innovations is exactly about this (i.e. how the livestock sector should develop in the next years), the studies of Alders and Verheu et al. will provide the

information that is needed to determine the extent of stakeholder and societal support for the program.

2.3.5 Criteria for the feasibility assessment

The feasibility of the policy program for sustainable livestock farming will be determined by an assessment of the internal consistency of the program theory, the enforceability of the program and the stakeholder and societal support for the program. The previous sections have outlined the methodology for this assessment. Table 2.1 gives an overview of the criteria that will be applied in the full assessment.

Internal consistency of the program theory	**Enforceability**	**Stakeholder and societal support**
Program goals and objectives are well defined The change process presumed in the program theory is plausible The procedures for identifying members of the target population, delivering service to them and sustaining that service through completion are well defined and sufficient The constituent components, activities and functions of the program are well defined and sufficient	The program goals and objectives are feasible The resources allocated to the program and its various activities are adequate	The attitude of stakeholders towards the program is neutral or positive The attitude of society towards the program is neutral or positive

Table 2.1 *Criteria for the feasibility assessment of the policy program for sustainable livestock farming*

2.4 Role of the case study

The previous sections have outlined the theoretical background and methodology of the feasibility assessment of the program theory. This feasibility assessment is central to this study. Nevertheless, the feasibility of the program will in addition be examined in a case study.

The case study is on the development of the Rondeel system and its realization in practice. This case is ideal for this research. The system is by policy makers mentioned as an example to follow; the system fulfills the criteria for an integral sustainable animal housing system and appeared at the same time to be a marketable concept. The policy aims for similar processes in the entire livestock sector, so that the appearance of integral sustainable animal housing systems becomes a reality on a large scale (Uitvoeringsagenda Duurzame Veehouderij, 2009). From the success that Rondeel is, lessons can be learned about the feasibility of projects that aim to bring an innovative sustainable concept in practice.

In the case study on Rondeel, the development of the concept and the realization of the concept in practice is analyzed. The aim is to derive the factors of success that make the realization of integral sustainable animal housing systems possible. Central to this case study is the question what can be learned from the process that led to the realization of Rondeel for other cases. It will also be researched to what extent it can reasonably be expected that the current policy will lead to the application of integral sustainable animal housing systems such as Rondeel on a large scale. From the knowledge this research derives, recommendations can be done for the governance of system innovations. The case study, i.e. the analysis of the process that led to the realization of Rondeel in practice, consists of interviews with Rondeel BV (the national sales organization of Rondeel eggs which played an important role in the application of Rondeel in practice) and the first entrepreneur (poultry farmer Gerard Brandsen) that applied the Rondeel system.

2.5 Methodology for the moral assessment of the policy program

Next to the feasibility assessment, the moral assessment of the policy program for sustainable livestock farming is central to this study. The extent to which the program is regarded as morally acceptable depends on the ethical principles one applies. The following will first outline the ethical position this research occupies.

2.5.1 Theoretical background: ethical theory

Ethical theories are theories of the scope and extent of moral standing and of the location of intrinsic value. Moral standing belongs to everything that has a good of its own, i.e. to things that ought to be taken into consideration when action is in prospect. Things are intrinsic valuable when they have value because of their very nature. This value is independent of the derivative value, such as instrumental value it has for other things (Attfield, 2003, pp. 11-12). Ethical theories differ in their ideas about moral standing and intrinsic value. Anthropocentric theories limit moral standing and intrinsic value to human beings. Sentientist theories hold that all sentient beings (i.e. all creatures that have the capacity to feel and to suffer) have moral standing and are intrinsic valuable. Biocentrism is the normative stance that everything that lives is intrinsic valuable and has moral standing. Ecocentrism takes an even broader scope and holds that ecosystems have a good on their own (Attfield, 2003, pp. 9-11). One can think of more theories, but within the field of environmental ethics, these theories are the most common.

2.5.2 Sentientist consequentialism, the ethical stand this study applies

This study adopts a sentientist perspective. It is argued that all sentient beings have moral standing and that their interests have independent value, because of their capacity to suffer. The capacity to suffer gives them a point of interest: to avoid suffering. Suffering of any creature matters and ought to be avoided. Things that lack the capacity to feel have no intrinsic value, because they lack a point of interest. Their value depends on the value they have for sentient beings.

A sentientist perspective is the most appropriate, because it guarantees that the interests of all beings with a capacity to suffer are considered in determining the morality of actions (and omissions). Things that lack the capacity to suffer have no point of interest, but they can be considered as well because of their interests for sentient beings. Whereas for example plants and ecosystems are not included in the moral scope of sentientist theories, they are protected because this is in the interest of humans and sentient animals. They have amongst other instrumental value (sentient creatures depend on plants and ecosystems for their existence) and aesthetic value (people are benefited by their existence through appreciating them). Sentientism thus preserves nature for the interest of sentient beings.

Sentientist theories exist in different forms. This study regards sentientist consequentialism as the most appropriate. It argues that consequences of actions (or omissions) form the basis for judgment about the moral rightness of them. What matters is the amount of suffering. A world with less suffering is a better world. When one has to choose between two alternative actions, the action that

brings the least suffering with it, is the right one. With suffering is meant the total amount of suffering for all sentient beings. This includes not only sentient beings living now, but also future generations, since they also have the capacity to suffer.

2.5.3 Mill's Harm Principle as a guideline for determining the moral adequacy of the policy program

The above has outlined the basic ethical foundation of the moral theory this study applies. This foundation needs to be worked out in more detail in order to assess the policy for livestock farming on its moral correctness. A principle against which the policy can be examined is required.

The leading principle this study adopts is the Harm Principle of the famous English philosopher John Stuart Mill (1806-1873). The Harm Principle holds that coercion is justified only to prevent the harming of parties other than the agent of the harm (Attfield, 2003). In other words, there is the freedom of the individual. Everyone is allowed to act as he or she likes, as long as it does not harm others.

The Harm Principle fits well in the theory of sentientist consequentialism. Harm is about consequences and harm can be operationalized as suffering. Adopting a sentientist perspective, this includes suffering to all sentient beings. Thus, when the Harm Principle is applied in sentientist theory it holds that everyone is allowed to act in freedom up to the point where acts bring about suffering to other sentient individuals. Whereas Mill regarded only the suffering of humans as relevant, this study broadens the Harm Principle and regards the suffering of all sentient beings as relevant.

Mill's Harm Principle, applied in sentientist theory, can be adopted to determine the moral correctness of policies. A policy program is morally correct as long as the consequences of the policy actions cause no unnecessary or avoidable suffering. the moral best policy program is the program of which the consequences are the least harmful of all theoretically possible policy programs. For reasons of clarity, this study regards the policy program for livestock farming responsible for all suffering linked to livestock farming. The absence of actions (or omissions) are thereby also regarded as part of the program. Although the program is not directly responsible for all suffering and it probably is unable to avoid all suffering, it has the power to bring down the total suffering as much as possible.

2.5.4 Criteria for assessment

To assess the policy program for sustainable livestock farming on its moral adequacy, the situation with the program in place will be compared with the hypothetical situation with a program in place that brings about the least suffering. The situation with the program will also be compared with the situation without the policy program.

The following criteria are applied to examine the moral adequacy of the Dutch livestock farming policy:

- The policy program causes no avoidable suffering
- The policy program avoids suffering that would have existed when the program would not have been set up

A morally right policy is a policy that causes the least possible (i.e. no avoidable) suffering. The first criterion is applied to examine to which extent one can speak of absence of avoidable suffering in the policy for system innovations. With the moral assessment of the policy, this study does not only aims for making statements about the moral rightness of the program by looking to which extent one can speak of avoidable suffering. Doing only this will bring particularly bring the possible moral deficits of the program to the surface. This study also aims for making statements about the possible moral improvements the policy causes. The second criterion is therefore applied with the objective to make statements about the 'moral change' the program causes. The program may not be completely morally right, but it may cause less suffering than the situation with absence of the program and thereby be a moral improvement. The moral adequacy of the policy program is determined by the extent to which it causes the least possible suffering. The moral change is determined by the difference in amount of suffering between the situation with the program and the situation without the program. The application of both criteria enables this study to identify the issues where the policy does well and where it does not. From this, recommendations for improvement can be done.

The moral assessment will focus on suffering of animals in the livestock sector, because by far the most unnecessary and avoidable suffering takes place there. Also, animals in the intensive farming industry deserve the most of our attention because they are in a worst-off position. Our moral concerns should go to them, because it is irrational to maximize positions which are already good at the expense of those in a worst-off position (Berg, 2011, pp. 3-5). Millions of animals suffer every day because of the cruelties in the intensive farming industry. The numbers of kept animals are large; most important are the poultry sector (96,9 million animals), the bovine and dairy sector (3,9 million) and the pig sector (12,4 million). More than 95% of these animals are kept in the intensive farming sector and suffer from stress, pain and other factors (Os and Gies, 2011, p. 21). They are closely packed and have no ability to show their natural behavior.

This study will to this end only theoretically sketch the consequences of the policy program for the total amount of suffering. A reality-check would be too intensive and falls outside the scope of this study. The consequences of the application of the ethical principles that underlie the program will be sketched roughly and the moral assessment will be based on this theoretical sketch. It are as such actually the policy aims that are treated as consequences and the subject of the assessment.

2.5 Concluding remarks

This chapter outlined the methodology for assessing the feasibility and the moral adequacy. The following chapter will reconstruct the program theory that underlies the policy for system innovations. The program theory is the main subject of this research. After its reconstruction, the methodology discussed in this chapter will be applied to assess its feasibility and moral adequacy.

3. Reconstruction of the program theory of the policy for system innovations

3.1 Introduction to this chapter

This chapter provides a reconstruction of the program theory that underlies the policy program for system innovations, which is part of the program for sustainable livestock farming. The main objective of this chapter is to answer the first central question of this study:

> *How does the program theory that underlies the policy for system innovations look like?*

To this end, the chapter will first give an overview of the issues the policy program for sustainable livestock farming covers and broadly describe the main objectives, so that an overview is provided of the larger picture where the policy for system innovations is part of. After providing this overview, the policy for system innovations will be explored in depth and a full reconstruction of the program theory that underlies this policy will be given. The program theory will be analyzed by discussing the identified cause-effect relations at first. Then the identified normative framework will be discussed. The third step is the discussion of the reconstructed goal tree.

3.2 The policy program for sustainable livestock farming

3.2.1 Background of the program

The policy for system innovations is part of the program for sustainable livestock farming. The starting point of this policy is the 2008 ministerial vision on the future of livestock farming. This vision was outlined in a letter to parliament in January of that year. Its core message is that policy will be developed with the aim to evolve the Dutch livestock farming sector into a sector that is sustainable in all its aspects and enjoys broad societal support. Within 15 years the objective of a livestock farming sector that produces with respect for people, animals and the environment all over the world should be attained (LNV, 2008). Reason for the policy is the enormous impact of the livestock sector on social and environmental issues, as is discussed in section 1.1.

3.2.2 The Implementation Agenda Sustainable Livestock Farming

The 2008 ministerial vision has been worked out in a specific policy program in the 'Uitvoeringsagenda Duurzame Veehouderij' (Implementation Agenda Sustainable Livestock Farming). The Minister of Agriculture, Nature and Food Quality by that time, Gerda Verburg, signed the implementation agenda in May 2009. This moment can be seen as the start of the implementation phase of the policy for sustainable livestock farming which set up was outlined in the 2008 ministerial vision. The implementation agenda is not a pure public affair; it is a collaboration between public parties, parties from the livestock sector and non-governmental (or civil society) organizations. In total, ten different parties take part in the collaborative program. In line with the 2008 ministerial vision, the aim of the implementation agenda is to transform the livestock sector into a sector that is sustainable in all its aspects. This objective should be reached in 2023, 15 years from the publication of the 2008 ministerial vision (Uitvoeringsagenda Duurzame Veehouderij, 2009).

The policy for sustainable livestock farming is a comprehensive approach towards the various problems in current livestock farming. The policy is multifaceted and covers a wide range of issues.

3.2.3 Parties of the implementation agenda

The policy program for sustainable livestock farming is a production of the 'collaboration implementation agenda'. Before discussing the program, the different parties of the collaboration will be described briefly. All these parties are involved in the program and its implementation.

Ministerie van EL&I
The Dutch Ministry of Economic Affairs, Agriculture and Innovation (Ministerie van Economische Zaken, Landbouw en Innovatie; EL&I) is with the 2008 vision the initiator of the program. This is the former Ministry of Agriculture, Nature and Food Quality (Landbouw, Natuur en Voedselkwaliteit; LNV), which published the 2008 vision. Since 2010 this is the Ministry of EL&I.

LTO Nederland
The Land- en Tuinbouw Organisatie Nederland (LTO Nederland; Agriculture and Horticulture Organization Netherlands) is an entrepreneurial and employers organization for the agricultural sector.

COV
The Centrale Organisatie voor de Vleessector (COV; Central Organization for the Meat Industry) is an organization of and for employers in the meat sector.

NZO
The Nederlandse Zuivel Organisatie (NZO; Dutch Dairy Organization) is the sector organization of the Dutch dairy industry.

Nevedi
The Nederlandse Vereniging Diervoederindustrie (Nevedi; Dutch Animal Feed Industry Association) is the sector organization of the animal feed industry.

Rabobank Nederland
Rabobank is a bank on a cooperative basis. It is a bank without shareholders. Its customers form its members that participate in the bank's policy.

Stichting Natuur en Milieu
Stichting Natuur en Milieu (Nature and Environment Foundation) is an environmental NGO that commits itself in different ways to a more sustainable world.

Dierenbescherming
The Dierenbescherming (Dutch Society for the Protection of Animals) is an organization that represents the interests of animals.

IPO
The Interprovinciaal overleg (IPO, Association of Provincial Authorities) is an organization of and for the Dutch provinces. IPO works to ensure a proactive and efficient provincial governance.

Groene Kennis Coöperatie
The Groene Kennis Coöperatie (Green Knowledge Cooperative) is an organization in which environmental educational and research institutions work together. It aims to contribute to the development of the green sector (Uitvoeringsagenda Duurzame Veehouderij, 2009).

3.2.4 Objective of the program

This study already mentioned several times the ultimate objective of the policy program for sustainable livestock farming that should be reached by 2023: 'an in every respect sustainable livestock farming in the Netherlands with broad support in society'. This is operationalized as 'a livestock farming sector that produces, while maintaining competitiveness, with respect for people, animals and the environment all over the world' (LNV, 2008; Uitvoeringsagenda Duurzame Veehouderij, 2009). In the following, this study will refer to this objective with the concept 'sustainable livestock farming'.

Achievement of goals on six focal points must lead to the realization of the objective of a sustainable livestock farming. The six focal points are:

- System innovations: a coherent package of reforms
- Animal welfare and animal health: quality of life of animals
- Social incorporation: connection to the wishes and ideas of society
- Energy, environment and climate: the effects of the livestock sector on these issues
- Market and entrepreneurship: the economic perspective of entrepreneurs
- Responsible consumption: consumer behavior (LNV, 2008; Uitvoeringsagenda Duurzame Veehouderij, 2009)

The focal points were mentioned for the first time in the 2008 ministerial vision. In May 2009, the implementation agenda translated the focal points into several challenges. For each focal point, challenges for 2023 are formulated. The achievement of these challenges must lead to the attainment of the program objective of a sustainable livestock sector (Uitvoeringsagenda Duurzame Veehouderij, 2009). One can also say that the objective of a sustainable livestock farming is operationalized in the challenges (i.e. following the program theory, achievement of the challenges means that a sustainable livestock sector is reached). Figure 3.1 shows for which aspects of the focal points challenges are formulated.

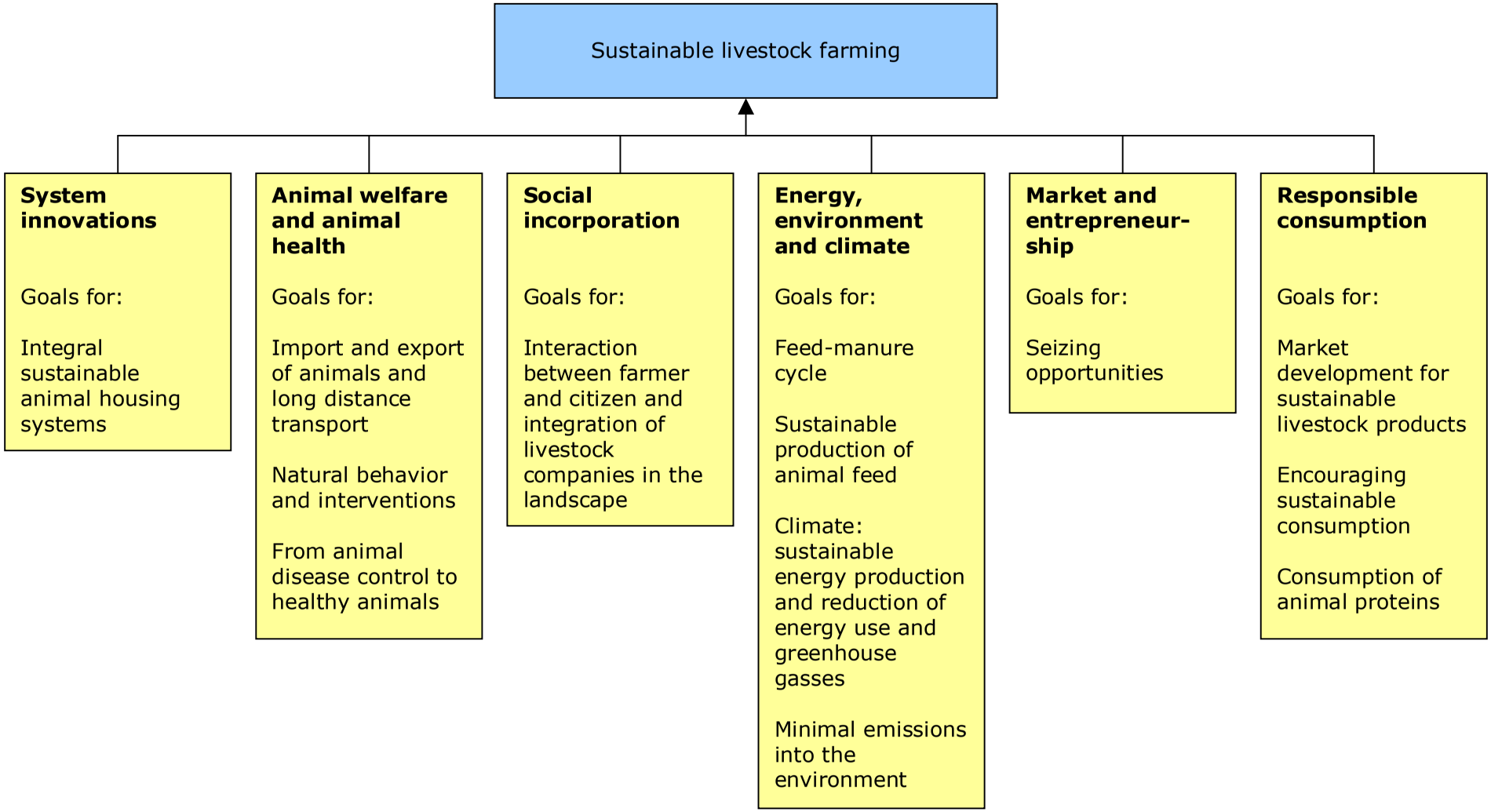

Figure 3.1 *Achievement of goals subdivided among six focal points must lead to attainment of the objective of a sustainable livestock farming.* Source: Uitvoeringsagenda Duurzame Veehouderij, 2009

3.2.5 The goals for 2023

Figure 3.1 shows how the collaboration aims to attain the objective of a sustainable livestock farming in 2023: by achieving goals on aspects that are subdivided under the six focal points. The following will describe these goals for the six focal points as formulated by the collaboration.

System innovations

The goals for system innovations lie – as figure 3.1 shows – in integral sustainable animal housing systems (Uitvoeringsagenda Duurzame Veehouderij, 2011a). These are new designed animal housing systems that put significant steps forward on the issues of animal welfare, environment, animal health, energy consumption and integration into the landscape (Uitvoeringsagenda Duurzame Veehouderij, 2009).

The implementation agenda formulates the following goals for integral sustainable animal housing systems:

- Five percent of all animal housing systems in the Netherlands is integral sustainable in 2011 and there is perspective on widespread appearance thereafter.
- Redesign or new designs of animal housing systems that are aimed at large steps forward on the issues animal welfare (natural behavior), environment (minimum emissions), animal health, energy use and integration in the landscape. Progress on the total needs to be in equilibrium with progress on the individual aspects.
- Anchoring of new concepts by practice.

Animal welfare and animal health

For the focal point animal welfare and animal health, goals are divided among three issues:

- Import and export of animals and long distance transport
- Natural behavior and interventions
- From animal disease control to healthy animals

The following goals are set up for the issue of import and export of animals and long distance transport:

- Slaughter animals are slaughtered close to the production location under the condition that market functioning remains intact.
- Quality transports. Transports take place according to a quality assurance system.
- Seizing opportunities in nearby markets.

Two goals are formulated for the issue of natural behavior and interventions:

- Farm animals demonstrate natural behavior
- No more interventions (such as tail docking of pigs), except for legally required interventions

For the issue 'from animal disease control to healthy animals' the following goals are formulated:

- Husbandry systems offer support to the resistance of animals. Animals grow up healthy.
- Efforts to selective, limited and curative use of veterinary medicines, including antibiotics.
- Socially acceptable methods for the remaining necessary disease control.
- Smart vaccination and treatment systems that ensure the marketing of products of vaccinated animals.

Social incorporation

For social incorporation goals are set up under the issue of 'interaction between farmer and citizen and integration of livestock companies in the landscape':

- Production is transparent: citizens have sight on and knowledge of farm animals.
- New built farmhouses are integrated into the landscape.

Energy, environment and climate

Four issues are identified within the focal point energy, environment and climate:

- Feed-manure cycle
- Sustainable production of animal feed
- Climate: sustainable energy production and reduction of energy use and greenhouse gasses
- Minimal emissions into the environment

Two goals are formulated for the issue feed-manure cycle:

- Closure of the feed-manure cycle as much as possible at the company, national or Northwest European level.
- Maximum use of minerals from animal manure as fertilizer through a treatment process.

The goal for sustainable production of animal feed is:

- Further work towards the sustainability of animal feed.

For the issue 'Climate: sustainable energy production and reduction of energy use and greenhouse gasses' the goal is:

- Maximum bet on the production of renewable energy from biomass, wind and sun by the livestock farming industry.

The goal formulated for the issue 'Minimal emissions into the environment' sounds:

- A livestock farming industry that produces with minimal losses of nitrogen compounds (nitrate to soil and groundwater; ammonia into the air), phosphate (to water), greenhouse gasses (less emissions of nitrous oxide and methane) and other contaminants (e.g. heavy metals to soil and water and fine dust into the air) into the environment.

Market and entrepreneurship

For the focal point market and entrepreneurship, two goals are formulated under the issue seizing opportunities:

- The producer-consumer chain associates sustainability with opportunities and smart entrepreneurship. Sustainability is part of entrepreneurship.
- The Dutch livestock sector has a leading position in the European market through its sustainable and competitive production.

Responsible consumption

Three issues are identified that fall under the umbrella of responsible consumption:

- Market development for sustainable livestock products
- Encouraging sustainable consumption
- Consumption of animal protein

The goal for the issue 'market development for sustainable livestock products' is:

- Stimulation of the supply of sustainable animal products (with a focus on animal welfare) by scaling up current initiatives and developing new private initiatives. This has to result in more choice for consumers in the purchase of animal products.

Encouraging sustainable consumption is an issue that has not been translated into a concrete goal for 2023.

The goal that is formulated for the issue consumption of animal proteins is:

- Consumption of animal proteins fits within a responsible consumption pattern.

3.2.6 Concluding remarks

The previous section has outlined the goals the collaboration formulated in 2009. The goals are mostly qualitative and abstract in nature. They provide a general sketch of the desired future scenario. The policy for sustainable livestock farming is for a great part goal seeking and more a process in continuous development

rather than a classic policy with fixed goals and objectives. The process of transition to a sustainable livestock sector does not follow a fixed plan (van der Wielen, 2010, p. 11). The 2008 ministerial vision states that the concrete interpretation of the concept of sustainable livestock farming should arise from the dynamic and the interplay between business and society (LNV, 2008, p. 6). The goals described in the above serve as indicators of the desired development of the livestock sector. The collaboration labels these goals as 'challenges' for the policy for sustainable livestock farming.

After the challenges were set up, the parties of the collaboration started to formulate concrete ambitions and actions for the period till 2015. This resulted in a roadmap per focal point. The roadmaps were adopted by the collaboration in January 2011. They are from time to time updated (Uitvoeringsagenda Duurzame Veehouderij, 2011b). The most actual roadmaps are from July 2011. They describe the challenges/goals for 2023, the more concrete ambitions for the period till 2015 and actions to realize these ambitions. The underlying assumption is that attainment of the goals for 2015 contributes to attainment of the challenges/goals for 2023. Ambitions and actions for the period after 2015 have not been set up. The policy framework is thus incomplete: the goals for 2023 are rather a general sketch of the desired future scenario than concrete objectives and it is nut fully worked out how the goals will be achieved.

This study will not discuss in greater detail the entire program for sustainable livestock farming. This chapter will now concentrate on its main focus: the program theory that underlies the policy for system innovations. With the broad outline of the program above, an overview is provided of the larger picture where the policy for system innovations is part of. The most recent roadmaps of each focal point (from July 2011) are added (in Dutch) in annex II.

3.3 The policy for system innovations

3.3.1 The program theory

The policy for system innovations holds an important position within the policy program for sustainable livestock farming. System innovations is one of the six focal points. System innovations are seen as a promising and essential tool towards sustainable livestock farming (LNV, 2008, p. 3). The goals the collaboration formulated for the focal point 'system innovations' relate to sustainable innovations in animal housing systems. The end goal appears to be that animal housing systems become 'integral sustainable'. Following the implementation agenda of 2009, integral sustainable animal housing systems should be the standard within a sustainable livestock sector. Figure 3.2 shows the reconstructed program theory of the policy for system innovations.

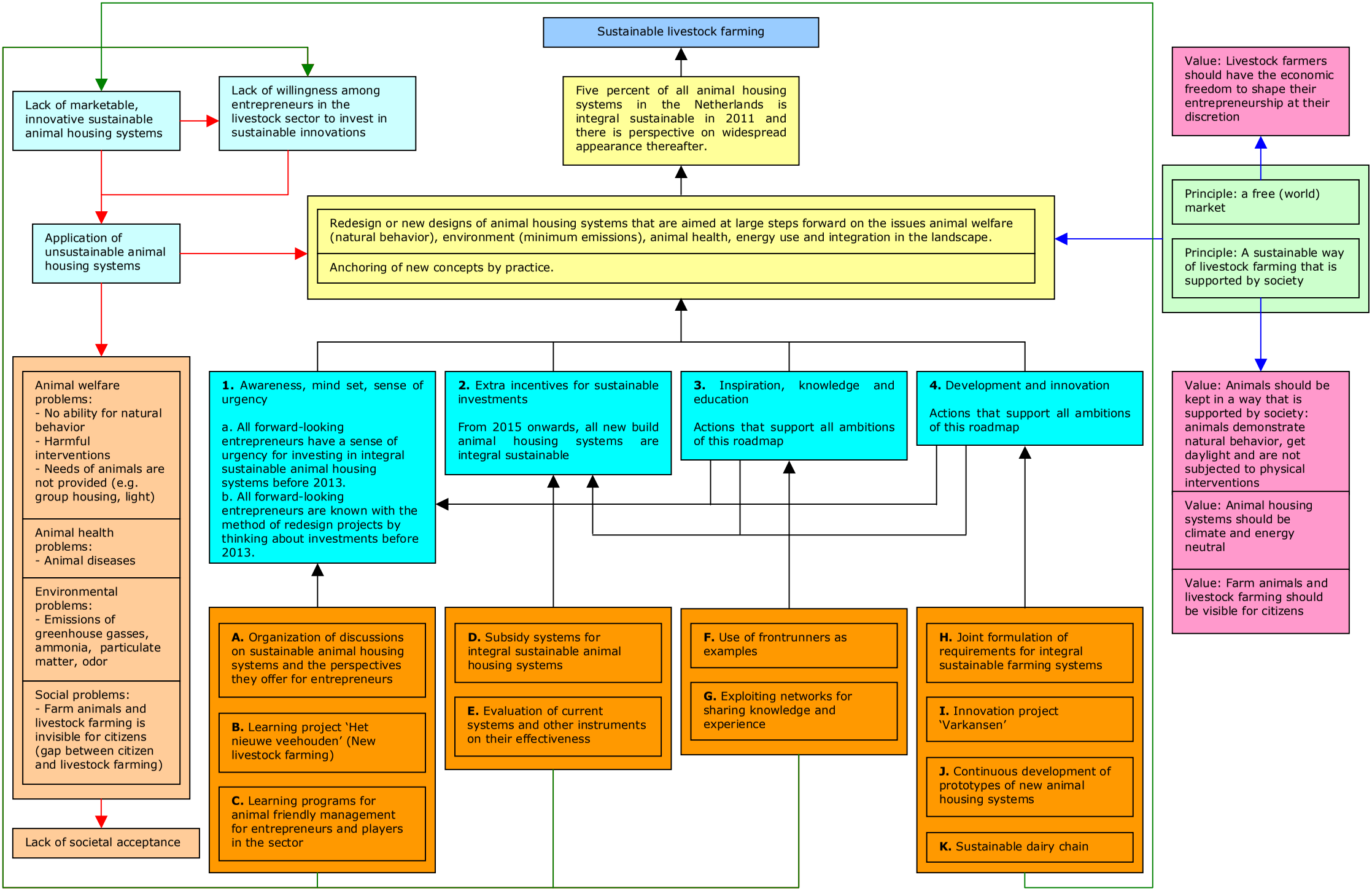

Figure 3.2 *The program theory that underlies the policy for system innovations*

The red arrows in figure 3.2 represent the cause-effect relations, the blue arrows the normative relations and the black arrows the goal-means relations. The green arrows represent how the policy intervenes in the current situation. They flow from the policy means to the situation they aim to change. The following of this chapter will analyze the program theory in three steps. First, the cause-effect relations (the policy problem) will be discussed. Second, the normative relations (which form the normative framework of the policy, i.e. the policy ideology) get the attention. Third, the goal-means relations (which constitute the solution tree) are discussed.

3.3.2 Cause-effect relations and the policy problem

The first step in reconstructing the policy theory that underlies the policy for system innovations will be an analysis of the policy problem. What problem(s) does the policy aim to solve? Figure 3.3 schematically represents the policy problem.

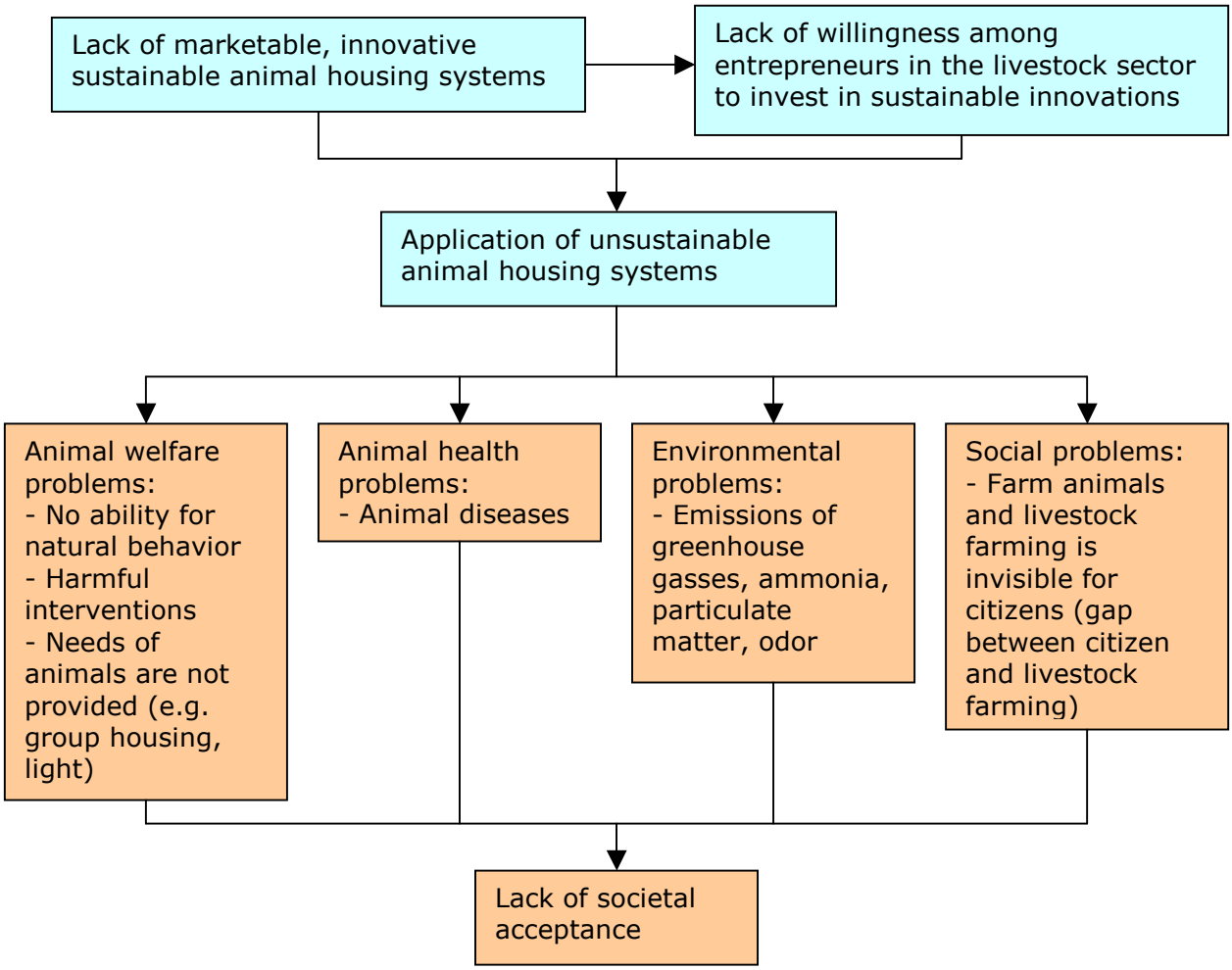

Figure 3.3 *The policy problem*

The current unsustainable animal housing systems contribute to various problems. Figure 3.2 gives an overview of the policy problem, i.e. the issues that policy makers regard as problematic and their causes. They form the reason for which the policy has been set up.

From policy documents it appears that the policy is aimed at solving several problems among the issues animal welfare, animal health, environment and social problems (LNV, 2008; Uitvoeringsagenda Duurzame Veehouderij, 2009; van der Wielen, 2010). Implicitly, it becomes clear that these problems are mainly regarded as problematic not because of their own nature, but because they are the cause of another problem: lack of societal acceptance for the current way of livestock farming. Current livestock farming is unable to fulfill new societal demands and is not flexible enough to fulfill future demands. Mainly due to societal demands about they way of keeping animals in the livestock sector, problems of animal welfare and animal health are the issues of the most concern by policy makers and the main reason for the policy for system innovations (van der Wielen, 2010). Current animal housing systems usually leave no room for animals to behave in their natural way. Needs of animals are not provided (amongst others: need for group housing, for light, for space). The intensive way of keeping animals causes stress in animals. This causes animal suffering and makes harmful interventions necessary (e.g. tail docking of pigs, because the pigs would otherwise – due to stress – bite each others tails or beak-trimming of poultry because chickens would otherwise pick each other). The way of keeping animals close to each other is furthermore problematic because in case of an outbreak, diseases will quickly spread. Next to animal welfare and animal health issues, current animal housing systems cause also environmental problems. Emissions of greenhouse gasses, ammonia, particulate matter and odor contribute to various environmental issues. Also, there are problems which are social in nature. The fact that farm animals and the livestock sector is invisible to citizens is regarded as problematic. De gap between citizens and the livestock sector causes a lack of understanding relative to each other (LNV, 2008; Uitvoeringsagenda Duurzame Veehouderij, 2009; van der Wielen, 2010).

Due to the problems they cause, current animal housing systems are regarded as problematic. Moreover, their application causes indirectly a lack of societal support for the way of livestock farming (e.g. the way in which animals are kept). The policy for system innovations is therefore aimed at stimulating the development of marketable innovative sustainable animal housing systems. In addition, it aims to stimulate entrepreneurs in the livestock sector to adopt innovative sustainable systems (Uitvoeringsagenda Duurzame Veehouderij, 2009). The policy goals and means will be discussed further in section 3.3.4. From the policy aims it appears that two factors are seen as causing the application of unsustainable animal housing systems: (1) a lack of marketable, innovative sustainable animal housing systems and (2) a lack of willingness

among entrepreneurs in the livestock sector to invest in sustainable innovations. The first of these factors thereby also strengthens the second factor.

3.3.3 Normative argumentations and the policy ideology

The policy problem was discussed in the above. The following will discuss the normative arguments that lie behind the policy for system innovations. They form the policy ideology, which comprises the idea of how reality should be. The discrepancy between this idea and how reality is, leads to the determination of the policy problem. The policy ideology forms the motivation for the policy, which is to change reality in the direction of the desired situation. Figure 3.4 shows the normative framework (i.e. the normative argumentations and their relation to each other) that underlies the policy for system innovations.

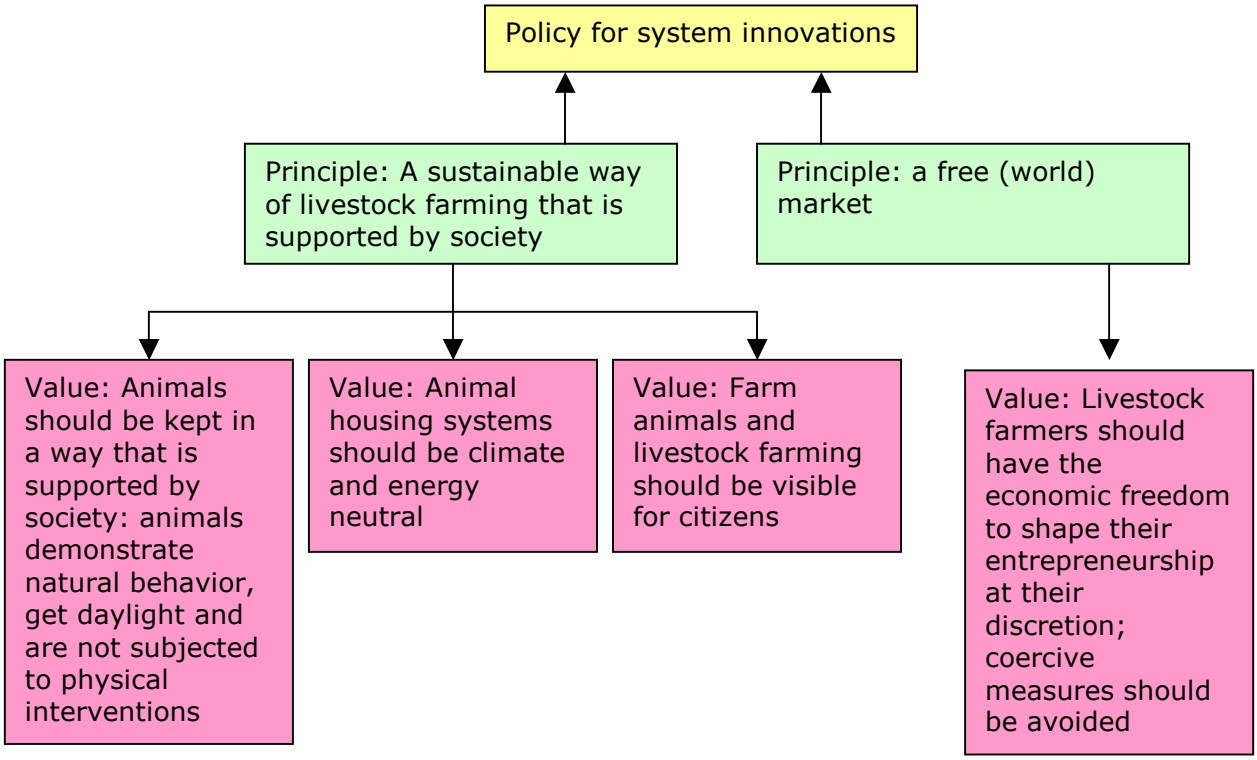

Figure 3.4 *Normative framework of the policy for system innovations*

The core principle behind the policy for system innovations is twofold: (1) that the livestock sector should be sustainable in all its aspects and (2) that the way of livestock farming is supported by society. From this principle, three main values are derived that form the motivation for the policy for system innovations. These values reflect ideas of how reality should be. The policy for system innovations is set up to realize the ideal this principle reflects: a sustainable way of livestock farming that is supported by society.

A sustainable way of livestock farming is by the policy makers operationalized as livestock farming that produces with respect for people, animals and the environment all over the world. Three main values are derived from this principle: (1) animals should be kept in a way that is supported by society: animals demonstrate natural behavior, get daylight and are not subjected to physical interventions, (2) animal housing systems should be climate and energy neutral and (3) farm animals and livestock farming should be visible for citizens.

The principle and the three values that are derived from it, reflect a new trend in policy making: whereas policy for livestock farming always has been mainly reactive and targeted at specific problems, the policy for system innovations is part of a comprehensive policy program which aims to make the livestock sector more sustainable. Growing concern for issues as animal welfare and environmental problems has led to this.

Policy documents reveal that sustainability is interpreted as societal support (Uitvoeringsagenda Duurzame Veehouderij, 2009; Uitvoeringsagenda Duurzame Veehouderij, 2011b). A sustainable way of livestock farming is understood as a way of livestock farming that enjoys broad societal support. It is acknowledged that sustainability is a dynamic concept: what is understood as sustainable now, may in ten years be regarded as unsustainable. The aim of the policy makers is to create a livestock sector that enjoys societal support now and in the future. The way of farming should be supported by the societal values of that time and fit within the then prevailing idea of sustainability.

The values that are derived from the principle 'a sustainable way of livestock farming that is supported by society' are thus based on current societal norms. There is minimal direct concern for the interests of non-human animals, but their interests are to a certain extent taken into concern, because of the prevailing societal values of how animals should be kept. The same applies to concern for environmental and other issues.

A second principle that underlies the policy is that of the free market. The parties of the collaboration believe in the system of a free world market with global competition. Dutch livestock farmers should be able to compete on this market. This implies economic freedom. For the policy for system innovations it means that coercive measures should be avoided. Livestock farmers should have the freedom to shape their entrepreneurship at their discretion (within the limits of the law).

Following both principles it can be concluded that intensive livestock farming is not seen as objectionable, but as a farming sector that should transform towards sustainability. The way of farming (e.g. keeping animals) should be brought in line with new societal values. The prevailing values ask for more concern for animal welfare, environmental issues and visibility of the sector in society.

Intensive livestock farming itself is not regarded as problematic, as long as the practice of farming is in line with the values in figure 3.4.

3.3.4 Goals-means relations and the policy strategy

The third step in reconstructing the policy theory is a reconstruction of the policy goals and means. Reconstructing the goals-means relations into a solution tree reveals the policy strategy, i.e. how the policy intervenes in the current situation and aims to change this situation towards the desired situation. Figure 3.5 represents the solution tree of the policy for system innovations. This section will analyze the goal-means relations in steps. It will start with discussing the main objective and then step by step – via intermediate goals and objectives – argue towards the policy means.

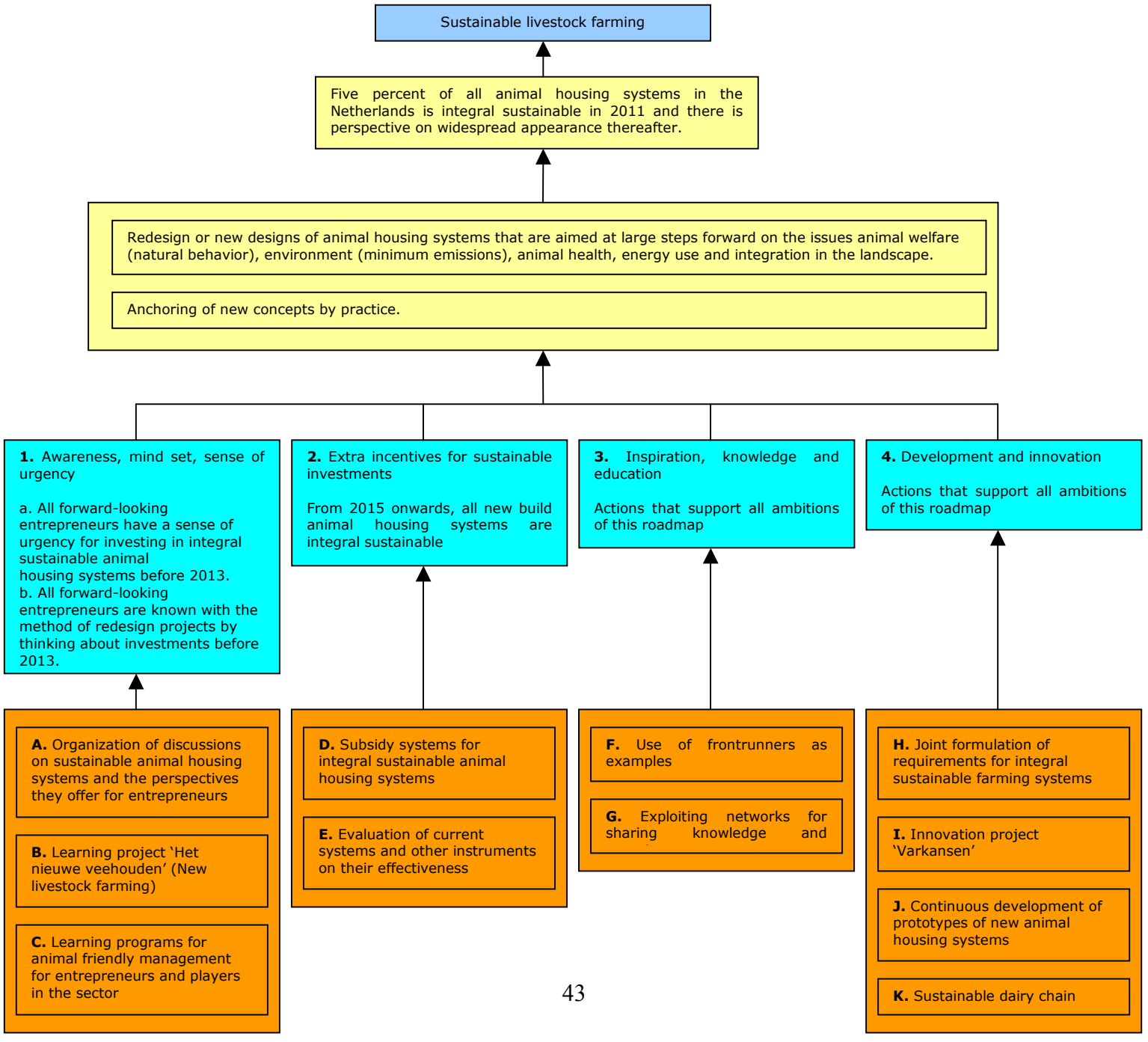

Figure 3.5 *Solution tree of the policy for system innovations*

3.3.4.1 Integral sustainable animal housing systems

The policy for system innovations aims at the application of integral sustainable animal housing systems. Before discussing the goals and means, the following will first elaborate on what integral sustainable animal housing systems are, as defined by the policy makers.

The former Ministry of Agriculture, Nature and Food Quality defines integral sustainable animal housing systems as 'animal housing systems that strongly improve animal welfare and in addition are better for environment, animal health, energy, working conditions and fit better in the landscape' (LNV, 2010, p. 5).

This definition gives an idea of what an integral sustainable animal housing system is, but it does not make entirely concrete when an animal housing system can be labeled as integral sustainable. Broadly defined, an animal housing system can be labeled as integral sustainable when it performs better on multiple of the issues animal welfare and animal health, environment and energy than law subscribes and than is prevailing (LNV, 2010, p. 7; van der Wielen, 2010, pp. 11-12). This implies that it is an evolving concept. An animal system that is now integral sustainable, may be prevailing in 2023.

Nevertheless, criteria are developed for integral sustainable animal housing systems. These are requirements that need to be fulfilled in order to be eligible for a subsidy program. (They are discussed in section 3.3.4.3). These criteria are not definite, but subject to change. The fact that the concept of integral sustainable animal housing system is always evolving is recognized by policy makers and criteria are periodically reviewed and updated (van der Wielen, 2010, p. 17). The policy for system innovations is as such an evolving process, without a fixed objective. Nevertheless, certain concepts of integral sustainable animal housing systems are at this moment regarded as the objective that is to be pursued for 2023. These are systems that at this moment score high on integral sustainability (compared to other current systems belonging to the highest scores on animal welfare, animal health and environment) and are a marketable product at the same time, such as the Rondeel system. They are seen as the types that fit within a sustainable livestock farming (Uitvoeringsagenda Duurzamee Veehouderij, 2009).

3.3.4.2 Goals and objectives

The collaboration has set up a policy for integral sustainable animal housing systems because it is believed that this will contribute to attainment of the main objective of the policy program for sustainable livestock farming: a sustainable livestock farming in 2023. Three challenges for 2023 are formulated that form the

goals of the policy for system innovations. Figure 3.6 schematically shows how these goals relate to the core objective of the program for sustainable livestock farming. Achievement of the goals should contribute to the solution of the policy problem.

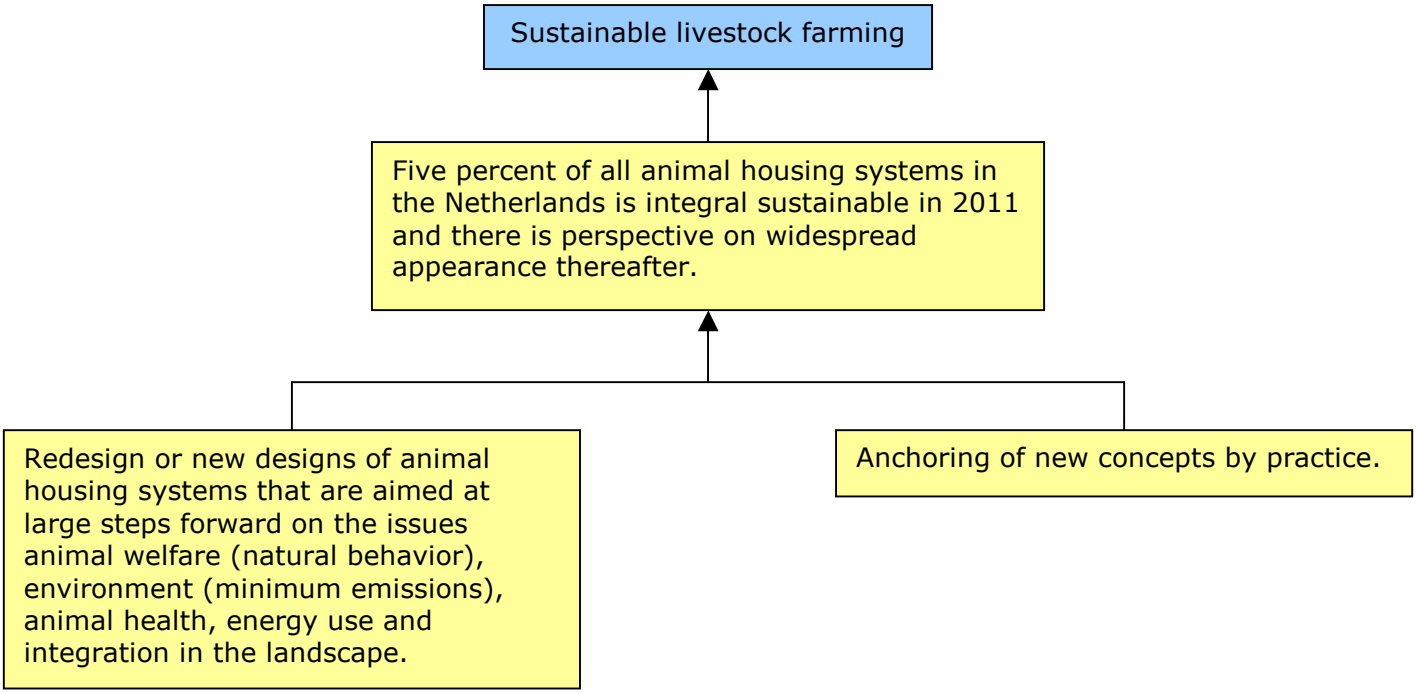

Figure 3.6 *Objectives of the policy for system innovations*

Figure 3.6 shows that the goals of the policy for system innovations are supposed to contribute to a sustainable livestock farming. It is assumed that attainment of all challenges of all focal points leads to the realization of the objective of a sustainable livestock farming. The following will discuss the challenges for system innovations – and how these should be interpreted – in more detail.

The first goal is: *Five percent of all animal housing systems in the Netherlands are integral sustainable in 2011 and there is perspective on widespread appearance thereafter*. The first part of this goal is straightforward. The second part is less clear. The objective 'perspective on widespread appearance' can be interpreted in various ways. Following the implementation agenda, a sustainable livestock farming in 2023 will have to include 100% integral sustainable animal housing systems. The currently common animal housing do not fit within sustainable livestock farming and should therefore disappear (Uitvoeringsagenda Duurzame Veehouderij, 2009). According to a study of van der Wielen (2010, p. 12) this should be interpreted as follows: 'from 2023 onwards all to be built animal housing systems are integral sustainable'. Interviews with policy makers in his study lead to this conclusion. In the period till 2023 system innovations should lead to an increasing percentage of integral sustainable animal housing systems. Because part of the (unsustainable) animal housing systems built before the

policy was in place will still be operational in 2023, policy makers regard it as unrealistic to set the goal of 100% integral sustainable animal housing systems by that time. The objective for 2023 can therefore best be understood as follows: from 2023 onwards, animal housing systems are built according to the concept of integral sustainability.

The second goal is: *Redesign or new designs of animal housing systems that are aimed at large steps forward on the issues animal welfare (natural behavior), environment (minimum emissions), animal health, energy use and integration in the landscape. Progress on the total needs to be in equilibrium with progress on the individual aspects.* This goal deals with the need for innovations. The collaboration aims for integral sustainable animal housing systems, but suitable concepts still need to be developed. The goal sets no clear objective, but as a directional objective it is clear: new designs of integral sustainable animal housing systems should be developed.

The third goal is: *Anchoring of new concepts by practice.* This goal builds on the second goal. New concepts need to be developed at first, but to make the policy a success, these concepts should find their realization in practice. Livestock farmers should bring suitable concepts into practice. Also this goal is rather a directional objective than a straightforward goal.

The goals form a general sketch of the desired future scenario. The first goal is the translation of the main and most concrete objective of the policy for system innovations: by 2023 all animal housing systems are built according to the concept of integral sustainability. The other goals are set up in support of this main objective. Concepts of integral sustainable animal housing systems need to be designed and anchored in practice.

The collaboration has been working on a concrete policy for system innovations since 2009, by formulating ambitions and setting up actions that support the three goals. A roadmap, describing ambitions and actions that are supposed to make attainment of the goals for 2023 possible, was created for the first time in January 2011. The policy is however a process in continuous development. The most recent roadmap is from July 2011. It describes ambitions for the period till 2015 and actions of which it is assumed that they lead to the attainment of these ambitions. Attainment of the ambitions is a step in the direction of the desired future scenario as described by the goals for 2023. Because the collaboration regards the policy for sustainable livestock farming as a dynamic process, a complete policy with actions till 2023 has not been established. How the goals for 2023 should be achieved is not clear yet. The ambitions and actions for the period till 2015 give however a direction.

3.3.4.3 Ambitions and actions

The lower part of figure 3.5 shows for the policy for system innovations the ambitions for the period till 2015 (in blue) and the actions that are supposed to lead to the attainment of these ambitions (in orange). Attainment of the ambitions should contribute to the realization of the goals for 2023 (slightly yellow). These goals are the ones presented in figure 3.6 (slightly yellow) which were discussed in the previous paragraph. Their attainment should contribute to the objective of a sustainable livestock farming. The following will discuss the ambitions and actions for system innovations in detail.

Ambition 1: Awareness, mind set, sense of urgency

The first ambition deals with awareness, mind set and sense of urgency. The aim is to create an awareness among entrepreneurs that it is inevitable that new investments will be done in a sustainable way. When investments are required, the entrepreneur should invest sustainable. This requires a new mind set than is currently prevailing. The actions discussed below (A,B,C) should realize the first ambition.

A. Organization of discussions on sustainable animal housing systems and the perspectives they offer for entrepreneurs
Different parties from the collaboration take initiatives for discussions on sustainability within the sector. An example is the project 'Voer voor Varkenshouders' (Feed for Pig Farmers) Rabobank initiated in 2011, a discussion program with pig farmers on social issues. Another example are the meetings dairy companies organized in 2010 with dairy farmers to make them familiar with sustainable entrepreneurship. The collaboration made the agreement that sector organizations will take initiatives for such projects. Specific goals or requirements for these projects have not been formulated, only that they should be aimed at the general objective of making entrepreneurs familiar with sustainable entrepreneurship and to show them the positive effects of it for the entrepreneur. As such, support for sustainable initiatives is created among entrepreneurs. The projects are aimed at creating an awareness for the need of sustainable investments.

B. Learning project 'Het nieuwe veehouden'
'Het nieuwe veehouden' (A new way of livestock farming) is a learning project developed by LTO, Wageningen University and Syntens (an innovation center that supports entrepreneurs with innovation projects) to support livestock farmers with accelerated introduction of practical and sustainable methods of farming. EL&I and LTO took the initiative for this project. Participants jointly develop – on a voluntary basis – initiatives that are positive for the entrepreneur, animals and

the market and draw up concrete plans to realize the designs. The project provides participants with knowledge and inspiration from other entrepreneurs and consultants from within and outside the sector. In the spring of 2011, learning projects for dairy farmers, pig farmers and poultry farmers started. The outcomes of each project will be shared with all parties that aim at making the livestock sector more sustainable. The projects are aimed at generating knowledge about obstacles for the transition to a more sustainable sector, so that solutions can be generated that help to eliminate these obstacles.

C. Learning programs for animal friendly management for entrepreneurs and players in the sector

Wageningen UR has developed several training courses for entrepreneurs to learn to recognize signals from animals. The needs of the animal (e.g. feed, rest, space) are main concern. The courses provide knowledge on how animal welfare can be improved. LTO is the actor that took the initiative for the learning programs. Entrepreneurs can participate on a voluntary basis.

Ambition 2: Extra incentives for sustainable investments

For 2023 the end goal is that by then to be constructed animal housing systems are integral sustainable. As a prelude, the ambition for 2015 is that by that time all to be constructed animal housing systems, are built according to the concept of integral sustainability as much as possible. The standards for integral sustainability will in 2015 however be less developed then in 2023. After 2015, new innovations should go along with renewing standards. The actions discussed below (D,E) should make the goal for 2015 possible.

D. Subsidy systems for integral sustainable animal housing systems

The national government initiated subsidy programs to support sustainable investments. Criteria are developed for integral sustainable animal housing systems by the program Maatlat Duurzame Veehouderij (MDV, Yardstick for Sustainable Livestock Farming)**.** These criteria are specified per animal species that is kept. Companies that fulfill the criteria can apply for a MDV certification and thereby for a subsidy for their sustainable animal housing system. The basic requirements relate to:

- Ammonia emissions: an emission reducing system should reduce the emissions of ammonia more than legally required.
- Animal welfare: in the animal housing systems, measures should be taken to improve animal welfare.
- Animal health: measures should be taken to (1) prevent that diseases enter the animal housing system; (2) impede that diseases spread within the livestock farm; and (3) improve the resistance of the animals against diseases.

- Energy: measures that contribute to the reduction of CO_2-emissions by energy saving measures and the generation of sustainable energy for own use.
- Particulate matter: measures are aimed at the reduction of emissions of particulate matter to the environment and the reduction of particulate matter in the animal housing system.
- Integration into the landscape: the animal housing system fits within its environment.

These criteria are not definite, but subject to change. The fact the concept of integral sustainable animal housing system is always evolving is recognized by policy makers and criteria are periodically reviewed and updated (van der Wielen, 2010, p. 17).

A second subsidy system is Small Business Innovation Research (SBIR). This system does not work with definite criteria; its intention is to promote sustainable initiatives within the livestock sector. The collaboration is searching for innovative ideas for sustainable animal housing systems which are marketable in the medium term. Livestock farmers can submit their innovative ideas and thereby qualify themselves for a subsidy when they implement their own innovative ideas. Every request is treated separately and examined on two main criteria: (1) the animal housing system performs better than the law requires and better than is prevailing on the issues animal welfare, animal health, environment and energy; (2) the concept has the capacity to end up as a concrete and marketable end product.

E. Evaluation of current instruments on their effectiveness
A study has been initiated to research the potential contribution of current instruments (i.e. the subsidy programs) to the achievement of the ambition that in 2015 all new build animal housing systems are integral sustainable. Regarding this ambitious objective, it will be studied how the effectiveness of current instruments can be improved.

Ambition 3: Inspiration, knowledge and education

Inspiration, knowledge and education are vital in order to take the necessary steps towards realization of ambitions 1 and 2. A transition process will not take place without frontrunners that inspire others and share their knowledge. The following actions (F,G) should realize the required inspiration, knowledge and education.

F. Use of frontrunners as examples
The collaboration has the ambition to set up a support program for forward-looking entrepreneurs. This program should support them to take steps towards sustainable livestock farming. The program should provide entrepreneurs to make use of the knowledge experiences of other entrepreneurs (early adopters). So far however, a program has not been established.

G. Exploiting networks for sharing knowledge and experience
LTO took the initiative for the establishment of a knowledge infrastructure (by combining existing networks and connecting existing knowledge institutes) to support entrepreneurial networks. The idea behind this is that existing networks are used to spread knowledge more efficient. The initiative has however not yet been realized in concrete forms.

Ambition 4: Development and innovation

The transition to sustainable livestock farming is a dynamic process in continuous development. To stimulate the innovation process, the collaboration takes the following actions (H,I,J,K).

H. Joint formulation of requirements for integral sustainable farming systems
An integral sustainable animal housing system in 2011 is different from an integral sustainable animal housing system in 2023: it is an evolving concept. LTO works towards a definition that provides more substance to the concept of integral sustainability.

I. Innovation project 'Varkansen'
LTO and the Dierenbescherming took the initiative for the project 'Varkansen', an innovation project that is aimed at achieving concrete and feasible concepts of 'pig housing systems for the future'. The concept of an integral sustainable housing system should become more concrete. The project has to make a contribution to innovations in pig housing systems by designing new housing systems and experimentation with these system innovations in pilot projects. EL&I, LTO and Wageningen UR work together on this project.

J. Continuous development of prototypes of new animal housing systems
Research centers for innovation in the livestock sector carry out studies to innovations for animal housing systems. It is researched how innovations in animal housing systems can contribute to improvements in animal welfare and reduction of environmental impact.

K. Sustainable dairy chain
NZO and LTO work together on sustainability in the dairy sector. The sector organization does not formulate concrete goals, but committed itself with the aim to experiment with new developed animal housing systems that are more sustainable.

3.3.4.4 Concluding remarks about the policy goals and means and the policy strategy

From the goals and means it appears that the policy for system innovations is not a strongly centralized policy that puts a blueprint on the concept of sustainable livestock farming. The central principle of the entire livestock farming policy is that the interpretation of this concept should arise from the interplay between entrepreneurs and society (LNV, 2008, p. 6). The ambitions and actions reflect a strong belief in a transition towards sustainability that will come from the livestock sector itself. The policy aims to tackle the policy problem by means that influence the causes of the problems that surround current animal housing systems. Policy actions H to K aim at the development of marketable, innovative sustainable animal housing systems. These actions thus aim to influence the current situation in which there is a lack of marketable, innovative sustainable animal housing systems. Policy actions A to G are aimed at creating willingness among entrepreneurs in the livestock sector to invest in sustainable innovations. They aim to change the current situation, where there is lack of such willingness. In figure 3.2, it is with green arrows schematically shown how according to the program theory the policy means influence the current situation. Overall the policy makers have a high belief that next to stimulating system innovations, the solution of the policy problem lies in creating awareness amongst entrepreneurs. Stimulation of sustainable innovations by subsidy programs and programs for knowledge, innovation and development should lead to more sustainable investments. Policy makers see no need for coercive measures.

3.3.5 Concluding remarks

This chapter provided a reconstruction of the program theory that underlies the policy for system innovations. It has outlined its cause-effect relations, its normative relations and its goal-means relations. Summarizing, it can be said that the policy for system innovations aims at the application of integral sustainable animal housing systems because the currently applied systems cause animal welfare, animal health, environmental and social problems which cause a lack of societal acceptance for the way livestock farming is currently practiced. It appeared that the policy aims to influence two factors to make an end to these

problems, so that also societal acceptance will grow: the lack of marketable, innovative sustainable animal housing systems and the lack of willingness among entrepreneurs in the livestock sector to invest in sustainable innovations. Policy means aim at eliminating the lack of it. This must realize in the large scale application of sustainable animal housing systems.

The reconstructed program theory is suitable for analysis. The following chapter will assess the feasibility of the program. After that, also the moral adequacy of the program will be determined by an analysis of the program.

4. Feasibility of the policy for system innovations

4.1 Introduction to this chapter

This chapter will assess the feasibility of the policy program for system innovations. The program theory, which has been outlined in the previous chapter, will be examined against the feasibility criteria discussed in the methodology (section 2.3). The following will first examine the internal consistency of the program theory. Next, the enforceability of the program will be assessed and after that the extent to which the program enjoys stakeholder and societal support will be determined. Based on these steps, this chapter will conclude with statements about the feasibility of the policy for system innovations.

4.2. Internal consistency of the program theory

4.2.1 Performance of the program theory on the criteria for determining its internal consistency

Table 4.1 shows the performance of the program theory that underlies the policy for system innovations on the criteria for determining its internal consistency.

Criterion	**Fulfillment**	**Source**
Program goals and objectives are well defined	-	Analysis of program theory
The change process presumed in the program theory is plausible	-	Analysis of program theory
The procedures for identifying members of the target population, delivering service to them and sustaining that service through completion are well defined and sufficient	+	Analysis of program theory
The constituent components, activities and functions of the program are well defined and sufficient	-	Analysis of program theory

Table 4.1 *Fulfillment of the criteria for the internal consistency of the program theory*

Table 4.1 shows that only one out of the four criteria is fulfilled. A '+' means fulfillment of the criterion and a '-' implies that the criterion is not fulfilled. The policy goals and objectives are not defined in sufficient concrete terms. It is therefore also unclear what the change process the policy aims to achieve comprises. Furthermore, many of the policy actions are not well defined and

insufficient. The few actions that are defined well, are not sufficient to establish a transition to large scale application of integral sustainable animal housing systems. This despite the fact that members of the target population are reached in an efficient manner. The policy actions themselves are just not sufficient enough.

The following paragraphs will elaborate in detail on the internal consistency of the program theory and clarify the results that are presented in table 4.1

4.2.2 Definition of program goals and objectives

The main objective of the policy for system innovations is to contribute to the realization of sustainable livestock farming. To reach this objective, the goal is set of 100 percent integral sustainable animal housing systems in 2023, which should be understood as that from 2023 onwards all new built animal housing systems are integral sustainable. The concept of sustainable livestock farming has not been formulated clearly. It is operationalized as a livestock farming sector that produces with respect for people, animals and the environment. These terms are not concrete enough to permit a determination of whether the objective has been attained.

The goal of perspective on widespread appearance of integral sustainable animal housing systems in 2023 is not defined in concrete measurable terms in policy documents. Among the policy makers there is however a consensus that the goal is that from 2023 onwards all to be built animal housing systems are integral sustainable. This detracts however from the desirable objective of sustainable livestock farming, where all animal housing systems are integral sustainable, not only the new built ones. Furthermore, the definition of this goal is problematic since it is unclear what criteria an animal housing system in 2023 must fulfill in order to be labeled as integral sustainable. It should however been taken into account that the policy for system innovations is a goal-seeking process. Criteria for sustainable animal housing systems have been developed and are updated continuously, as new innovations become available. The end goal for 2023 (i.e. what is regarded as integral sustainable by that time) is thereby unclear, so that sufficient determination of the likelihood of its attainment is not possible. However, by 2023, attainment of the goal can be examined against the then actual criteria.

It is not fully clear what exactly is expected from the goals ‘new design of animal housing systems’ and ‘anchoring of new concepts by practice’. The goals reflect the goal-seeking process that characterizes the policy. The end goal for 2023 is not determined yet and it is unclear what criteria animal housing systems by then should fulfill. The goals make clear that innovations need to be developed and

applied, but there are no hard criteria to determine whether or not this has been done adequately. Determination of goal attainment can thus not be done sufficiently.

The ambitions for 2015 are intermediate goals. Theirs attainment should contribute to the achievement of the main goals for 2023. The most concrete ambition is that from 2015 onwards, all to be built animal housing systems are built according to the concept of integral sustainability. By that time, to be built animal housing systems should fulfill the most actual criteria for sustainable housing systems. How these criteria will look like in 2015 is yet unclear, because they are periodically actualized. Goal attainment can however be determined afterwards. The other ambitions are less concrete. Inspiration, knowledge and education and development and innovation are mentioned as ambitions, but are more factors that should be stimulated to reach the policy goals. For these ambitions no concrete goals have been defined. Also the ambition of creating an awareness among entrepreneurs has not been defined in sufficient concrete terms for determination of attainment. This awareness should consist of a sense of urgency for sustainable investments and being familiar with the method of redesign projects. It has not been defined how this will be measured.

Overall, the policy goals and objectives are not defined in sufficient concrete terms. That is, insufficient for the determination of goal-attainment. The policy does not aim for a fixed end situation, but is a goal-seeking process in which goals as criteria for animal housing systems develop as a consequence of progression in innovation technology and other factors.

4.2.3 Plausibility of the change process presumed in the program theory

The policy aims for a transition from current to integral sustainable animal housing systems. Already in 2015, new built animal housing systems should fulfill the sustainability criteria, as a prelude to harder criteria in 2023. The criteria for 2015 and 2023 are however not developed yet, which makes it not fully clear what the change process comprises.

In general, the change process includes a change in the daily practice of livestock farming: from the current way of livestock farming to a way of livestock farming that enjoys broad societal support, now and in the future. The practice of livestock farming should conform to new societal values, such as higher standards for animal welfare. To this end, animal housing systems should become integral sustainable. Although it is not specified what criteria an integral animal housing system should fulfill, it is possible to make statements about the plausibility of the change process by determining the strength of the policy actions. The question is

if they can reach the desired effect of the application of integral sustainable animal housing systems on a large scale.

The change to integral sustainable animal housing systems should come from actions that stimulate entrepreneurs to do sustainable investments: innovation projects, learning programs, subsidy systems, etc. Regulations are not imposed and the free market system is ensured. Entrepreneurs can choose for sustainable investments without obligation. The case study on Rondeel (discussed in chapter 6) learns that the actions of the policy will not lead to large scale application of these and similar systems in the short term. The presumed change process to integral sustainable animal housing systems is thus implausible. Entrepreneurs will not tack when they see no (economic) benefits for their own business. The power of the policy program to influence their point of view and willingness is limited. This study has not researched the willingness of entrepreneurs to do sustainable investments, but the Rondeel case study learned that overall this willingness is limited to a small group of farmers. Taking into account the dynamics of the market, only a small percentage of entrepreneurs will choose for sustainable investments and integral sustainable animal housing systems when the current actions of the policy program will not be supplemented. The percentage of entrepreneurs which has a willingness to do sustainable investments may grow in the future, depending on factors as demand for sustainable animal products.

4.2.4 Definition and sufficiency of the procedures for identifying members of the target population, delivering service to them and sustaining that service through completion

Entrepreneurs in the livestock sector, who are the main members of the target population, are reached in an efficient manner. The most important sector organizations of the livestock sector are part of the collaboration of the implementation agenda. These sector organizations take active part in the policy process and set up actions to stimulate sustainable investments. Entrepreneurs are reached by their sector organizations and the service they need for the implementation of the policy (i.e. doing sustainable investments) is as such guaranteed. Support for implementation of the policy by the members of the target population is thus sufficient. However, entrepreneurs still need to do a lot by themselves. Implementation of the policy requires their active participation.

4.2.5 Definition and sufficiency of the constituent components, activities and functions of the program

The components and activities of the policy are not defined in detail. Some activities have been set up, others are still in a stage of development. It has not explicitly been defined how actions should contribute to goal-attainment. The actions comprise learning programs, innovation projects and others and must lead to sustainable system innovations on a large scale. There is however no plan for how exactly this process should go. It has not been worked out in detail how the actions will lead to the realization of integral sustainable animal housing systems on a large scale. The process of realization of Rondeel in practice is seen as the example to follow, but the case study has learned that this process was sufficient for the realization of an integral sustainable concept in practice, not for realization of integral sustainable animal housing systems on a large scale. An innovation program, a subsidy system and the cooperation between different actors made that a livestock farmer had the opportunity to change over to an integral sustainable animal housing system for his animals and dared to do this. The activities of the program are sufficient to realize an integral sustainable concept in practice and to establish a niche market. Regarding the objective of the policy program it is however the challenge to get a vast majority of the entrepreneurs on board and to make integral sustainability the norm. This requires a next step in the policy program which has not been developed yet. Regarding the facts, amongst others the presence of a bulk market, the actions of the policy program are insufficient to attain its intended goals and objectives.

4.2.6 Concluding remarks about the internal consistency of the program theory

Overall, this study concludes that the program theory that underlies the policy for system innovations lacks internal consistency. However, it has to be taken into account that it is a deliberate choice of the policy makers not to aim for a fixed end situation. The policy is a goal-seeking process in which goals as criteria for animal housing systems develop as a consequence of progression in innovation technology and other factors. However, also a goal-seeking process can be judged on its internal consistency. The analysis in this section has shown that the internal consistency of the policy is inadequate. Policy actions are not well defined and insufficient to reach the unspecified objectives of the program.

4.3 Enforceability of the policy program

4.3.1 Performance of the program theory on the criteria for determining its enforceability

Table 4.2 shows the performance of the policy for system innovations on the criteria for determining its enforceability. A '+' means fulfillment of the criterion, a '-' no fulfillment. A '+/-' means that the criterion is partly fulfilled.

Criterion	**Fulfillment**	**Source**
Feasible goals and objectives	-	Analysis of program theory
Allocation of resources to the program and its various activities in an adequate way	+/-	Analysis of program theory

Table 4.2 *Fulfillment of the criteria for enforceability of the program*

Table 4.2 reveals that the criteria for determining the enforceability of the policy for system innovations are not fully fulfilled. It is highly unlikely that the goals and objectives will be attained. Various resources are allocated adequately to the program and its activities. That is, sufficient for the development of innovations and other objectives, but not adequate enough to realize large scale application of integral sustainable animal housing systems, which is the main objective of the policy. In particular financing is inadequate. This is why the allocation of resources is regarded as only partly sufficient (in table 4.2: +/-).

The following paragraphs will elaborate in detail on the enforceability of the program and clarify the results that are presented in table 4.2.

4.3.2 Feasibility of the program goals and objectives

The policy aims that from 2023 all to be built animal housing systems are built according to the standards of integral sustainability. This involves conditions that lay outside the influence of the policy. To fulfill this objective, it is necessary that entrepreneurs in the livestock sector will do the necessary sustainable investments. They are however free to do these investments or not. Policy makers can establish criteria for animal housing systems and they may, by taking coercive measures, force entrepreneurs to ensure that these criteria are fulfilled. They can however not force entrepreneurs to adopt certain innovations. Besides, the policy for system innovations does not contain coercive measures. It is highly unlikely that all entrepreneurs in the livestock sector will innovate according to the standards of integral sustainability. This lies outside the influence of the policy program. The main objective of the policy can therefore be regarded as unfeasible.

4.3.3 Adequacy of the allocation of resources to the program and its various activities

The various activities of the program are mainly aimed at the development of new innovations, anchoring of new innovations in practice and creating a sense of urgency among entrepreneurs to do sustainable innovations. Many activities of the program are however rather plans than concrete actions. Types of actions are mentioned, but a lot of them need to be worked out in more detail and resources still need to be allocated to them. The policy is also still in development. The roadmap that describes the path to 2023 is in continuous development and it is very likely that new actions will be established in the near future. Probably most of them will be similar to existing activities. Activities are thus not always concrete yet, which makes it not possible to determine the adequacy of the allocation of resources. The allocation of resources can however be assessed for the general plans for actions. This is what the following of this section will concentrate on.

The collaboration of the implementation agenda itself comprises various actors. The policy also focuses on bringing different parties together. Through this, some resources are efficiently allocated. Knowledge is efficiently allocated by involvement of research institutes (Wageningen University and others) in certain activities. An important objective of the program is that new types of integral sustainable animal housing systems will be developed. By the allocation of knowledge in an efficient manner, the change of success is high.

Furthermore, networks are efficiently used. Sector organizations play an important role in various activities (e.g. in the projects Varkansen and Sustainable Dairy Chain). Entrepreneurs from within the sector are involved, mainly through the efforts of sector organizations they are reached and made familiar with activities of the policy program (e.g. innovation projects, subsidy programs). Networks were an important factor in the realization of the Rondeel concept in practice. Resources were efficiently brought together which made the realization possible.

Due to the collaborative character of the policy, exclusive resources of different parties are brought together and are efficiently allocated to the various activities of the policy program. Networks and relationships are efficiently used. Through this, relevant actors – most importantly members of the target population (entrepreneurs in the livestock sector) – become involved in the policy. The allocation of knowledge resources is also effective for the development of new innovations. Allocation of resources is however insufficient in the case of activities that are aimed at realization of new innovations in practice. The policy program calls for the unrealistic high outcome of sustainable system innovations by every entrepreneur in the livestock sector in the long run. In comparison with this

objective, there is very little funding available. The subsidy programs are only able to support a small percentage of entrepreneurs with sustainable innovations. The SBIR program only runs for a year and the MDV program has the resources to support only a few dozen entrepreneurs (SMK, 2012).

The collaboration between various actors is an important factor of success in the policy for system innovations. It makes that the resources various actors possess, are brought efficiently together. The allocation of resources to the various activities of the program is however not always sufficient. Knowledge and networks are important factors and their effective allocation to activities for design of new sustainable animal housing systems and introducing them in practice makes that these activities can become a success. The available resources are however insufficient for large scale realization of integral sustainable animal housing systems.

4.3.4 Concluding remarks about the enforceability of the program

The policy program for system innovations is quite unenforceable. It is highly unlikely that the goals and objectives will be attained. Despite the fact that various resources are allocated adequately to the program and its activities, this is not adequate enough to realize large scale application of integral sustainable animal housing systems, which is the main objective of the policy. In particular financing is inadequate.

A strong point of the policy is its collaborative character. There is efficient collaboration between parties and networks are efficiently used, so that resources as knowledge are efficiently shared. This opens possibilities for a more enforceable policy. Maintaining the collaboration and networks is important to make future policy actions successful.

4.4. Stakeholder and societal support

4.4.1 Criteria for determining stakeholder and societal support for the program

A program that enjoys sufficient stakeholder and societal support fulfills the criteria in table 4.3. To what extent they are fulfilled in the case of the program for system innovations is presented in this table. A '+' means the fulfillment of a criterion, a '-' means no fulfillment.

Criterion	Fulfillment	Source
The attitude of stakeholders towards the program is neutral or positive	+	Alders (2011); Verhue et al. (2011)
The attitude of society towards the program is neutral or positive	+	Alders (2011); Verhue et al. (2011)

From table 4.3 it appears that stakeholder and societal support are sufficient. This research came to this conclusion by studying Alders (2011) and Verhue et al. (2011). Alders has done research to the attitude of stakeholders in livestock farming and society towards livestock farming and its future. Verhue et al. did a similar research, but only focused on the attitude of society. Both studies applied three scenarios for the future of livestock farming, i.e. three possible scenarios of how the livestock sector could develop in the coming years. The attitude of stakeholders and society towards these scenarios is subject of their studies.

The three scenarios are:
1. Competitive livestock farming: with the emphasis on the economic significance of the sector. In this scenario, the livestock sector focuses on the European market. Farms are large in scale, they will expand (more animals will be kept on one place) but the number of farms will decrease. Legislation for the sector follows what is prescribed by the European Commission.
2. Future-proof livestock farming: with the emphasis on sustainable development. Future-proof livestock farming is based on the (sustainability) demands of society/the consumer. Stakeholders in the sector collaborate in order to make sustainable innovations possible. The sector maintains competitive and simultaneously meets the growing demands of consumers regarding animal welfare, environment, the landscape and public health.
3. Caring livestock farming: with the emphasis on human and animal welfare. In this scenario the scale of the sector decreases sharply. The Netherlands will no longer be an exporting country. Livestock farming will go further on a small scale with concern for animal welfare, public health and the environment. Strict regulations for these issues will be developed (Alders, 2011, pp. 21-24; Verhue et al., 2011, pp. 50-51).

Future-proof livestock farming is exactly the scenario that the policy for sustainable livestock farming – where the policy for system innovations is part of – implements. This scenario has been assessed on stakeholder and societal support by Alders (2011) and Verhue et al. (2011). The following will discuss their findings.

4.4.2 Attitude of stakeholders towards the program

Stakeholders in policy for livestock farming are parties from: public authorities, the livestock sector (primary parties and parties from the chain), NGOs for environment and/or animal welfare, the scientific community. This study has not carried out its own stakeholder analysis, because this has already been done by Alders (2011). A list of all stakeholders can be found in annex I.

In his study to the view of these stakeholders to the future of livestock farming, Alders (2011) made use of the three future scenarios discussed in the previous paragraph. The preferences of each stakeholder were mapped. It appeared that a vast majority preferred future-proof livestock farming is the ideal scenario (44 of the 48 stakeholder parties, which is about 92%). Only a few NGOs were exceptions to this and preferred caring livestock farming. Furthermore, all actors agreed that collaboration between different parties is of great importance in policy making.

Since the scenario of future-proof livestock farming is equivalent to the policy for sustainable livestock farming where the policy for system innovations is part of, it can be said that the policy for system innovations enjoys large stakeholder support. The findings of Alders (2011) suggest that more than 90% of the stakeholders have a positive attitude towards the policy.

4.4.3 Attitude of society towards the program

The attitude of society towards the three future scenarios (competitive, future-proof and caring livestock farming) is assessed by both Alders (2011) and Verhue et al. (2011). Both come to the conclusion that a future-proof livestock farming scenario enjoys the most societal support.

Verhue et al. (2011, p. 51) comes with the most detailed numbers about the attitude of society towards this scenario. The attitude towards the policy for system innovations will not differ, since the policy is exactly what this future (policy) scenario describes. A majority of 56% of society has a positive attitude towards the future livestock farming scenario. In addition, 34% has a neutral attitude towards this scenario, meaning that only 10% has a negative attitude towards the program. The scenario – and thus the policy for system innovations – thus enjoys large societal support. In comparison, 33% has a positive and 40% a neutral attitude towards the scenario of a competitive livestock farming. Only 27% has a positive attitude towards the scenario of a caring livestock farming and 32% a neutral attitude. Of all scenarios, future-proof livestock farming has the largest support and faces the least opposition.

This leads to the conclusion that the attitude of society towards the policy for system innovations is mainly positive. Another part of society is neutral towards the program and it faces almost no opposition. This means that the policy enjoys sufficient societal support.

4.4.4 Concluding remarks about the extent of stakeholder and societal support for the program

The paragraphs above demonstrated that there is large stakeholder and societal support for future-proof livestock farming, the ideal that also the policy for system innovation has. The policy can thus count on sufficient stakeholder and societal support.

4.5 Concluding remarks

The internal consistency of the program theory and the enforceability and extent of stakeholder and societal support have now been assessed. The internal consistency of the program theory is weak, mainly due to inadequate policy actions and insufficient definitions of policy goals and actions. The likelihood that the policy is well enforceable is also low, since goals and objectives are for a great part unfeasible and the allocation of resources to the program is only partly sufficient. Stakeholder and societal support for the program is nevertheless more than sufficient. Unfortunately, this does not compensate for the weak internal consistency and the poor enforceability, for which the program is unfeasible.

5. Moral adequacy of the policy for system innovations

5.1 Introduction to this chapter

In this chapter the moral adequacy of the policy for system innovations will be discussed. Following sentientist consequentialism, the moral rightness of the policy program is determined by its consequences for sentient beings. All that matters is the amount of suffering. The focus lies on suffering of animals in livestock farming, since by far the most unnecessary and avoidable suffering takes place here.

The moral adequacy of the program will be determined by assessing the ethical foundation of the policy program for system innovations. The ethical foundation of the policy consists out of principles and values, which are discussed in section 3.3.5. By looking at what the consequences of these principles and values are for the policy and to which consequences this leads for sentient beings, the moral adequacy of the policy program can be determined.

Two criteria are applied to examine the moral adequacy of the policy for system innovations:

- The policy program causes no avoidable suffering
- The policy program avoids suffering that would have existed when the program would not have been set up

The following will first outline the subject of the moral assessment, which is a part of the normative framework of the policy for system innovations discussed in section 3.3.5. The consequences of the part of this normative framework will then be sketched and it will be assessed to what extent there is a moral change compared to the current situation. This is followed by an assessment to the extent to which the policy will cause avoidable suffering. Mill's Harm Principle – broadened so that all sentient beings are regarded as 'others' and thus as morally relevant – is applied to determine the amount of avoidable suffering.

5.2 The subject of the moral assessment

Section 3.3.5 has outlined the normative framework that underlies the policy for system innovations. It has shown that the policy is based on two main principles: (1) a sustainable way of livestock farming that is supported by society and (2) a free (world) market. The following will discuss the moral adequacy of the first principle and the values that follow from them. The second principle is not

discussed, since it does not deal with the focus of this assessment, which is animal suffering.

The policy for system innovations is set up to realize a sustainable way of livestock farming that is supported by society. Sustainability is operationalized as supported by the prevailing societal values. From this principle 'a sustainable way of livestock farming that is supported by society' are three main values derived: (1) animals should be kept in a way that is supported by society: animals demonstrate natural behavior, get daylight and are not subjected to physical interventions, (2) animal housing systems should be climate and energy neutral and (3) farm animals and livestock farming should be visible for citizens.

To determine the moral adequacy of this principle and these values, they should be tested on the consequences of their application. The consequences on the total amount of avoidable suffering for animals kept in the livestock farming industry are thereby the focus.

It should be taken into account that this moral assessment is – due to time constraints – quite rough. A detailed study to the policy consequences has not been done. The principles and values of the policy themselves are assessed in a way as if they were the policy consequences (e.g. the value 'animals should be kept in a way that is supported by society: animals demonstrate natural behavior, get daylight and are not subjected to physical interventions' is translated in the consequence 'animals are kept in a way that is supported by society: animals demonstrate natural behavior, get daylight and are not subjected to physical interventions'.

5.3 The extent of moral change

Application of the values discussed above will strongly improve the welfare of animals kept in the livestock sector. Nowadays, these animals are subjected to stress, painful physical interventions and other forms of suffering. They are unable to demonstrate natural behavior (Uitvoeringsagenda Duurzame Veehoderij, 2009). All this suffering is avoidable. The policy for system innovations, with the values described above comprising its normative framework, will avoid a great part of this suffering. When animals are able to demonstrate natural behavior and are no longer subjected to physical interventions, they will suffer much less during their life. Although there is no direct concern for the interests of animals, only indirect by societal values of how animals should be kept, animal welfare will strongly improve. The amount of avoidable suffering largely decreases when reality fits within the ideal of 'animals demonstrate natural behavior, get daylight and are not subjected to physical

interventions'. Since all that matters is the policy consequences – and not whether or not the reasons for the policy are the right one – it can be concluded that the policy for system innovations is a large moral improvement. It improves the lives of animals and decreases their suffering, albeit that only indirectly their interests are of concern.

5.4 Moral adequacy

Despite the fact that the application of the principles that underlie the policy for system innovations will be a moral improvement, there will still be avoidable suffering. When the policy fulfills its aim, the amount of suffering will sharply decrease, as was determined in the previous section. When animals have the possibility to indulge in their natural behavior, avoidable suffering during their life will practically disappear. However, intensive farming will still exist. Millions of animal will still be killed each year. The program does nothing to prevent this suffering. The discourse is that it is allowed to keep animals on a large scale for the pleasure of humans, as long as these animals have a life in which they can demonstrate natural behavior and the other values from section 5.2 are visible brought in practice. The policy does not oppose intensive livestock farming itself. Following Mill's Harm Principle, applied in sentientist consequentialism, this is not justifiable. The Harm Principle says that suffering is not justified when it is unnecessary or avoidable. The death of animals in the livestock sector is however unnecessary and avoidable. Although the animals may not suffer from death itself, they suffer from death since it forecloses the valuable opportunities that continued life would afford (DeGrazia, 2002, p. 61). The animals are killed for human pleasure only. Humans do not need the animal products the sector provides for their survival (Ibid., p. 75). Nevertheless, the policy does nothing to prevent the large scale suffering from death: it does not aim for reducing the livestock sector. Moreover, it does not regard the unnecessary death of animals as morally wrong. The policy for system innovations can therefore not be regarded as morally adequate.

5.5 Concluding remarks

Focusing on the aspect of animal welfare only, it is the unnecessary death of animals that makes the policy for system innovations morally inadequate. To be morally just, the policy should do all it can to prevent the suffering of animals from death. Since this is not done, the policy for system innovations is morally inadequate. Nevertheless, the policy is a moral improvement, since it reduces the amount of avoidable suffering sharply. The lives of animals are improved largely.

6. Case study on the development of the Rondeel concept and its realization in practice

6.1 Introduction to this chapter

Chapter three provided a reconstruction of the program theory of the policy for system innovations. This reconstruction has shown that the policy has as its objective that animal housing systems become integral sustainable.

The Rondeel system is an integral sustainable animal housing system that has been adopted successfully in practice. Rondeel is an innovative housing system for layer poultry. The concept is the fruit of a study performed by Wageningen University. It became reality thanks to the effort and co-operation of various parties. The concept, how it originated and how it is brought into practice is by the policy makers seen as a success story and the to be pursued situation (LNV, 2008). They aim for similar processes in the entire livestock sector, so that the appearance of integral sustainable animal housing systems becomes a reality on a large scale. In this case study on Rondeel, the concept and the realization in practice is analyzed. The aim is to derive the factors of success for the realization of integral sustainable animal housing systems. Central to this chapter is the question what can be learned from the process that led to the realization of Rondeel for other cases. It will also be researched to what extent it can be reasonably expected that integral sustainable animal housing systems such as Rondeel will be applied on a large scale.

The following will first discuss the Rondeel system itself, i.e. the design of the system and what is different from current traditional animal housing systems. After that, the process of originating of the concept and its realization in practice will be analyzed by studying scientific reports on the Rondeel system and interviews with Rondeel BV (the national sales organization of Rondeel eggs) and the first entrepreneur that realized Rondeel in practice. The studied reports are mainly studies from Wageningen University, the actor that played a central role in the development of the concept and continuous to conduct studies on the Rondeel system. Finally, the Rondeel system and its performance on moral issues, such as animal welfare and environmental performance, will be discussed in more detail. This is done with the aim to make a moral assessment of the system possible. Since Rondeel is seen as the desired system of livestock farming, it also provides the input for a moral assessment of the policy for system innovations.

6.2 The Rondeel system

The Rondeel is designed to allow the hens to indulge in their natural behavior (Wageningen UR projectteam Houden van Hennen, 2004). This has been the most important principle in the design phase of the concept: allowing hens to indulge in their natural behavior formed the reason for the search for a new animal housing concept. In the design it has been taken into account that interventions (such as beak-trimming) will not have to be applied. In the traditional intensive farming sector, these interventions are prevailing and hens are closely packed together in enclosed spaces, where they have no room to indulge in their natural behavior.

Figure 6.1: A Rondeel farm (source: Rondeel BV, 2012)

A Rondeel farm on the other hand, is aimed at meeting the natural needs of the laying hens. Figure 4.1 is a schematic representation of a Rondeel. The following will elaborate on the Rondeel system. The information that construes this elaboration is derived from Wageningen UR projectteam Houden van Hennen (2004), Rondeel BV (2012) and Brandsen (2012, pers. comm. 25 May). It consists roughly out of 4 different parts. The night quarters (number 1) provide the hens with space to meet their primary needs: eating, drinking, resting and laying eggs. The feeding system and laying nests are designed according to existing technology. The day quarters (number 2) simulates the natural environment of the hens. Here, they are able to indulge in their natural behavior (foraging, dust bathing). Number 3 in figure 4.1 is the wooded area. Also here, the hens are given space to indulge their natural behavior. They can forage, explore and find shelter. This area simulates their natural woodland environment. When a calamity occurs that requires the hens to be confined (e.g. an outbreak of

avian influenza) this area can be closed off. Number 4 is the central core. It contains three parts: (1) the ground floor, which is the working area of the farmer; (2) the first floor is for visitors, who can there see how the Rondeel system works; and (3) the second floor, which contains heat exchangers. They are used to dry the manure of the hens and to control the climate in the night quarters. An open area in the Rondeel provides access to the central core. The open area splits one day quarter in two smaller day quarters. In a full quarter, 6000 hens are kept. In total there are five quarters (four full and two half ones), so that the Rondeel system houses 30.000 hens. On a Rondeel farm 6,7 hens are kept on each square meter. On a traditional farm for laying hens, nine hens are kept on each square meter; in organic farming six.

The Dutch Society for the Protection of Animals developed a certification scheme for animal welfare. Animal products can score one, two or three points on animal welfare, where a higher score means that the animal where the product is from had a 'better life'. Rondeel eggs gain the highest score with three points, just like organic eggs. In comparison, free range eggs (from hens that have the possibility to potter about outside) score two points and traditional eggs (from hens that are kept in a traditional animal housing system) score one point. Rondeel eggs are the only eggs in the Netherlands that combine their high score on this animal welfare label with an ecolabel. All in all, it can be concluded that the relative high score on (certification systems for) animal welfare and environmental performance are – together with the fact that Rondeel appeared to be a marketable concept – the reason for policy makers to label Rondeel as an ideal example of the desired situation. The following will discuss how this ideal example became realized in practice: from the process that let to the design of the concept on the drawing board to the process that led to its realization in practice.

6.3 The development of the Rondeel concept

The Rondeel concept arose from the project 'Houden van Hennen' (Keeping and Loving Hens), a study performed by Wageningen University commissioned by the Ministry of Agriculture, Nature and Food Quality. This project started in 2004 with the objective to create a sustainable future for the poultry industry. Researchers examined the differing dynamics of corporate social responsibility, the needs of the laying hens and the ideal working conditions for the poultry farmer. From this study, a package of demands could be drawn up, from which new concepts for housing and keeping layer poultry were designed: the Rondeel and the Plantage (Wageningen UR projectteam Houden van Hennen, 2004). The Plantage has never been realized in practice, but in 2010 the first Rondeel was built in Barneveld (Rondeel BV, 2012).

The process that ultimately led to the design of the Rondeel concept, started in 2004. The Ministry of Agriculture, Nature and Food Quality gave Wageningen University the task to develop new systems for housing layer hens. The prevailing systems were by that time already regarded as no longer suitable for the near future: they are not able to fulfill increasing demands for animal welfare and other increasing (sustainability) demands from society. Wageningen University, entrusted with this task, set up the project Keeping and Loving Hens. Its mission: to develop a housing system for laying hens that meets the needs of the animals, poultry farmers and society (Wageningen UR projectteam Houden van Hennen, 2004, pp. 4-6). To assure that a new design would meet these requirements, the project started with polls to determine the opinions of poultry farmers and the opinions in society. At the same time literature studies were conducted on the natural needs of hens. The information that was gathered in this first phase was used for the development of three challenges for a new design:

- A system that is socially desirable and where hens can indulge in their natural behavior
- A system that is robust, i.e. a system that operates well, independent of disruptions (e.g. changing legislation or changing wield prices)
- A system with free range for chickens, with the possibility to potter about outside (Ibid, pp. 6-8)

These challenges became the point of departure in the design phase of a new housing system. The project group however realized that the challenges may conflict with each other, e.g. free range outside may conflict with the challenge of a robust system (due to health risks). Because the group of researches aimed for the design of a broadly supported system, various actors were involved in the project to overcome the conflicts between challenges in a way whereby stakeholder and societal support is still assured.

As a consequence, the search for a new concept became an open and interactive process. The project group invited various actors from the poultry industry and also citizens to participate in the process. Most important was the collaboration with poultry farmers and to a lesser extent other actors from the poultry industry (e.g. veterinarians, animal feed companies). The project group sang the praises of the interactive process, but in fact only a small group from the sector was enthusiastic about the project, saw future in a new way of livestock farming and took active part in the process. An invitation of the research group in the trade journal for poultry farmers 'De Pluimveehouderij' (The Poultry Sector) to join the project by thinking about new ways of poultry farming. In total, 112 farmers (about 8% of all laying hens businesses) gave response. They were asked for the most important challenges for innovation in poultry farming according to them. 'Economy' and 'societal acceptance' appeared to be the most important factors (Wageningen UR projectteam Houden van Hennen, 2004, pp. 9-10). Subsequently, intensive discussions with 15 actors from the poultry sector

(farmers and others) took place. According to the project group, a few of these actors were skeptical about renewal, but most of them took active part in the process. The various actors could bring their demands forward. This enabled the research group to map in detail the demands of entrepreneurs from the sector. The demands of actors from the livestock sector were mainly economic in nature, they demanded a fair price for their product. Some of them observe changing demands for animal products in society and saw a market for innovations the research group aimed for. These forward-looking entrepreneurs were however not immediately on board, for their main concern is to earn an honest living. An innovative system needs to assure this in the first place, so is the thought of the poultry farmer (Ibid.). Also the societal demands were mapped after an interactive process with citizens and the needs of hens were mapped after an intensive study (Ibid., p. 11). A package of various demands ultimately formed the input for the design of two innovative concepts of housing systems for laying hens: Rondeel and Plantage.

The Keeping and Loving Hens project appeared to be a success for it enabled the design of concepts that conformed to the assignment and at the same time could count on support from actors from the sector and other parties. The interactive character of the process made this possible, for it brought diverse demands together. Without this interaction and the efforts of the research group, this probably would not have happened, since the interests of various parties are conflicting. There would be struggle between them, in case there was no collaborative process to overcome the challenge of conflicting interests. The main concern of a poultry farmer is to make an honest living. Without their participation in the process, the research group could not design a system with chance of success. The poultry farmers are key to change: they are the ones that need to adopt the innovations. The involvement of actors from society and study to the needs of hens made that demands for innovative housing systems could be drawn up. The involvement of entrepreneurs from the sector made that these demands could be connected to the demands of entrepreneurs so that innovative concepts could be designed with a good chance of realization of them in practice.

Though, the success of the project should not be overestimated. As stated already, only a small percentage of poultry farmers was enthusiastic to participate actively in the program. In general, the attitude of poultry farmers towards sustainable innovations is quite skeptical. The farmers that participated in the process represent a small group of forward-thinking entrepreneurs (Wageningen UR projectteam Houden van Hennen, 2004, p. 8). A majority of the entrepreneurs in the poultry sector sees no market for sustainable innovations. Their main concern is economic survival and their conviction is that efficient production is the way to do this. Also the forward-looking entrepreneurs' main concern is economic survival (Brandsen, 2012, pers. comm., 25 May). Therefore, also they will not automatically adopt sustainable innovations in their business.

Nevertheless, the project was successful in the design of innovative concepts for housing of laying hens that conformed to the assignment. The following section will further elaborate on the next phase of the process that led to the application of Rondeel in practice: the step from design of the concept to the actual realization of it in practice.

6.4 The realization of the Rondeel concept in practice

The previous paragraph discussed the process that led to the design of the Rondeel concept. A successful new and sustainable animal housing system was with this not yet settled: the concept did not became automatically realized in practice after it had been designed. The Keeping and Loving Hens project resulted in two concepts, Rondeel and Plantage, but only Rondeel was realized in practice. It took an extensive process to make Rondeel a true reality. The following will discuss this process, with the aim to derive the success factors that led to the application of the concept in practice. From this, recommendations for the governance of system innovations can be done. It will also be assessed to what extent the presence of the success factors that led to the realization of the concept in practice also enables the application of Rondeel on a large scale.

6.4.1 Actors that took part in the realization process

Roughly, it can be said that the extensive collaboration of various actors made the realization of Rondeel possible. The following will first discuss the actors that played an important role in the realization process.

Venco Groep
The Venco Groep played a central role in the realization of the concept. Venco Groep is a corporation that positions innovative brands in the poultry sector. Its mission is to supply a solid and reliable package of products that offers a broad range of solutions for the poultry sector (Rondeel BV, 2012). After the publication of the 'Keeping and Loving Hens' project, the Venco Groep set itself the objective of developing the Rondeel concept into a feasible and marketable product. Once this had been done and the first Rondeel farm was constructed, the Venco Groep established Rondeel BV in order to market the Rondeel system. The Venco Groep was the main initiator of realizing the concept in practice (Ibid.).

Ministry of Agriculture, Nature and Food Quality
The Ministry of Agriculture, Nature and Food Quality facilitated the construction of the first Rondeel farms with a subsidy program to encourage sustainable and innovative projects (Ibid.).

TransForum
TransForum was an innovation program in the period 2005-2010. Its aim was to contribute to sustainable development in the Dutch agricultural sector by uniting research institutes, the government, non-governmental organizations and the private sector. The program helped the realization of Rondeel in practice by the creation of a deeply committed coalition of knowledge institutes, entrepreneurs, governments and social organizations (Ibid.).

ZLTO
ZLTO is part of LTO Nederland, the entrepreneurial and employers organization for the agricultural sector. ZLTO is an organization for agriculture and horticulture in the south of the Netherlands. Its supports their members with strategic activities and the establishment of (sustainable) projects to strengthen their market position. ZLTO supported the realization of Rondeel in practice via knowledge, networks and resources (Ibid.).

Dierenbescherming
The Dutch Society for the Protection of Animals aims for higher animal welfare in intensive livestock farming. The organization was closely involved by the Venco Groep during the development of the Rondeel for use in practice (Ibid.).

Various other organizations became part of the process as well: organizations from the poultry sector, chain parties and others were involved by the Venco Groep and made familiar with the concept. They played however no active role in the process, but were involved by the practices of the Venco Groep (e.g. chain parties were consulted for their view on the marketability of Rondeel eggs). Rondeel was realized in practice due to the effort of the actors discussed above and their collaboration. The following will discuss the realization process itself.

6.4.2 From concept to realization in practice

After the Keeping and Loving Hens project developed the Rondeel system, the Venco Groep took the challenge to make from the concept a commercial sustainable product. Despite the efforts of the Keeping and Loving Hens project, this still was a big challenge, because the production price of Rondeel eggs is higher than of prevailing free-range eggs. The cost price for the consumer would therefore also be higher, in order to make the product profitable. In addition, the Rondeel system was unfamiliar to the consumer and concepts as sustainability and animal welfare are often vague for consumers and retailers. The difficulty of the challenge lay in creating a new market in which retailers would see possibilities and consumers would be willing to pay a higher price (Vermeij, 2011, pp. 4-5).

To overcome this challenge, the Venco Groep started to bring relevant actors (sector organizations, chain parties, research institutes, NGOs) together (Vermeij, 2011). Multiple organizations were consulted. Parties from the livestock sector were involved to convince them that Rondeel would be a marketable product. NGOs were invited to gain societal support. Chain parties were consulted for their view on the feasibility of the concept. A coalition was formed with Transforum. This organization started to do continuing research to the international market, consumer behavior and other issues. In the sales chain of eggs, supermarket chain Albert Heijn – with 33,6% market share the largest player in the market (Distrifood, 2012) – appeared to be very enthusiastic about the concept and committed to collaboration. Thereby, a sales market for Rondeel eggs was found. The Dutch Society for the Protection of Animals expressed its support for the Rondeel system, which according to the research of TransForum would lead to societal support and the opening of a market for Rondeel eggs. Research to consumer behavior revealed that with a good presentation of the product, it would gain adequate market share. Due to these facts, the chance that Rondeel would be a market success became very realistic (Vermeij, 2011). The main challenge now became to find an entrepreneur that was willing to adopt the Rondeel system. Ultimately, in 2008, a poultry farmer had been found via sector organization ZLTO that was willing to enroll in the concept (Brandsen, 2012, pers. comm. July 27). From this point, the process took a new turn.

The Venco Groep now found an entrepreneur who was willing to adopt the Rondeel system. From doing research to the market and consultation with various stakeholders, the process now had concrete sight on the application of the concept. The focus of the process shifted to the case of the entrepreneur to make the application a success.

The laying hens business which was willing to adopt the Rondeel system, had been the family business Brandsen that already had a business in the prevailing intensive farming sector. Owner of the business is Gerard Brandsen. The Rondeel concept came for this entrepreneur exactly at the right moment. By 2008, he was – for economic reasons – looking for an innovative expansion of his company (Brandsen, 2012, , pers. comm. July 27).

According to Brandsen (Ibid.), the sector was by that time very skeptical towards the Rondeel concept. Poultry farmers did not believe that Rondeel would be a marketable product and the general consensus was that it would solely lead to higher costs for the farmer and not to higher profits or a fair price for their product. Brandsen was less skeptical than his colleagues. He acknowledged a shift in the market, i.e. a growing niche market where the concern of consumers for sustainability issues as animal welfare grow.

In 2008, Brandsen aimed for an innovation that would make the business more profitable and robust. In the first place, his thoughts were to expand the current intensive farming business. At the same time, he came via ZLTO in contact with the Venco Groep. The Venco Groep convinced him that there would be a market for Rondeel eggs. After discussions with the Venco Groep, Brandsen saw the Rondeel system as a good innovation for his business which came for him at the right time. He had the idea that the application of the Rondeel system as a expansion of his business would be the ideal way to make the business more robust. Market fluctuations would be easier to cope by not to producing for one market: the business would with the Rondeel system produce for a niche market (where concern of consumers goes to sustainability issues and consumers are willing to pay a surplus) and for the bulk market (where price competition is dominant). Brandsen saw this in 2008 as the ideal situation for his business, because of the growing niche market he witnessed and his conviction that the bulk market would still remain the most important. His family business still keeps 120.000 laying hens in the traditional way. Brandsen is convinced that large scale bulk production will always remain. His business would now however also start producing for a niche market. It was agreed with the Venco Groep that this organization would become the marketing and sales organization of the Rondeel eggs. This gave Brandsen some certainty about the economic feasibility of the innovation. Alone, he would never be able to market his new product.

After Brandsen stepped into the process that the Venco Groep started in 2004, the collaboration with the Venco Groep remained important. Venco Group remained the marketer of Rondeel and continued its efforts to make Rondeel a success. When the Rondeel farm of Brandsen started to operate – in April 2010 – Venco Groep established Rondeel BV as the sales company of the Rondeel eggs. Rondeel BV became the owner of the Rondeel concept. The organisation buys the eggs of the Rondeel farmer and sells them further. Entrepreneurs that adopt a Rondeel system in their business, sign a franchise agreement and a purchase agreement with Rondeel BV. The entrepreneur becomes as such a franchisee with a Rondeel system. The sales of the eggs is done via Rondeel BV, the franchisor. The financial margin is agreed in advance. Brandsen is as entrepreneur with a Rondeel system very satisfied with this system and calls it a success because he gets a fair price for his product, because Rondeel eggs fulfill the demands of the consumer and because the Rondeel system is better for the animals.

From the moment the first Rondeel in Barneveld started to operate, in April 2010, Rondeel was a market success. Rondeel eggs found their way to the consumer via supermarket chain Albert Heijn, that bought the eggs from Rondeel BV. It appeared that there was sufficient market for the eggs, to make the product profitable. This market success was caused by the way the product was presented and the certification of the Dutch Society for the Protection of Animals. The eggs are available in the supermarket in a round box, other than the prevailing boxes

and were labeled with three points (the highest score) in the certification scheme of the Dutch Society for the Protection of Animals for animal welfare. This draw the attention of a small group conscious consumers for sustainability issues. In addition, the eggs are less expansive than organic eggs that score similar on animal welfare. Presentation, certification and price, were as such the main factors that made the Rondeel eggs a market success, according to Zanders (pers. comm. 24 July), the head of Rondeel BV.

The purchase of Rondeel eggs started to grow slowly since April 2010 and by Ocotber 2010 consumer demand could no longer be met. This had to do with an advertisement of Wakker Dier on the national radio (Brandsen, 2012, pers. comm. July 27). Wakker Dier is an organization that defends the interests of animals in the intensive farming sector. In the advertisement they expressed their support for the Rondeel eggs, because the hens in the Rondeel are kept in an animal friendly way, i.e. where they can demonstrate their natural behavior. Rondeel now really had its place in the market and since April 2011 there are three Rondeel system operational in the Netherlands, next to the first one in Barneveld, there is a Rondeel in Wintelre and Ewijk (Rondeel BV, 2012).

Rondeel thus really has become a system that managed to secure its position in the market. The aim of the Venco Group to make the concept marketable thus has become a success. However, despite the policy goal to realize large-scale application of Rondeel and similar systems, experts in the egg chain and market expect that the market for Rondeel eggs will stay a small niche market. In the free market system, a large bulk market will always maintain. Competition will in this market always be on price and the emphasis will always be on the cheapest possible production (Brandsen, 2012, pers. comm. July 27; Zanders, 2012, pers. comm. July 24). Also, entrepreneurs in the sector are overall still skeptical towards the Rondeel system, because they are convinced that the consumer still wants the lowest price.

6.5 Lessons learned

The previous section described the process of the realization of the Rondeel concept in practice and its market success. The section before discussed the process that led to the successful development of the concept. The following describes the lessons that can be learned from both processes for similar cases.

6.5.1 Factors that made the development of the Rondeel concept a success

The development of the Rondeel concept was a success for the concept conformed to the demands of the Ministry of Agriculture, Nature and Food Quality (roughly: a system that meets the needs of animals, farmers and society) and at the same time had perspective on marketability. The following factors contributed to this success:

Extensive research to the demands of entrepreneurs, society and animals
In the first phase of the Keeping and Loving Hens project, the research team studied the demands of poultry farmers, societal organizations and laying hens. By mapping these needs, it became clear which demands a design had to fulfill. Due to this research, the team was later not faced with unpleasant surprises. From the research, the basic requirements for a successful design (i.e. a design that fulfills the needs of entrepreneurs, society and animals) could be distilled.

An open process in which stakeholders were involved in an early phase
Early in the process, before any design had been made, various stakeholders were involved in the process to face them with the challenge of the research team. All stakeholders were able to contribute to the process in the search for a new design. They could bring forward their demands and have influence on the process. Consequently, stakeholder support for the ultimately developed design was high. The open structure of the process made that despite big differences, there was understanding for each other's opinions. By respecting each other's opinions and listening to each other, the Rondeel became a design which all parties can fully endorse.

6.5.2 Factors that made Rondeel a market success

The translation of a design into a marketable concept became a success due to the following factors.

Presence of a deeply committed organization
With the design of Rondeel and Plantage, the Keeping and Loving Hens project ended. From that point, the Venco Groep took the challenge to make the Rondeel concept marketable. The organization was deeply committed to fulfill this aim. There was a lot of effort needed to make the concept marketable and it is very questionable if Rondeel could have changed into a marketable concept without the commitment of the Venco Groep.

Involvement of stakeholders
Stakeholder support has been very important in the market success of Rondeel. The support of chain parties has been necessary to create a sales market, the

support of NGOs for societal support and thus for creating consumer demand etc. The support of stakeholders was obtained by consulting them and involvement of them in the process. By making agreements with chain parties (supermarket chain Albert Heijn), a sales market was more or less ensured at forehand. Involvement of the Dutch Society for the Protection of Animals gave certainty about societal support. Societal organizations are powerful in creating consumer valuation for a product presented as sustainable. All in all, the involvement of stakeholders decreased the uncertainty of a new concept entering the market.

Entrepreneurial courage

Bringing a new concept on the market always involves uncertainty. The Rondeel case learns that overall the attitude of entrepreneurs in the livestock sector is very skeptical towards new sustainable concepts of farming. It takes courage to renounce from the usual way of farming and to go against the norm. Despite the Venco Group due to its efforts could take away uncertainties to quite some extent, adopting a new concept always takes entrepreneurial risk. In the Rondeel case, an entrepreneur was found that had the courage to take this risk.

Presentation of the product to the consumer

The presentation of the eggs to the consumer has been a not to be underestimated factor in the market success of Rondeel. The Rondeel case learns that marketability not only needs to exist in theory, but that it is also necessary to present a new product in such a way that consumers' attention is drawn the consumer becomes familiar with the concept behind the product.

6.6 Concluding remarks

This chapter analyzed the process that led to the development of a sustainable animal housing system, Rondeel, and the realization of this concept in practice. The case learns that it is possible to develop a system that fulfills policy demands and at the same time is a marketable concept. Several factors contributed to this success, which have been discussed in the above. The lessons from the case can be applied in similar cases where a new sustainable concept needs to be developed and realized in practice.

The aim of the policy for system innovations is however not only the development of new sustainable systems and the realization of these concepts in practice. The ultimate goal is large scale application of these systems. This is another big step. Rondeel has obtained a position in the market, but Rondeel systems produce for a small niche market. The production costs are too high to compete on the bulk market, where price is the by far the most important competing factor.

It is assumed that this bulk market, with price as the competing factor, will always maintain. This is the conviction of entrepreneurs in the livestock sector as well. A vast majority sees no perspective in sustainable system innovations. The challenge is thus to overcome the barriers that hamper sustainable system innovations from becoming mainstream. In the discussion this will be discussed in more depth. A small study in innovation literature is done to do recommendations for the governance of this challenge.

7. Discussion

7.1 Introduction to this chapter

This study researched the feasibility and the moral adequacy of the policy for system innovations in the livestock sector. The findings of this study are discussed in this chapter, along with the strengths and weakness of the applied methodology. The following will first address the findings of this research regarding the feasibility of the policy program. The results of the feasibility assessment of program theory will be discussed, as well as the results from the case study on the Rondeel system. Secondly, the results regarding the moral adequacy of the policy for system innovations will be outlined. In this, the findings from the moral assessment of the program theory are discussed. A concluding section finalizes this chapter.

7.2 Discussion of the results of the feasibility assessment

The analysis on the feasibility of the policy program for system innovations contained three steps: an assessment of the internal consistency of the program theory, an assessment of the enforceability of the program and an assessment of the stakeholder and societal support for the program.

The internal consistency of the program theory appeared to be weak, just as the enforceability of the program. Only stakeholder and societal support were sufficient for a feasible program. It should however be taken into account that the policy for system innovations is not a classical policy with specific and concrete goals and objectives. Policy makers deliberately choose for a goal-seeking process. The policy for system innovations is part of the policy for sustainable livestock farming, which is the governance of a transition process that knows no concrete measurable objectives, but only a sketch of the desired future scenario. As a consequence, it can be questioned if the applied criteria in this study are adequate. The applied criteria for feasibility are criteria for the evaluation of a classical policy. Borgstein et al. (2010) argue that in case a policy is rather a searching process, an evaluator should choose for another form of assessment: a qualitative approach. However, the aim of this study is to assess the feasibility of the policy. Certain guiding tools are thereby necessary. It must also be possible to judge a policy that is a goal-seeking process on its feasibility or success. This justifies the choice for the applied methodology in this research.

In addition, the case study on Rondeel has strengthened the methodology of this research. It enabled a second type of research to the feasibility of the policy for system innovations: the qualitative approach. This prevents the drawing of conclusions from a unilateral perspective. By combining the findings of the assessment of the program theory for system innovations with the findings from the case study, decent recommendations for the governance of system innovations can be done. The following will therefore discuss the findings of the case study, before integrating the results of both type of studies.

The Rondeel case is the proof that the policy for system innovations can be a success. It is a system in which animals can indulge in their natural behavior. The Rondeel system fulfills the policy aims. It fulfills the demands of the entrepreneur, society (the consumer) and the animal. Animal welfare, animal health, environmental and social problems are at least scaled down to acceptable levels. Policy makers regard Rondeel as a system that enjoys sufficient societal support.

The Rondeel case revealed that this success was not just realized as a consequence of policy actions. Similar achievements, i.e. other cases of a new developed integral sustainable animal housing system realized in practice do not exist. Stakeholder involvement, an open process, commitment of actors and entrepreneurial courage appeared to be key to the success of Rondeel. Within scientific literature, the importance of stakeholder involvement and an open process is often emphasized for success in a complex policy problems where many actors have a stake (Freeman and McVea, 2001). Also extensive research and a good marketing strategy appeared to be of great importance for making Rondeel a market success. All in all, it is about introducing a new product into the market.

Despite its success, the case study was closed with the notion that the challenge is the application of the system on a large scale. To this end, several hurdles need to be overcome. The technological innovation that Rondeel is, needs to be stimulated in order to grow out to a mainstream system. The following will discuss how the policy for system innovations can contribute to this.

Policies that aim for creating sustainability by stimulating technological innovations can be labeled as innovation policies. Transition management appears to be the key for success in these kind of policies. Top-down governance and setting definite goals and objectives does not work. The dynamics of market and society asks for a long-term perspective and adaptive flexibility (Nill and Kemp, 2009, pp. 677-688). The policy for system innovations already is a policy that passes this test: it is a goal-seeking process, however with a long-term perspective. The collaboration implementation agenda seems to realize the importance of an open and flexible process to respond to the challenge of creating sustainability in a dynamic world. However, Nill and Kemp (2009, pp. 677-688)

emphasize the importance of sharp criteria in such a policy and the development of time-dependent instruments. Despite an innovation policy should be flexible, time-dependent instruments with clear goals are important to guarantee commitment. Smith (2001, pp. 25-26) discusses possible time-dependent instruments. In a study to eco-innovation and market transformation, he concludes that small eco-businesses are likely to benefit from the dissemination of information and appropriately geared financial incentives to stimulate consumer demand. A niche market can grow when the policy focuses on the producer (e.g. the Rondeel farmer). Direct grant aid, tax advantages are suitable, as well as subsidies to encourage greener consumer activity. Public procurement policies could also stimulate demand for sustainable products. A mixture of policy measures is preferred (Ibid.)

The above discussed the results of the assessment on the feasibility of the program theory and the findings from the case study. The feasibility assessment of the program theory revealed the absence of concrete policy goals and means and well-defined criteria for integral sustainable animal housing systems. Following the theoretical framework of this study, this would imply that the policy for system innovations is highly unfeasible. The Rondeel case study nevertheless revealed that the application of an integral sustainable animal housing system can be successful. Several factors contributed to this success: extensive research, an open process with stakeholder involvement, the presence of a deeply committed organization, entrepreneurial courage and a good market strategy (presentation of the product). A successful policy will aim at influencing these factors. The above also outlined which strategy policy makers should follow in order to make system innovations prevailing after their application and the establishment of a niche market.

All in all, it can be said that despite its program theory is regarded as unfeasible, the policy for system innovations can still lead to success. This will however by no means be self-evident. The current policy is therefore too limited. The Rondeel system was all in all realized in particular thanks to efforts of an external actor. Policy makers can nevertheless learn from the Rondeel case and aim the policy at influencing the factors that led to the successful application of Rondeel. In the end also the policy goals need to be defined more concretely, so that policy success in terms of goal-attainment can be determined

7.3 Discussion of the results of the moral assessment

It appeared from the moral assessment that the policy for system innovations strongly decreases the amount of avoidable suffering. Nevertheless, the policy

can not be regarded as morally adequate, since it still causes avoidable suffering in the form of the unnecessary death of animals.

This applied methodology has a large influence on this judgment. The application of any other ethical theory than sentientist consequentialism would lead to other conclusions. This study however defends sentientist consequentialism as the most appropriate ethical theory, since it guarantees the inclusion of the interest of avoidance of suffering of all beings in determining the morality of actions.

The outcomes of the assessment have however also been influenced by the choice for the focus on suffering of non-human animal only. This choice has been defended by the fact that the most suffering takes place in animals. A more comprehensive approach would reveal more insight in the morality of the policy, nevertheless this study revealed insight in the most important aspect: animal suffering, which should draw the most attention because the total amount of suffering is the greatest among animals in the livestock sector.

Due to time constraints, the moral assessment was treated quite roughly. The values that underlie the policy were treated as policy outcomes. As such, it were the policy aims that were studied, not the policy consequences. In reality the policy may be less effective and the outcomes may be different than the policy aims. In fact, this chance is quite likely, since this study revealed that the feasibility of the program is weak. The choice to treat the policy aims as consequences is a weakness of the moral assessment, justified due time constraints.

The knowledge derived from the assessment is nevertheless useful. From the assessment recommendations can be done for the applied principles in the program theory. From the feasibility assessment recommendations can be done regarding the effectiveness of the policy. Together, they form a package of recommendations for the governance of integral sustainable animal housing systems. The ethical recommendations in combination with the recommendations from the feasibility assessment, can effectuate a more effective policy with improved moral outcomes.

7.4 Concluding remarks

This chapter discussed the results this study obtained and put them in some perspective. The opens the way towards a conclusion.

8. Conclusions

8.1 Introduction

The following research question has been central to this study:

> *To what extent is the policy program for system innovations, that is part of the program for an in every respect sustainable livestock farming in the Netherlands in 2023, feasible and morally acceptable?*

In this concluding chapter, the aim is to provide an adequate answer to this question.

In line with the research questions, this study aimed for doing two types of recommendations for the governance of sustainable livestock farming. These recommendations, that follow from a feasibility assessment and a moral assessment, are:

1. Recommendations to improve the feasibility of the policy program for system innovations
2. Recommendations to improve the moral adequacy of the policy program for system innovations

In this concluding chapter, an answer to these research objectives will be given. First, concluding comments on the feasibility of the policy for system innovations will be outlined. Then concluding comments on the moral adequacy of the policy will be presented. In the last section, recommendations for the governance of system innovations in the livestock sector will be given.

8.2 Feasibility of the policy for system innovations

The feasibility assessment revealed that the program theory had a weak internal consistency and a poor enforceability. The insufficiency of the internal consistency of the program theory is caused by:

- Inadequate definition of program goals and objectives
- Inadequate definition of the actions of the program and their insufficiency to reach program goals
- An implausible presumed change process

The program is poor enforceable due to:

- Unfeasible goals and objectives

- Inadequate allocation of resources to the program and its various activities

Stakeholder and societal support for the program are however sufficient.

Overall, The findings suggest a program that is highly unfeasible. Nevertheless, the case study on Rondeel revealed that bringing system innovations into practice can be successful. This has however not been a success of the policy for system innovations, since Rondeel was already developed and realized before this policy was set up. From the case it was learned that for successful development and application of a sustainable system innovation it is indispensable to have sufficient stakeholder support. This can be achieved by involving stakeholders early into the development and realization process. A fixed end should not be defined at forehand, but all involved actors must have a common understanding of the challenge of the project. Other factors that contributed to the success of Rondeel were:

- Extensive research to the demands of entrepreneurs, society and animals
- Presence of a deeply committed organization
- Entrepreneurial courage
- A good marketing strategy (presentation of the product to the consumer)

In order to make systems as Rondeel prevailing, it is in particular important that there are sufficient financial incentives for entrepreneurs to adopt these systems.

Overall it can be concluded that – following from the analysis of the program theory – the policy for system innovations is at this moment highly unfeasible. The Rondeel case however, offers hope. The case showed that it is possible to adopt a sustainable system innovation in practice. From the case, recommendations for a more feasible policy can be done. Section 8.4 provides these recommendations.

8.3 Moral adequacy of the policy for system innovations

The policy for system innovations appeared to be a moral improvement. When it realizes its aims, the amount of avoidable suffering of animals in the livestock sector will largely decrease. Nevertheless, avoidable suffering will still be present in the unnecessary death of animals. It can therefore be concluded that the policy for system innovations is morally not adequate. This means that the policy can morally be improved. Recommendations for this improvement will be done in the following section.

8.4 Recommendations for the governance of system innovations

The policy aim is to make systems as Rondeel prevailing. Innovation policy should to this end stimulate the application of these integral sustainable animal housing systems, as was discussed in the discussion. All in all, the obtained results and the conclusions that follow from them are translated in the following recommendations for the governance of system innovations. The recommendations are intended for the collaboration of the implementation agenda sustainable livestock farming.

Better definition of program goals and objectives and actions while maintaining the transition process
Policy goals and objectives should be defined more clearly, i.e. in sufficient terms for evaluation, so that the aim of the policy becomes fully visible. Also the policy actions should be defined more clearly, as the criteria for sustainable animal housing systems. The policy should however stay a flexible process aimed at transition of the livestock sector. A fixed policy is not the solution, regarding the dynamics of society and the market. However, it should be clear what is aimed for with which actions. Time-dependent instruments with clear goals are the solution.

Maintaining the collaborative character
The open process and stakeholder involvement ensure sufficient stakeholder support, which is – regarding the power of various actors and their dynamics and interplay – of indispensable importance for policy success. It is however important that all actors are aware of the policy challenge of creating sustainable livestock farming and commit themselves to efforts. Keep the process open is to this end the credo, so that there is mutual understanding between stakeholders. Collaboration is the key, since one actor alone is not powerful enough to realize change. Next to this, it is important to keep in collaborative contact with other relevant actors which are not represented in the collaboration of the implementation agenda (e.g. chain parties which are not directly part of the collaboration but are important in creating a sales market for new sustainable products).

A more adequate allocation of resources to the program activities; in particular more financial and knowledge/information resources should be made available
More financial resources are needed to support entrepreneurs that adopt system innovations. In order to let integral sustainable animal housing systems become mainstream, financial support is necessary. Otherwise, these new production systems can not compete on the bulk market due to high production costs. In addition, information resources are needed to convince entrepreneurs and other actors of the possibilities the adoption of sustainable system innovation offer. Many entrepreneurs are still skeptical. The Rondeel case however shows the

possible success. Continuing research to the market possibilities and sharing knowledge with entrepreneurs and other relevant actors is of great importance. Research to a good market strategy is part of this. A more adequate allocation of financial and knowledge resources will increase entrepreneurial courage and willingness to make sustainable investments.

A policy that aims at decreasing the total amount of animal suffering

It is realized that this is a quite vague recommendation. A concrete recommendation has not been given, because it is ultimately up to the policy makers to decide if they stick to the current normative framework of the program or are willing to change their convictions. This study regards – from a sentientist consequentialist perspective – that animal suffering should be avoided as much as possible. It is therefore suggested that the policy for system innovations also aims for a decline of the livestock sector. The way for doing this is left open. One can think of taxes on animal products or another policy that discourages the consumption of animal products. This study emphasizes that within such a policy the consumption of animal products from animals out of sustainable animal housing systems should be less discouraged, since the total amount of suffering is there less than in currently prevailing systems.

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Willem Vermaat
August 13, 2012

Annex I - Stakeholders that were involved in the research of Alders (2011)

Livestock sector:
Nederlandse Melkveehouders Vakbond, LTO varkenshouderij, ZLTO, LLTB, LTO Noord, NVP, LTO melkveehouderij, Productschap Pluimvee en Eieren, Nederlandse Vakbond Varkenshouders

Chain parties:
Nevedi, COV, VION N.V., CBL, Rabobank, NZO

NGOs:
Stichting Natuur & Milieu, Milieudefensie, Burgerinitiatieven tegen megastallen uit diverse provincies, Dierenbescherming, Brabantse Milieufederatie, Gelderse Milieufederatie, Roos Vonk Groep

Governmental parties:
IPO, VNG, GGD Hart van, Rijksadviseur voor het Landschap

Science:
LEI, WUR, WUR Live Stock Research, RIVM, DLO, Alterra, CLM

Annex II - Roadmaps of each focal point for the sustainable livestock farming policy

Routeplannen per speerpunt

Leeswijzer

De Uitvoeringsagenda Duurzame Veehouderij is gericht op een ‘in alle opzichten duurzame veehouderij in 2023. Het samenwerkingsverband heeft hiervoor in mei 2009 zes speerpunten met een aantal uitdagingen voor 2023 benoemd. Na het opstellen van de voortgangsrapportage in juni 2010 voor de Tweede Kamer is de regiegroep aan de slag gegaan met het formuleren van tussenstappen voor de periode tot 2015. De ambities die hiervoor benoemd zijn, worden in dit geval opgevat als ‘inspanningsverplichting’. Vervolgens is een groslijst opgesteld van activiteiten die kunnen bijdragen om deze ambities te realiseren.

De ambities en acties zijn gebundeld in een zogenaamd routeplan per speerpunt. Deze routeplannen zijn vastgesteld in het bestuurlijk overleg van de uitvoeringsagenda op 27 januari 2011. Binnen de groslijst van activiteiten heeft de regiegroep een selectie gemaakt van prioritaire activiteiten voor de komende periode tot en met mei 2011. De leden van de regiegroep nemen hiervoor zelf het initiatief om te zorgen dat deze acties worden opgestart en opgepakt door de diverse betrokken partijen. Op basis van de resultaten zullen de routeplannen na mei worden geactualiseerd voor de tweede helft van 2011. De routeplannen vormen zo een dynamische, voortschrijdende agenda.

In deze notitie is in de vorm van een schema het routeplan per speerpunt weergegeven. De eerste kolom geeft de uitdagingen richting 2023, de tweede kolom de ambities tot 2015 en in de derde kolom de acties die nu met voorrang worden opgepakt in de eerste helft van 2011. In de vierde kolom is aangegeven welke partij in de regiegroep de trekker is van een bepaalde actie. Tenslotte is in de vijfde kolom aangegeven wat de planning is voor mei 2011, wanneer de voortgangsrapportage opgeleverd moet worden, welke resultaten dan verwacht kunnen worden.

Het routeplan voor speerpunt 1 Systeeminnovaties is gecombineerd met twee onderdelen van speerpunt 2 Welzijn en gezondheid van dieren, nl. natuurlijk gedrag en ingrepen en gezonde dieren. De reden is dat natuurlijk gedrag en gezonde dieren direct te maken hebben met het houderijsysteem en belangrijke eisen stellen aan systeeminnovaties. In de acties kan dit dan direct integraal worden meegenomen.

ROUTEPLAN SPEERPUNT 1 SYSTEEMINNOVATIES
SPEERPUNT 2 WELZIJN EN GEZONDHEID VAN DIEREN
b. natuurlijk gedrag en ingrepen
c. van dierziektenbestrijding naar gezonde dieren

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
Integraal duurzame veehouderijsystemen: • 5% integraal duurzame stallen in 2011 en perspectief op grootschalige toepassing daarna • Herontwerp / nieuwe ontwerpen van stal- en houderijsystemen gericht op forse stappen voorwaarts voor dierenwelzijn (natuurlijk gedrag), milieu (minimale emissie), diergezondheid, energieverbruik en landschappelijke inpassing. Voortgang op het totaal moet in evenwicht zijn met de voortgang op individuele aspecten • Verankering van nieuwe concepten door de praktijk **Natuurlijk gedrag en ingrepen:** • Dieren vertonen natuurlijk gedrag in houderijen • Geen ingrepen meer (exclusief wettelijk verplichte) **Van dierziektebestrijding naar gezonde dieren:**	*Bewustwording, mind set, sense of urgency* 1. Vóór 2013 is er bij alle toekomstgerichte ondernemers een 'sense of urgency' voor het investeren in integraal duurzame houderijsystemen (stal, bedrijfsmanagement en fokkerij) *2.* Vóór 2013 zijn alle toekomstgerichte ondernemers bekend met de methodiek van de herontwerptrajecten bij het nadenken over investeringen	A) Organiseren van gesprekken over duurzame houderijsystemen en de perspectieven die dat kan bieden voor de ondernemer. Daarbij wordt ook de omgeving betrokken (stallenbouwers, adviseurs, erfbetreders)	LTO, NZO, RABO	diverse initiatieven lopen
		B) Cursus methodiek herontwerpen	LTO, EL&I	gestart
		C) Leertrajecten voor diervriendelijk management voor ondernemers en ketenpartijen	LTO, DB	loopt
	Extra stimulans om duurzaam te investeren *3.* Vanaf 2015 zijn alle nieuw te bouwen stallen / houderijsystemen integraal duurzaam	D) Subsidieregelingen integraal duurzame stallen, SBIR, MIA/Vamil	EL&I	SBIR gunning 2e fase, vervolg SBIR bedrijf en omgeving
		E) Evalueren van bestaande regelingen en andere instrumenten (fiscaal, stimulering) op effectiviteit	EL&I, LTO, RABO	gestart, eerste tussenresultaten

• Houderij en fokkerij bieden ondersteuning aan de weerstand van het dier. Dieren groeien gezond op • Inzet op selectief, beperkt en curatief diergeneesmiddelengebruik, inclusief antibiotica • Maatschappelijk aanvaardbare methoden voor de noodzakelijk resterende blokkades van bedrijven bij dierziektebestrijding • Slimme vaccinatie en behandelsystemen met waarborgen voor de afzet van producten van gevaccineerde dieren	*Stimuleren van aanpassingen in bedrijfsmanagement, huisvesting en fokkerij* 4. In 2015 is het systeem van Welfare Quality praktisch toepasbaar en voor de boer te gebruiken in zijn managementsysteem 5. In 2013 ligt er een routekaart voor het uitfaseren van ingrepen die afhangen van het houderijsysteem 6. In 2013 is het antibioticagebruik gedaald met 50% ten opzichte van 2009 (in 2011 20% minder) *7.* In 2015 zijn via fokkerijlijnen stappen gezet gericht op inzet van robuuste dieren	F) Welfare Quality praktijkrijp maken en verbinden aan sectorinitiatieven	DB, LTO, NZO	gestart
		G) Opstellen routekaart ingrepen per sector	DB, LTO, EL&I, COV	advies plan van aanpak gereed, overzicht acties uitgezet
		H) Uitwerken plan van aanpak bedrijfsgebonden dierziekten	LTO, EL&I	start gemaakt
		I) Oprichting initiatiefgroep Duurzame Fokkerij	LTO, DB, EL&I	loopt
	Inspiratie en kennisuitwisseling Acties die alle ambities van dit routeplan ondersteunen	J) Gebruik van koplopers als voorbeelden (boegbeeldenproject)	EL&I, LTO	concept projectplan gereed
	Ontwikkeling en innovatie) Acties die alle ambities van dit routeplan ondersteunen	K) Gezamenlijk formuleren van eisen (randvoorwaarden, richtingen) voor integraal duurzame houderijsystemen (stal, management, rassen)	LTO, NZO, EL&I, DB	brainstormbijeenkomst met stakeholders georganiseerd
		L) Innovatieprogramma	LTO, DB	gestart

		Varkenshouderij		
		M) Benutten van netwerken voor uitwisselen van kennis en ervaring	LTO, NZO, EL&I	doorlopend
		N) Invullen van witte vlekken met onderzoek en experimenten	LTO, NZO, EL&I	doorlopend
		O) Uitproberen via proefboerderijen (Sterksel)	LTO, EL&I	doorlopend

ROUTEPLAN SPEERPUNT 2 WELZIJN EN GEZONDHEID VAN DIEREN
a. im- en export van levende dieren en lange afstandstransporten

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
• Slachtdieren worden dicht bij de productielocatie geslacht onder voorwaarde dat de marktwerking geborgd blijft • Kwalitatief verantwoord transport: het transport vindt plaats conform een gewaarborgd kwaliteitssysteem • Kansen benutten in nabije markten (export biggen, import nuchtere kalveren) • In 2023 is het aantal transporten en het aantal transportkilometers in een dierenleven minimaal	<u>*Slachtdieren:*</u> *Ontwikkelen kwaliteitssysteem 'Eén Huis dat staat'.* 1. In 2012 zijn alle partijen het eens over de regels voor transport binnen het kwaliteitssysteem *2.* In 2015 werken alle transporteurs volgens het kwaliteitssysteem voor transport. Voor varkens en kalveren werken alle transporteurs in 2013 al volgens het kwaliteitssysteem.	*NB. Deze ambities zijn gericht op het voldoen aan de wettelijke norm. De uitvoeringsagenda richt hier geen eigen acties op. Wel op de onderstaande ambities 3-9 waarbij de acties vooral gericht zijn op de voorlopers*		
	Kwaliteitseisen doorontwikkelen 3. In 2013 zijn er 5 voorbeelden van integraal duurzame concepten rond transport (inclusief keten) 4. In 2014 zijn kwaliteitseisen vastgesteld voor integraal duurzaam transport (inclusief keten) per diersoort die opgenomen worden in het kwaliteitssysteem 5. In 2018 werken alle transporteurs integraal duurzaam volgens het verbeterde kwaliteitssysteem	A) Ontwikkelen van 5 voorbeelden van integraal duurzame concepten voor transport (inclusief de keten)	COV, EL&I, DB	project gefinancierd en uitgezet
		B) Verkennen van mogelijkheden voor een beloningssysteem voor hogere kwaliteit van transport	COV, DB, EL&I	concept voorstel gereed

	Verminderen / alternatieven voor transport: 6. In 2012 zijn voor slachtvarkens, -kippen en –runderen haalbare strategieën onderzocht waardoor een groter deel van de slachtdieren in de regio en met een minimaal aantal transporten kan worden geslacht 7. In 2015 is er een gezamenlijk voorstel voor de integrale duurzaamheidsaspecten (afstand, duur, kwaliteit) voor transport van dieren per sector	C) Onderzoek naar haalbare strategieën om slachtvarkens, -kippen en –runderen in de regio af te zetten met een minimaal aantal transporten in samenwerking met stakeholders	COV, EL&I, DB, LTO	project gefinancierd en uitgezet
	<u>Gebruiksdieren:</u> *Benutten van kansen in nabije markten* 8. In 2011 zijn 2 of meer haalbare strategieën onderzocht en uitgewerkt waardoor een groter gedeelte van de gebruiksdieren in de eigen regio (straal 500 km) kan worden afgezet 9. In 2015 is alle transport verder dan 500 km comfort class transport	D) Onderaoek van 2 of meer concepten om groter gedeelte van biggen in de eigen regio af te mesten (o.a. gesloten bedrijven, fosfaatproblematiek) in samenwerking met stakeholders	COV, EL&I, DB, LTO	project gefinanciierd en uitgezet

ROUTEPLAN SPEERPUNT 3 MAATSCHAPPELIJKE INPASSING

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
• Transparante productie: de burger heeft zicht op en kennis van de voor productie gehouden dieren. De boer heeft weer een gezicht voor burgers • Nieuw te bouwen bedrijven zijn landschappelijk ingepast	*Transparantie, openheid en interactie* 1. In 2015 is de productiewijze van alle bedrijven in principe transparant 2. In 2015 zijn op 10% van alle bedrijven voorzieningen getroffen waardoor burgers rechtstreeks in contact komen (als klant of bezoeker) met agrarische bedrijven en waardoor deze een transparant beeld krijgen van de agrarische productie ter plaatse 3. In 2015 hebben toekomstgerichte bedrijven een bedrijfsportfolio beschikbaar waarin bepaalde standaardinformatie aanwezig is en het bedrijf zich naar believen kan presenteren. Burgers kunnen het via internet raadplegen en zo zien hoe er op dat bedrijf geproduceerd wordt en waarom. De landschappelijke inpassing van een bedrijf maakt standaard deel uit van een bedrijfsportfolio	A) Bevorderen van vernieuwende relaties tussen veehouders en burgers d.m.v. pilotprojecten	IPO, RABO, NZO	1e pilot ontwikkeld
		B) Transparantieonderzoek door het LEI	EL&I	gereed
		C) Ontwikkelen en verspreiden van voorbeelden voor een digitaal beschikbaar 'ondernemingsportfolio' met informatie over de bedrijfsopzet en de landschappelijke inpassing	LTO, EL&I, IPO	projectplan gereed voor pilotproject
	Landschappelijke inpassing 4. In 2015 worden alle nieuw te bouwen bedrijven ontwikkeld met ruimtelijke kwaliteit en zijn deze zodanig landschappelijk ingepast in hun omgeving dat deze kunnen rekenen op een breed draagvlak bij de bevolking en	D) Realiseren van minimaal één voorbeeldstal in 3 of meer provincies die model staat voor een gebiedseigen betaalbaar ontwerp dat economisch uitvoerbaar is	IPO, LTO	prijsvraag uitgezet voor conceptontwikkeling
		E) Stimuleren vormgeving via Maatlat	EL&I	criterium bedrijf en

	recreanten	Duurzame Veehouderij		omgeving toegevoegd
	Inspireren 'het kan ook anders' Acties die alle ambities van dit routeplan ondersteunen	F) Een voorbeeldenboek met bijzondere ontwerpen die reeds zijn gerealiseerd	IPO	Stallenportfolio gereed en slim verspreid

ROUTEPLAN SPEERPUNT 4 ENERGIE, MILIEU EN KLIMAAT
a. Voer-mest Kringloop

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
• Zoveel mogelijk sluiten van de voer-mest kringloop op bedrijfs-, nationaal of NW Europees niveau • Maximale benutting van mineralen uit dierlijke mest als meststoffen door mest te bewerken / verwerken. Zie de uitdagingen uit het convenant Schoon & Zuinig	*Aanpakken korte termijn problematiek* *1.* Begin 2011 hebben Nevedi en LTO een mineralenconvenant gesloten met ambities en aanpak voor het terugdringen van fosfaat in dierlijke mest	A) Project Mineralen, deelproject fosforverlaging via het voerspoor	Nevedi, LTO	plan van aanpak gereed
	Korte termijn aanpak verbinden aan lange termijn ambitie 2. Eind 2011 is er een gedragen plan van aanpak voor het sluiten van voer-mest kringlopen *3.* In 2015 is het mineralenoverschot in Nederland verwerkt	B) Verder oppakken van het sluiten van kringlopen binnen een op te richten 'Task Force Voer-Mest Kringlopen'	Nevedi, LTO, EL&I	Task Force is opgericht en loopt

ROUTEPLAN SPEERPUNT 4 ENERGIE, MILIEU EN KLIMAAT
b. grondstoffen voor diervoeder op duurzame wijze geproduceerd

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011

• In 2023 worden alle grondstoffen duurzaam geproduceerd	*Verduurzamen grondstoffen* 1. In 2015 is 100% van de in Nederland gebruikte soja duurzaam geproduceerd (RTRS gecertificeerde soja) *2.* In 2015 is duidelijk wat er voor nodig is om voor andere grondstoffen tot 100% duurzaam te komen	A) Project Carbon Footprint Animal Nutrition (inzicht in de mate waarin de samenstelling van diervoeders bijdraagt aan de carbon footprint van de veehouderij	Nevedi, EL&I	loopt

ROUTEPLAN SPEERPUNT 4 ENERGIE, MILIEU EN KLIMAAT
c. klimaat: duurzame energieproductie, reductie van energieverbruik en broeikasgassen

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
• Maximale inzet op productie van duurzame energie door veehouderij uit biomassa, wind en zon *NB. Uitdagingen zijn gekwantificeerd in het Convenant Schone en Zuinige Agrosectoren (inclusief die voor reductie van energieverbruik en broeikasgassen) en worden via dat convenant gerealiseerd. De ambities lopen in het convenant tot het jaar 2020 evenals in het programma Duurzame Zuivelketen.*	*Energiebesparing en productie (deels uit Convenant Schone en Zuinige Agrosectoren)* 1. Duurzame Zuivelketen: in 2020 is de zuivelketen energieneutraal 2. Convenant S&Z: verdere reductie van het gebruik van fossiele energie van gemiddeld 2% per jaar tot aan 2020. De emissie veroorzaakt door direct energiegebruik (gas, olie en elektra) is in 2020 verminderd met circa 60% t.o.v. 1990 3. Convenant S&Z: de ATV-sector streeft naar de productie van	A) Energiebesparing op boerderijniveau (2PJ) via nieuwe programma's incl. erfbezoekers (machinebouwers, installateurs	NZO	bijeenkomst met erfbezoekers georganiseerd, 40 bijeenkomsten met boeren geweest
		B) Opstellen routekaart energie (windenergie, minder kunstmestgebruik, biogasinstallaties)	NZO	gereed
		C) Subsidieregelingen duurzame stallen, samenwerking bij innovatie, duurzame energie, Investeringsregeling milieuvriendelijke	EL&I	lopend

	duurzame energie van 63 PJ in 2020 (gelijk aan een vermeden CO_2- uitstoot van 3.0 Mton/jaar)	maatregelen		
	Reductie overige broeikasgassen (deels uit Convenant Schone en Zuinige Agrosectoren) 4. Convenant S&Z: de emissie van overige broeikasgassen is door sectorale ontwikkelingen, gerichte reductiemaatregelen en gedeeltelijke omzetting van mest in duurzame energie in 2020 verminderd met circa 25 tot 30% t.o.v. 1990 5. Inzet in 2020 binnen de EU de laagste uitstoot overige broeikasgassen per liter melk te realiseren 6. PM ambities die gesteld worden na oplevering van het project Carbon Footprint Animal Nutrition (zie ook 4b)	D) Innovatieprogramma emissiearm veevoer voor emissiereductie van methaan uit de pens van koeien	Nevedi, NZO, LTO, EL&I	gestart
		E) Praktijkproject Koeien en Kansen	LTO, EL&I	gestart
		F) Project Weerbaar Vee	NZO	gestart
		G) Emissiereductie van broeikasgassen uit mestopslagen (SBIR Ondernemers-innovatieprogramma (ROB))	NZO	loopt

ROUTEPLAN SPEERPUNT 5 MARKT EN ONDERNEMERSCHAP

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
• De keten van producent tot en met consument associeert duurzaamheid met kansen en slim ondernemerschap. Verduurzaming is onderdeel van ondernemerschap • De Nederlandse veehouderij heeft door duurzame en concurrende productie een leidende positie in de Europese markt	*Bewustwording van mogelijkheden voor zelfsturing* 1. Voor 2013 zijn alle toekomstgerichte ondernemers zich er van bewust dat zijn zelf kunnen sturen op duurzaamheid in hun bedrijf 2. In 2013 maakt 50% van de melkveehouders gebruik van een tool om te sturen op duurzaamheid *3.* In 2015 kan direct zichtbaar gemaakt worden wat het effect van managementmaatregelen is op duurzaamheid in de bedrijfsvoering	A) Duurzaamheidstool melkveehouderij en praktijkprogramma; afstemmen met eisen Welfare Quality	NZO, LTO, DB, EL&I	loopt, afgestemd
		B) Project Smart Dairy Farming	NZO, EL&I	loopt
	Systematiekontwikkeling diversificatie 4. In 2015 heeft de ondernemer de beschikking over meer variatie in bedrijfsstrategieën *5.* In 2015 is de keten d.m.v. segmentatie ingericht op systemen waarin variatie in producten vanaf de boerderij behouden blijft in het verwerkingstraject en verwaard wordt in eindproducten naar de consument	C) Toepassingsmogelijkheden voor methodieken in andere sectoren dan melkveehouderij verkennen	NZO, LTO, COV, RABO, EL&I	uitwisselingsbijeenkomst georganiseerd

	Stimuleren via onderwijs *6.* In 2015 is duurzaam ondernemerschap een vaststaand onderdeel binnen het groene onderwijs en het vakonderwijs	D) Afstemmen van acties gericht op uitwisseling van kennis, ervaringen, onderwijs, onderzoek op samenhang, witte vlekken	NZO, LTO, RABO, EL&I, COV	overzicht gereed

ROUTEPLAN SPEERPUNT 6 VERANTWOORD CONSUMEREN

a. marktontwikkeling duurzame dierlijke producten
b. stimuleren van duurzaam consumptiegedrag
c. consumptie van dierlijke eiwitten

Uitdagingen richting 2023	Ambities tot 2015	Acties	Trekkers regiegroep	Planning tot mei 2011
Marktontwikkeling duurzame dierlijke producten • Stimuleren van het aanbod van duurzame dierlijke producten – met een focus op dierenwelzijn – door bestaande initiatieven op te laten schalen en nieuwe private initiatieven te laten ontwikkelen. Dit moet leiden tot meer keuzemogelijkheden voor consumenten bij de aankoop van dierlijke producten **Stimuleren duurzaam consumptiegedrag**	*Aantoonbaar duurzaam geproduceerd* 1. In 2013 kunnen diverse duurzame marktsegmenten op andere thema's dan dierenwelzijn herkenbaar vermarkt worden	A) Identificeren welke initiatieven er zijn die zich lenen voor een duurzaam marktsegment. Deze bundelen en analyseren waar doorbraken mogelijk zijn op milieu èn dierenwelzijn. Zoeken naar concepten als voorbeeldwerking voor nieuwe initiatieven met als centrale vraag: hoe krijg je duurzaamheid betaald? In samenwerking met supermarkten, initiatiefnemers. (Voorbeelden zijn: de Hoeve, Heidehoeveconcept, Vechtdalconcept, FrieslandCampina weidemelk, VION?AH sterren, Barometer Duurzame Slager, Blaarkopproject etc.)	SNM, COV, DB, NZO, EL&I	gesprek georganiseerd met diverse stakeholders voor uitwerken plan van aanpak

Consumptie van dierlijke eiwitten • Consumptie van dierlijke eiwitten past binnen een verantwoord consumptiepatroon *NB. 6b en 6c worden gerealiseerd via het Convenant Marktontwikkeling Verduurzaming Dierlijke Producten en het programma Duurzame Voedselsystemen*	*Beweging en verbreding in de markt* 2. In 2011 wordt er een verbinding gelegd tussen de Uitvoeringsagenda Duurzame Veehouderij, het Convenant Marktontwikkeling Biologische Landbouw, het Convenant Marktontwikkeling Verduurzaming Dierlijke Producten en het Platform Verduurzaming Voedsel 3. In 2015 is er een substantieel aantal duurzame marktsegmenten op andere thema's dan dierenwelzijn geïntroduceerd	B) Project Varkenshouderij 2.0: co-creatie van vernieuwende duurzame houderijsystemen via een dialoog van stakeholders en publiek	SNM, LTO, EL&I	eerste fase gestart