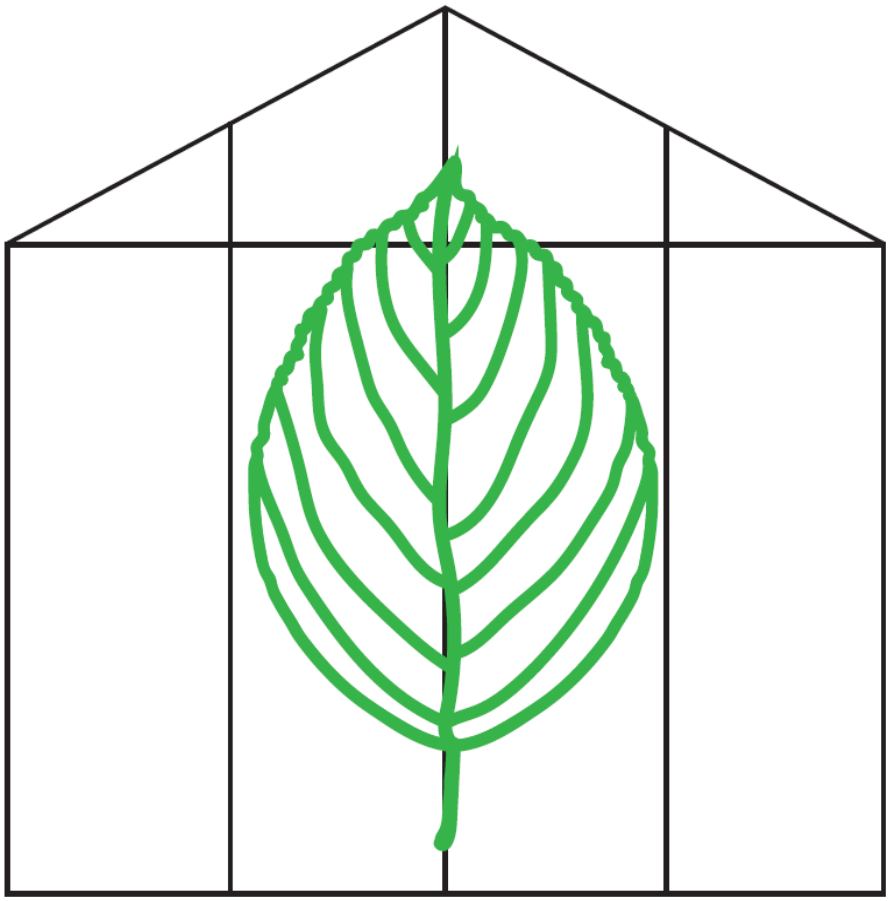
Innovation decisions towards a sustainable future of the greenhouse horticultural sector

Exploring the influences on innovation decisions of greenhouse horticulture entrepreneurs

– B.P. Poot



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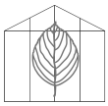

Innovation decisions towards a sustainable future of the greenhouse horticultural sector

Exploring the influences on innovation decisions of greenhouse horticulture entrepreneurs

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Table of contents

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Happy reading!

Executive summary

The Earth's climate and ecosystems are changing. The consequences of changes in the Earth's System can be deleterious or even catastrophic for the environment. These changes are caused by the emission of greenhouse gases (GHG) in the atmosphere. The burning of fossil fuels is one of the factors that leads to these emissions.

Policies have been designed and adopted all around the globe to mitigate climate change by controlling the emissions of the pollutants. The consequences of climate change are felt globally, so global action is needed. Measures of international coordination have been set to guide nations. The Netherlands, as a Member of the European Union, has to meet the GHGs emission reduction targets of the European Union. The greenhouse horticultural sector in the Netherlands consumes a relative large amount of energy and contributes to the emissions of GHGs, especially to the emission of CO_2. The carbon footprint of the sector has to decrease by saving energy and making use of renewable energy. The New Cultivation Concept is a joint action programme of the Ministry of Agriculture, Nature & Food Quality and the interest group of the greenhouse horticultural sector, LTO Glaskracht Nederland. This programme focuses on quality improvement, production maximisation of crops and at the same time reducing CO_2 emissions. This is done by changes in cultivations methods and investments of the greenhouse horticultural entrepreneur.

The implementation of this action programme is important to reach the targets which are set by the European Union and the Dutch government. Different factors underlie the decision of the greenhouse entrepreneur to apply measures of the New Cultivation Concept in the greenhouse. These innovation decisions are almost never individual decisions, stakeholders influence the decision making process. This leads to the following central question of this study:

"In what ways do stakeholders influence the greenhouse horticulture entrepreneur in making innovation decisions, especially with regard to the "New Cultivation Concept"?"

To be able to answer this question a case study has been carried out. With a focus on the relationships of different stakeholders within the decision making process of the greenhouse horticulture entrepreneur, the external pressures. Especially focused on the influence of the cultivation consultants, suppliers and the horticultural journals during the decision making process. Besides, also the influence of internal pressures on the decision making process has been studied. Six decision making processes of six entrepreneurs were used as cases. Three entrepreneurs can be categorised as innovators and the other three entrepreneurs can be categorised as early adopters when it comes to implementing the measures of the New Cultivation Concept. Interviews were carried out with the entrepreneurs, cultivation consultant and supplier of the entrepreneurs.

Leading to the following results. First of all the internal pressures influence the need to start to collect information. Entrepreneurs who find energy savings and sustainability important seem to start collecting data on the New Cultivation Concept more soon. Secondly, the way of collecting information is influenced by the internal pressures. Energy savings, sustainability and a better understanding of the plant leads to active search for different measures of the New Cultivation Concept to apply in the greenhouse. Furthermore, external pressures influence the information collection of the entrepreneur. In a more dense network the need for the

entrepreneur to actively search for different measures decreases. Besides, the closer situated stakeholders will cooperate more with the entrepreneur leading to modified solutions in which all parties search for relevant information.

When looking at the specific stakeholders studied for this research the following results are obtained. The horticultural journals only provide information at the start of the decision making process, providing the entrepreneur information about the environment in which he is situated. When the cultivation consultant cannot provide the right information with regard to the New Cultivation Concept, the entrepreneur will not use or will use the information of the cultivation consultant to a limited extent. Other stakeholders are used (when it is an already existing information channel) or found (when it is a new formed information channel) to provide the entrepreneur with information regarding the New Cultivation Concept. These new formed information channels consist of small dense networks which provide ready-made solutions with regard to the New Cultivation Concept. For suppliers of plant materials the role in the decision making process of the entrepreneur sticks to the identification phase, whereas suppliers of technical systems also have a role in the other phases of the decision making process. The suppliers of technical systems are located in the guidance committee - a small dense network - with the entrepreneur in which also other stakeholders participate.

Further research should focus on the intercommunication in the small dense networks. Besides, a better understanding should be obtained on the different kind of motivations of greenhouse horticulture entrepreneurs for applying measures of the New Cultivation Concept. Moreover, how this motivation influences the information collection in the decision making process.

LIST OF ABBREVIATIONS

CSR	Corporate Social Responsibility
EEA	European Environment Agency
EFAS	Edinburgh Farming Attitudes Scale
EFOS	Edinburgh Farming Objectives Scale
EU	European Union
GES	Greenhouse as Energy Source
GHG	Greenhouse gases
LEI	Agricultural Economic Research Institute
Ministry of LNV	Ministry of Agriculture, Nature and Food Quality
NCC	New Cultivation Concept
WEcR	Wageningen Economic Research
WUR	Wageningen University and Research

1. Introduction

1.1 Problem indication

The Earth's climate and ecosystems are changing. Over the past 540 million years the temperature on the Earth has been warmer 85 percent of the time than it is today. Also colder periods have existed, mostly known as ice ages. It can be said that changes in the system of the Earth are a continuous process, where colder and warmer periods alternate (Herman, 2009). However in recent years a tremendous shift has been seen, a new epoch has entered, also known as the Anthropocene (Rockström et al., 2009). In this new epoch the dominant drivers of change in the Earth's System are human beings, due to the ever-expanding quest of human needs like feed, house and clothes (DeFries et al., 2012). To meet those requirements, fossil fuels are needed to generate electricity, for the cooling and heating of buildings and the empowerment of vehicles. The burning of fossil fuels leads to the emission of greenhouse gases (GHGs) in the atmosphere. This also happens due to cutting and burning down forests that normally retain the GHGs. Many scientists view the Industrial Revolution, which began in the late 18th century, as the start of the human emission of GHGs in the atmosphere. Different kind of GHGs exist, the most common ones that humans have brought into the atmosphere are carbon dioxide (CO_2), methane, nitrous oxide and fluorinated gases. Many of these gases remain in the atmosphere for a longer period of time. Which means that past emissions affect the atmosphere on a daily basis. Accordingly, future emissions will affect the atmosphere in the foreseeable future (EPA, 2016).

The consequences of changes in the Earth's System can be deleterious or even catastrophic for the environment. The transition from the Holocene to the Anthropocene affects every living creature on this planet. Where the Holocene provided a stable environment for agriculture and complex societies to develop and flourish, the period of the Anthropocene is uncertain. Science has already proved that changes in the Earth's climate and the stratospheric ozone are affected by human activities. These activities causes serious pressures on the planet. Other biophysical processes are certainly affected by human activities, for example the rate of biodiversity and ocean acidification. However, these effects are still unclear. If these human activities did not take place the Holocene state would possibly have retained for thousands of years (Rockström et al., 2009; Steffen et al., 2015).

The biophysical process is the development in the Earth's climate, also known as climate change. This process is well known by the world population, being daily in the news on a global basis. The Earth's climate contains the long-term average of the individual weather conditions which communities experience every day. Moreover, the climate is variable and changeable, having consequences for ecosystems and livelihoods (Sango & Godwell, 2014). These consequences of climate change have been studied often after the Rio Earth Summit of 1992, also known as the United Nations Conference on Environment and Development (Safi et al., 2016). A large variety of consequences can be listed: sea level rise caused by land-based ice and thermal expansion of the oceans because of increasing ocean temperatures; rise in

intensity, frequency and different types of extreme events; wide ranging effects on the environment; wide ranging effects on socio-economic and related sectors, like agriculture (UNFCCC, 2007).

Besides the research on the consequences of climate change, research has also been done with regard to climate change mitigation. Policies have been designed and adopted all around the globe to mitigate climate change by controlling the emissions of the pollutants. The consequences of climate change are felt globally, so global action is needed. Measures of international coordination have been set to guide nations, treaties such as the United Nations Framework Convention on Climate Change (UNFCCC) and the extended Kyoto Protocol (IPCC, 2014). A recent example of a complementary initiative of the UNFCCC is the Paris Agreement of 2015. In this agreement goals are set to avoid dangerous warming by staying below a rise in temperature of two degrees Celsius. The European Union (EU) was one of the parties that signed this agreement and set targets to reduce GHGs emissions (EEA, 2016).

The Netherlands, as a Member of the EU, has to meet the GHGs emission reduction targets of the EU. The bigger firms in the Netherlands are covered by the EU Emission Trading System, while for the other – smaller - firms the Dutch government makes policies, agreements and provides subsidies as well as financial stimuli. These firms are from all kind of sectors, each contributes in a different extent to climate change (Atsma, 2011). A sector that contributes approximately ten to fifteen percent to the GHGs in the Netherlands is the agricultural and horticultural sector (CBS, 2016). At the same time this sector experiences the consequences of climate change, for example the extreme weather conditions that occurred June 2016. The extreme weather caused a lot of damage to crops, affecting the economy with a loss of millions of euros (NRC, 2016).

Within the agricultural and horticultural sector in the Netherlands, the greenhouse horticultural sector consumes a relative large amount of energy as shown in Appendix VII. The sector contributes to the emissions of GHGs, especially to the emission of CO_2. The emissions per product and the energy consumption per product have decreased in recent years due to innovations, resulting from cooperation's between the Dutch government and the sector itself. However, the current supply of energy is almost entirely based on fossil fuels. Due to the trends towards more illuminate cultivation and crop-cooling, the major challenges of this sector are energy efficiency, sustainable energy and reduction of CO_2 emissions in order to become more sustainable and less dependent on fossil fuels (CE Delft, 2015).

The horticultural sector is one of the nine so-called "top sectors" in the Netherlands, due to the contribution the Netherlands makes to this sector on a global scale. By 2020 the Netherlands wants to be the leading country within this sector by providing sustainable solutions to social problems. A steady flow of innovative technological approaches is provided by collaborations between firms, research institutes and governments, the so-called "Golden Triangle". This results in material and immaterial innovations, so products or knowledge which leads to changes in the way of conducting business. This will cause a common vision and action plans from the involved stakeholders (Verdouw et al., 2014). According to Gerritsen et al. (2014) these innovations are mainly focused on sustainability. An example of an action plan is "Het Nieuwe Telen" (further: New Cultivation Concept (NCC)). This joint programme of the Ministry of Agriculture, Nature & Food Quality (further: Ministry of LNV) and the interest group of the greenhouse horticultural sector, LTO Glaskracht Nederland, focuses on quality improvement, production maximisation of crops and at the same time reducing CO_2 emissions. This is done

by changes in cultivations methods and investments (see Appendix I, 1). The action plan derived from the transition programme "Kas Als Energiebron" (further: "Greenhouse as Energy Source" (GES)) which exists since 2002. This transition programme is the foundation for achieving the goals of the "Convenant Schone en Zuinige Agrosectoren" - also known as "agroconvenant" - set up in 2008 by the Ministry of LNV and LTO Glaskracht Nederland to reduce CO_2 emissions in the horticultural sector (Velden, van der & Smit, 2013).

1.2 Research aim and research question

Research has already been conducted on sustainable behaviour of entrepreneurs in the sector (Verstegen et al., 2003a; Ruijs et al., 2008; Velden, van der & Smit, 2013; Buurma & Smit, 2013; Buurma et al., 2015). The different studies mention different factors which influence the sustainable behaviour of the entrepreneur. Including business factors, stakeholders, personal traits and attitudes of the entrepreneur. The government and the research institutes, as part of the "Golden Triangle", are one of the stakeholders which influence the greenhouse horticulture entrepreneur. The Dutch government recognises that the implementation of innovations stands or falls by the different factors, but no thoroughly research has been done to this influence for the New Cultivation Concept action plan (see Appendix I, 3). The aim of this research is to provide knowledge on the forcefield of the entrepreneurs in the greenhouse horticultural sector. This knowledge can eventually lead to improvements in the implementation of the legislation formulated by the Dutch government. So, the role of the Dutch government is not only to stick to formulating the legislation for the entrepreneurs in the greenhouse horticultural sector, but also to look at the factors that can influence this entrepreneur and eventually the implementation of the legislation. In this policy area this recognition was already there. But, in recent years this trend is implemented in a wide variety of policy areas, called "met kennis van gedrag beleid maken". The broad recognition for the need of behavioural sciences - when making legislation - came in 2008. Classical economic assumptions on decision making did not provide the right information and could not prevent the financial crisis. Onwards, two major problems have been identified. First, summed up individual decisions seem to cause a lot of problems, for example climate change. Second, the Dutch state is a so-called neo-liberal state, with focus on own responsibility and freedom of choice for her citizens. It is not a given fact that people are capable of doing the right thing, the government should be aware of this and try to prevent wrong decisions (WRR, 2014). Moreover, the action plan needs to be carried out well with the right information spread out by the different actors involved. When wrong information is distributed the goals and ambitions of the action plan are harder to reach. With this knowledge the government can anticipate on the different influencing factors and could try to ensure that these factors will push the entrepreneur in the right direction, which leads to the implementation of sustainable innovations (see Appendix I, 3).

The focus of this study will be on the innovations that derived from the New Cultivation Concept action plan. As mentioned above, the main challenge of the horticultural sector is energy efficiency, sustainable energy and the reduction of CO_2 emissions. The government wants to stimulate sustainable behaviour. It is interesting to know which factors influence the entrepreneurs in making innovation decisions. The entrepreneurs chosen for this study consist of entrepreneurs which can be seen as innovators and early adopters (see paragraph 3.6 on Case selection). Entrepreneurs almost never make individual decisions, stakeholders influence the decision making process. To what extent these stakeholders have influence depends on the stakeholder themselves and on the entrepreneur's personality, the degree in which the entrepreneur wants go get informed (Verstegen et al., 2003). Stakeholders cannot be defined

in a clear manner, because no consensus exists. Freeman (1984, p. 25) has set the basis with his definition: "*any group or individual who can affect or is affected by the achievement of the firm's objectives*". Broader and tighter definitions have developed over the years, the main principle is the requirement of stakeholders influencing the choices made by the management of the firm (Rowley, 1997).

Before providing the research question it is important to clarify what the greenhouse horticultural sector entails. It is a sector which focuses on the production of horticultural crops within glass or plastic structures. This way of growing crops provides modified growing conditions and/or protection from pests, diseases and adverse weather (NSW Government, 2016). It is the only production method that can significantly control abiotic and biotic conditions (WUR, 2016a). The Netherlands is unquestionable the leading country in the international market of flowers, plants, bulbs and reproductive products. Moreover, it is the number three exporter of the world in nutritional horticulture products like vegetables and fruit (Dutchagrofood, 2016).

The concept of sustainability has to be clarified as well. Anticipating the Rio Earth Summit of 1992 the Brundtland Commission (1987) – also known as the World Commission on Environment and Development – came up with a definition on sustainable development: "*meeting the needs of the present generation without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p. 8). Sustainability in this manner means to ensure that material reproduction does not diminish the fortunes of future generations (Warde, 2011). The European Environment Agency (EEA) describes environmental sustainability should include a reduction in environmental pressures and achieving gains in resource efficiency (EEA, 2015). This is exactly what the Dutch government wants to achieve with their legislation within the greenhouse horticultural sector. Reducing CO_2 emissions by saving energy and promoting sustainable energy. The innovations deriving from the New Cultivation Concept cause energy savings, sustainability will refer to this component and will be specifically called "environmental sustainability".

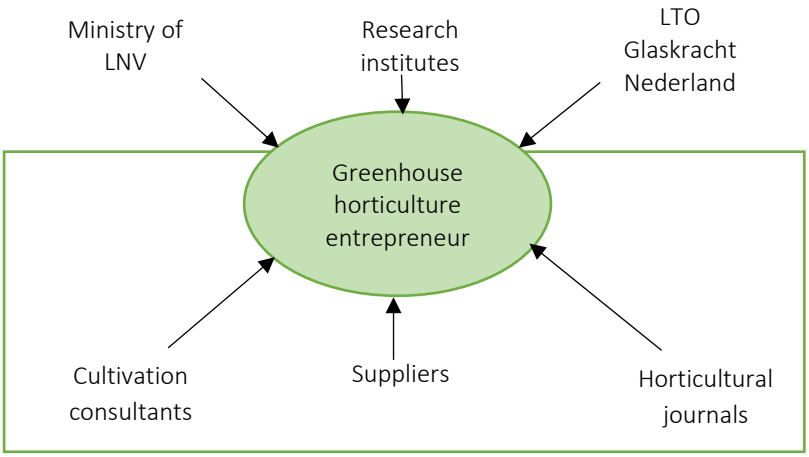
Focusing on the innovation decisions made by the greenhouse entrepreneurs it should be clear what innovations consist of. It is a broad concept which is often linked to business and the improvements made to a product, which can be a good or service. However, the implementation of new or significant improvements can also be made in processes, methods, workplace organisation or external relations (European Commission, 2016). After clarifying certain concepts which are important for the central question, this question can now be formulated.

The central question of this thesis is:
"*In what ways do stakeholders influence the greenhouse horticulture entrepreneur in making innovation decisions, especially with regard to the "New Cultivation Concept"?*"

Due to time limitations, not all the factors which influence the entrepreneur in making sustainable innovation decisions will be studied thoroughly. The focus of this study will be on external pressures, addressing the role of cultivation consultants, suppliers and horticultural journals in influencing the entrepreneurs. This is shown in figure 1.1 within the green lined rectangle. These are the stakeholders which - besides the Ministry of LNV, research institutes and LTO Glaskracht Nederland - will be in contact with the entrepreneurs regarding innovation decisions. The cultivation consultant provides advice to various decisions, such as advice on

cultivation but also financial (investment) advice. The supplier supplies materials, services and production or improvement of production tools, such as software adjustments. The horticultural journals provide information on trends, research and experiences of colleagues. It is important to know if the information which the stakeholders provide and the message they bear corresponds to the goals and ambitions of action plan NCC. It is not possible for the government to impose any sanctions on the entrepreneurs for not implementing the innovations, so other ways need to be found to steer the entrepreneur in the right direction to implement innovations (see Appendix I, 3).

Figure 1.1: Greenhouse horticulture entrepreneur and stakeholders



To tackle the broad central question of this thesis five sub-questions arise. These five questions structure the thesis and each sub-question answers a part of the central question.

1. *Why do firms want to innovate in sustainable matters? (Corporate Social Responsibility)*
2. *What does a decision making process consist of when talking about innovations with a goal and having ambitions in mind? (decision making process)*
3. *What is the role of information in the decision making process? (information in the decision making process)*
4. *In what ways can the (cultivating) behaviour of the entrepreneur be influenced? (behaviour theory)*
5. *With which stakeholders is the entrepreneur in contact for making decisions regarding the NCC? (stakeholder theory)*

1.3 Literature review

The greenhouse horticulture as a "top sector" in the Netherlands causes a lot of investments in the field, which leads to many studies. Most studies arrive from Wageningen University and Research (WUR). More in particular from the Agricultural Economic Research Institute (LEI) (recently changed to Wageningen Economic Research (WEcR)). In the "Golden Triangle", which has been mentioned before, it is the main research institute that works together with firms and the government. A lot of research focusses on the growing conditions of crops (Kaiser & Janse, 2016; Messelink et al., 2016; Kromwijk et al., 2015) because greenhouse entrepreneurs see the added value of these studies for their crop quality. Energy efficiency and sustainable energy are studied extensively as well, because energy efficiency and renewable energy will help to reach the targets which are set by the EU and the Dutch government. These studies focus mainly on innovations which occur within the sector (Dueck, et al., 2015; Schuddebeurs

et al., 2015; Gelder et al., 2016). Some studies compare the new, older and even future initiatives of energy efficiency and sustainable energy (Hietbrink et al., 2001). In this study interviews were conducted with stakeholders of those energy efficiency initiatives.

Besides the studies which focus mainly on the innovations within the sector, attention is also given to the business side of implementing the energy efficiency systems in firms. The study of Diederen et al. (2002) focusses on the feasibility of an investment concerning more energy efficient systems. A "real-option" theory has been used during this study, which calculates – in case of irreversibility and uncertainty - the value of waiting to implement innovations. Studies which focus more on sustainability within the sector, and have a focus on energy efficiency and a reduction in the emission of CO_2, are for example the studies of Verreth et al. (2015) and Aramyan et al. (2007). As mentioned above, both these studies focus on the behaviour of firms regarding energy use and investments in energy technologies. For the study of Verreth et al. a dynamic cost minimization and a profit maximization framework for the optimal use of energy have been applied on a panel study of 97 Dutch greenhouse firms in the period 2001-2008. For the study of Aramyan et al. investment theories were used to analyse the factors underlying investment decisions and to explore the underlying factors of the optimal size of investments.

Additionally, a pure social point of view can be observed in research regarding innovation decisions in the greenhouse horticultural sector. As mentioned before, Verstegen et al. (2003a) focuses on sustainable behaviour of greenhouse entrepreneurs by looking at the barriers and drivers for implementing sustainable energy and energy efficiency innovations. The barriers and drivers of 95 greenhouse entrepreneurs were compared to the barriers and drivers mentioned in the "Theory of Planned Behaviour" by Ajzen (1991). Another study of Verstegen focuses on the influence of the market and the entrepreneurs orientation on making strategic marketing choices. Both farmers and horticultural growers were surveyed (Verhees et al., 2012).

All the research discussed above is of Dutch origin, but not only in the Netherlands social research has been conducted in the field of the greenhouse horticulture. For example in New-Zealand (De Silva & Forbes 2015) a study is conducted on sustainability within the sector. With the main goal to provide insights into views, practices, benefits and barriers of sustainability within the New-Zealand horticultural sector. A list of environmental sustainability practices and social and economic sustainability practices was made based on relevant literature. Mixed methods have been used, starting with an online survey followed-up by interviews. Findings on the inconsistent views of sustainability, both for the consumers and growers, resulting in an expectation gap which the government should overcome.

1.4 Relevance of the study

As mentioned in paragraph 1.3, a lot of research has already been done within the horticultural sector with a focus on energy efficiency and renewable energy. The social aspects which are in play when making innovation decisions have also been studied. It is important for the working group of the New Cultivation Concept action plan to know what the message is of the stakeholders who influence the greenhouse horticulture entrepreneur. As mentioned before, by doing so the government knows whether the information the stakeholders provide and the message they bear corresponds with the goals and ambitions of the NCC action plan. With this knowledge the government can anticipate on how the information on sustainable innovations must be brought to attention, both to the different stakeholders and the entrepreneur. In the end the future of the greenhouse horticultural sector and the achievement of legislation

depends on the implementation of the energy transition (see Appendix I, 3). Moreover, the implementation of the energy transition is also important for the society. Schmidheiny describes the importance of sustainability in our contemporary society and the broadness of the topic:

> "*Sustainable development will obviously require more than pollution prevention and tinkering with environmental regulations. Given that ordinary people - consumers, business people, farmers - are the real day-to-day environmental decision-makers, it requires political and economic systems based on the effective participation of all members of society in decision making. It requires that environmental considerations become a part of the decision-making processes of all government agencies, all business enterprises, and in fact all people*" (in Schmidheiny, 1992: 7).

It shows that sustainable development is only possible if all individuals take the environment into consideration and goes beyond the prevention of pollution. The greenhouse horticulture entrepreneurs should do this as well and the findings of this study will provide the government the knowledge on how the information on sustainable innovations must be brought to attention.

Furthermore, this knowledge might also be of interest for other sectors whose future depends on the implementation of innovations. A unique combination of theories is used for studying the innovation decisions of the greenhouse horticulture entrepreneur, which is displayed in the conceptual framework in paragraph 3.1. This developed conceptual framework can be relevant for different kind of innovation decisions within different sectors. This research project can be an example on how these different theories are combined.

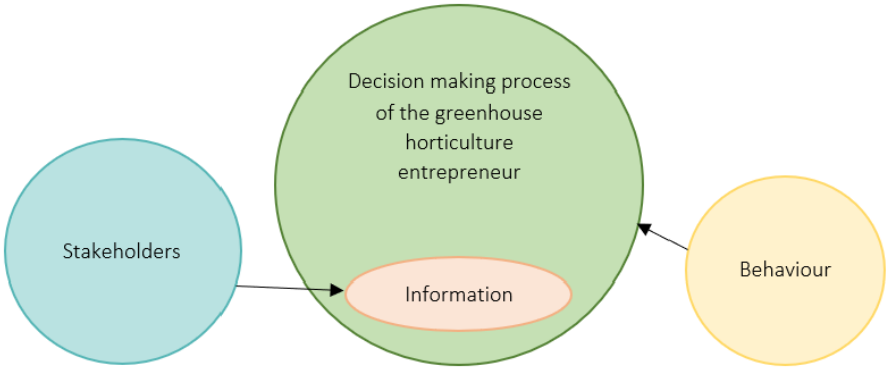
1.5 Reading guide

This study consists of six remaining chapters. Chapter two provides the theoretical framework of this study to make the social phenomenon understandable. The five sub-questions are used as the basis for the chosen theories. Chapter three discusses and accounts for the methodological approach which is used during this study. Chapter four gives an explanation of the New Cultivation Concept and by doing so providing the background information of chapter five on Case study results. In chapter five the sub-questions are answered per case, using the information obtained from the semi structured interviews and additional questionnaires. Chapter six contains the results of the media analysis of the horticultural journals. In the last chapter, chapter seven, the expectations are discussed by using the case study results. Furthermore, the central question is answered in this chapter and the limitations are given of this study. At last, recommendations for further research are set out.

2. Theoretical framework

To answer the research question the theoretical perspectives used during this study should be clear. This helps to backcloth and justify the research which will be conducted. At the same time it will set the framework which makes social phenomenon understandable. Moreover, research findings can be interpreted and structure the empirical analysis (Bryman, 2016). First, it is important to clarify why firms want to innovate to become more sustainable. These theories will focus on Corporate Social Responsibility. In paragraph 2.2 the decision making process sets out a clear image of the steps taken to come to a decision. Paragraph 2.3 focuses on the information gathering in order to make a decision. In paragraph 2.4 the factors which contribute to the behaviour of the entrepreneur are set out. These internal influences on decision making are not the main focus of this study, but are important to contextualise the external pressures on the decision making process. The last paragraph provides the stakeholder theory, which focuses on the types of relationships that occur in a network. Figure 2.1 visualises the linkages between the different subjects of theories which are used during this study.

Figure 2.1: Relation between the different theories



2.1 Corporate Social Responsibility

A link can be found between the notion to innovate and the corporate social responsibility (CSR) of a firm. A strong connection can be seen in Research and Development (R&D) expenditures and organisational attention to ecological and social environments, which are part of CSR (Mithani, 2016). Moreover, the innovations are not only viewed as high technological and product innovations, but also as a part of the firms continuous and systematic broader activities. More and more firms are willing to take the social and environmental impact of their activities in consideration to be innovative (MacGregor & Fontrodona, 2008). Which means CSR should be embed in the firms innovations. But what does this CSR consists of, besides the already called ecological and social environment?

CSR has developed, since it emerged in the 1950s, from a more voluntary practice towards a response on stakeholder pressures whereby future commitments are made. Moreover, CSR is also incorporated in the legislation of a lot of states (Maon et al., 2008). In the earlier years the

academic debate started on what the firms should be held responsible for. In the 1990s environmental concerns grew rapidly, which led to the expectation of firms to respond. The challenges firms faced had to do with the growth of their businesses and the greater use of resources, which led to a greater burden on the natural resources and increasing emissions (Blowfield & Murray, 2014). A clear definition of the concept cannot be given. Many researchers have already tried to combine different literature on CSR to come up with the most appropriated definition for their study (Maon et al., 2008; Blowfield & Murray, 2014; Freeman & Hasnaoui). Recognising that CSR is defined broadly, which has everything to do with the different values that companies wish to uphold. These values differ among the different companies and will lead to different practices (Blowfield & Murray, 2014). This broadness can be merged in the following definition of CSR:

> *"Corporate responsibility comprises (a) the responsibilities of business in the context of wider society (b) how those responsibilities defined and negotiated, and (c) how they are managed and organised"* (in Blowfield & Murray, 2014, p. 12).

Blowfield and Murray mention the wider society as the group which is affected by the way the firms operate, because resources are depleted from the Earth's stock and emissions are emitted.

Maon et al. (2008) put the stakeholders in a central position in the concept of CSR, instead of the wider society like Blowfield and Murray. The group of stakeholders is affected by the firm's business activities, but can influence the business activities of the firm at the same time. The firm is aware of the responsibility they have towards the stakeholder and is seeking society's acceptance of the legitimacy of the firm in return.

2.2 Decision making process

Second of all it is important for this study to look at the decision making process which the greenhouse horticulture entrepreneur will follow when making innovation decisions. This process influences the decisions which are made as well as the consequences that occur (Nutt, 2005). A decision is a specific commitment to action, usually with the need of resources. The process towards a decision consists of a set of actions and dynamic factors (Mintzberg et al., 1976). The sequence actions in the process, according to Bryson et al. (1990), Mintzberg et al. (1976) and Witte et al. (1972), are the gathering of intelligence, setting of the direction, generation of alternatives, selection of a solution and implementing this solution. Various models exist in the literature to explain decision making on different levels (Turpin & Marais, 2004). A main group within the literature focusses on the organisational decision making in the field, researched by management theorists and political scientists (Mintzberg et al., 1976). This literature is interesting for this study and will be set out further.

According to Nutt (2005) organisational decision making is in place when a person in authority classifies an important issue. Moreover, a process starts to come to a choice which will lead to an outcome with consequences. The various models can be divided in many ways. Turpin & Marais (2004) differentiate, among other things, the rational approach, the bounded rational approach and the garbage can model. Nutt (2005) distinguishes on the models which can be seen in table 2.1. Whereby, according to Eisenhardt (1997), the chance, the politics/bargaining and (bounded) rational approaches can be viewed as non-routine decision models which have competing characteristics.

Innovation decisions are not made in a routine manner, because they make a substantial change in the technologies, products and the continuous and systematic broader activities (MacGregor & Fontrodona, 2008). Mintzberg et al. (1976) call this unstructured processes. These processes have not yet been encountered in quite the same form before, no arranged and explicit set of systematic responses exist in the organisation. The action plan "New Cultivation Concept" is a goal-oriented action plan (see Appendix I, 1 & 3). It seems appropriate to focus on the rational approaches which are goal directed (see table 2.1).

Table 2.1: Possible decision models

Approach types	Inferred prescription	Driving force	Illustration/noted by
Opportunity (e.g., Mintzberg)	Position to observe developments	A solution	Decision making awaits a flash of insight that reveals a potentially useful practice *Found when*: the idea uncovered initiated the decision making effort
Chance/emergent opportunity (e.g., March)	Cultivate idea champions	An emergent solution	Alternatives emerge from the chance meeting of pre-existing ideas, perceived needs, choice situations, and people looking for action *Found when*: idea outside the decision making effort pre-empted search
Politics/bargaining (e.g., Pfeffer, Salancik)	Bargain to find solution(s) acceptable to stakeholders	Compromise solution	Decision maker facilitates negotiations to uncover a compromise solution *Found when*: evidence that stakeholders met with the intent of bargaining to find a solution
Rationale approaches—goal-directed (e.g., Simon)	Uncover solution that provides desired results	Target	State expectations and engage people inside and/or outside the organization to find ways to meet expectations *Found when*: a goal could be recalled that was consistent with the results realized
Problem directed (e.g., Van Gundy)	Solution uncovered to overcome problems	Target	Analyze problem to find solution cues *Found when*: a problem was articulated and solution was uncovered that referenced the problem (e.g., moral problems produced moral-like solutions)

Source: Nutt (2005)

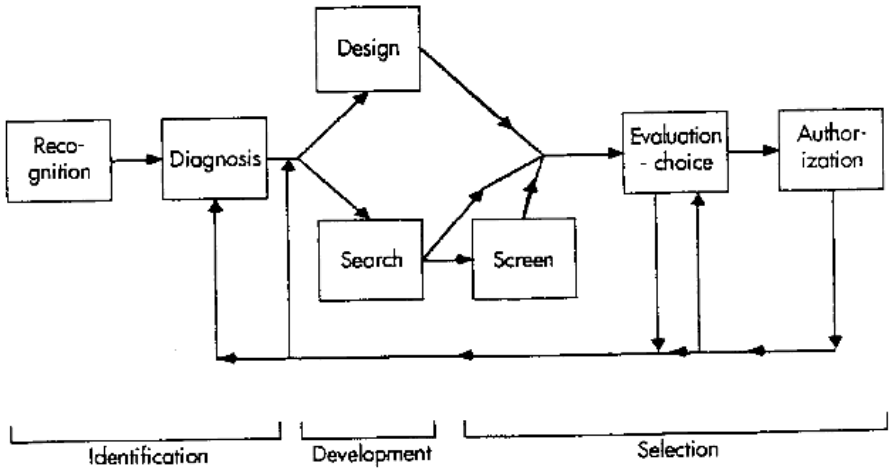
This rational approach is twofold, bounded rational and rational. The rational approach is the idealised predecessor of the bounded rational approach, both set out by Simon (Eisenhardt, 1997). With the rational decision model the decision maker is a rational and complete informed person according to Simon (Simon, 1965 in Turpin & Marais, 2004). In 1979 Simon came up with the bounded rationality decision making model. Decision makers are not seen as "all known" anymore, optimal choices cannot be found and are not always required. There will be searched for options which are satisfying (Turpin & Marais, 2004). Moreover, the decision makers act rational in the limits of their own capabilities, where goals are often redefined. The success of a decision maker relies heavily on the process, which can be rational in some ways but not in others. This can for example refer to the many alternatives which are formulated, but are not analysed thoroughly. Moreover, it refers to contingency plans which are made and based on incomplete information (Eisenhardt, 1997).

The decision making process consists of a number of distinct phases programmed in time. It is not necessary in the decision making process to follow all the phases, it is possible for the decision maker to skip one or more phases (Citroen, 2011). They must be seen as actions instead of phases, so also the order of the phases can differ per decision making process (Öhlmér et al., 1998)

Mintzberg et al. (1976) focus on strategic decision making processes. Strategic refers to important decisions in terms of the actions taken, the resources needed and the criteria set. This model of a decision making process will be used as the basis during this study, along with

literature of other authors. Simon's intelligence-design-choice trichotomy is used as the start for the decision making model. Instead of these concepts Mintzberg et al. use identification, development and selection, within these different phases several "routines" appear. The routines which are visible in the entire decision making process are *decision control, communication and political*, other routines differ per phase (see figure 2.2).

Figure 2.2: General model of the strategic decision making process



Source: Mintzberg et al. (1976)

2.2.1 Identification phase

In the identification phase of the decision making process two routines can be identified, the *decision recognition* and the *diagnosis* (see figure 2.2). In the *decision recognition routine* a decision is recognised when a difference exist between the information on the current situation and the expected standard. Mostly this does not presents itself to the decision maker in a convenient way. Especially for the identification of problem and opportunity decisions the decision maker needs to find his or her way through streams of ambiguous, largely verbal data. The stimuli which tempt the decision maker for making a decision can come from inside or outside the organisation. Often many stimuli are evoked before coming to a decision process. Opportunity decisions can also come from a single stimulus, often an idea. An interesting phenomenon is that of matching. Matching happens when a decision maker sees the possibility to match an opportunity with a problem. The actual determination of the moment of action can be viewed as the relationship between cumulative extent of the stimuli and an action threshold. The extent of each stimuli depends on several factors:

- Influence of its source;
- Interest of the decision maker in the case at stake;
- Perceived pay-off when taking action;
- Uncertainty associated with the action taking;
- Perceived probability if successful termination of the decision.

If the stimuli are cumulative, their combined extension is a function of each. Furthermore, their pattern and frequency plays a part in influencing the actual determination of the moment of action.

When the cumulation of the stimuli reached the threshold level, the decision making process is initiated and resources are gathered, this is the *diagnosis routine*. The decision maker will face an unstructured decision process, with partially ordered data. New information channels are being formed and existing information channels will be used to clarify the crisis, opportunities

or problem at stake. Diagnosis do not need to be a formal and explicit routine which is reported, it can also be informal and implicit.

2.2.2 Development phase

The development phase in the decision making process can be set out in two forms of routines, the *search routine* and the *design routine* (see figure 2.2). Searching means ready-made solutions need to be found, this can be divided in four types. (1) Memory search whereby the organisation's existing memory is scanned, this can be reported memory or the memory in the head of humans. (2) Passive search when organisations are waiting for spontaneous alternatives to appear, but these alternatives can also be looking for organisations (Cyert & March, 1963). (3) Trap search involves stakeholders in the research process by letting them produce search alternatives. (4) Active search consists of directly searching for alternatives this can be in a wide area or a narrow one. The types of search can be used interchangeably. Cyert and March (1963) say search mostly starts in an easy accessible area, where after more remote and less familiar areas are searched when initial failure occurs.

If no suitable ready-made solutions are found the *design routine* comes in. This routine can be divided in two groups, the custom-made solutions and the modified solutions. Modified solutions are founded, suitable, ready-made alternatives, which are narrowed down and redesigned for special application. The custom-made solutions crystallises during the process of shaping. Moreover, the decision maker does not have a clear image of the end stage until it is completed.

2.2.3 Selection phase

A decision process involves a great number of selection steps, most of which scattered around the development phase. In the development phase of the decision making process a decision is factored in a few sub-decisions which require at least one selection step. The intensity of the selections made is higher at the end of the decision process. The selection phase consists of a few routines, the *screen, evaluation-choice* and the *authorisation routines* (see figure 2.2).

When the probability exists that search will generate more ready-made alternatives than can be intensively evaluated, *screening* comes in. The appropriateness of the alternatives are challenged, which reduce the alternatives to a number which can be handled by the decision maker. It eliminates the inappropriate alternatives and does not go into much detail. Mostly this is an implicit part of search, it happens naturally and is not reported.

When a solution is custom-made the role of the *evaluation-choice routine* is to trim on the process and ratification of the solution which has been shaped in the design and diagnosis routine. Plenty of value and factual principles come into play, which most are not concrete and consist of emotions, politics, power and personality. Further, this is complicated by dynamic factors and uncertainty. So, this routine is influenced by information overload and by unintended and intended biases. But how do decision makers cope with these cognitive pressures of selection? According to Soelberg (1967) primary goals and secondary constraints need to be distinguished. This is done by scaling and in that way differentiate between maximising and satisficing alternatives. Each alternative should be evaluated along a line of independent goal criteria. These criteria's differ in the satisfactory or maximisation purposes. Eventually some alternatives remain in the discussion making process which can be divided in acceptable, unacceptable or marginal in keeping the primary goals in mind. The alternatives

which end up in the acceptable category are compared to each other. In the end there will be searched for an outstanding alternative that scores best at the different independent goals.

If the individual decision maker does not have the authority to commit the organisation to a course of action, *authorisation* comes in. In this study this is not the case, the greenhouse horticulture entrepreneur is owner or co-owner of the greenhouse, so this will not be explained further.

2.3 Information in the decision making process

An important factor in the strategic decision making process of Mintzberg et al. is the information which the decision maker collects. The information does not need to be "complete", this means that not all the information needs to be retrieved and analysed, to be still called a rational decision. Relevant information for the issue at stake is always limited, because of limited resources and time to collect the information. Eventually an equilibrium will be reached between the costs and time to collect additional information to base the decision on and the expected benefits of this additional information. These benefits are the prevention of not knowing what decision should be taken in the decision making process (Citroen, 2011). As said before also Simon observed the decision maker as a person who is rational in the limits of their own capabilities. Information is also part of the detailed description of the decision making process of Mintzberg et al. (1976), whereby the communication routine is dominating every phase within the decision making process according to Witte (1972). Furthermore, the quality of decision making is directly linked to the access of relevant information (Rowley, 1998). Before proceeding to the role of information in the strategic decision making process, it should be clear what information consists of.

2.3.1 What is information?

Information influences our perceptions of the world around us, and in that way our attitudes, emotions and actions. A clear and single definition of the concept does not exist, there are multiple dimensions of the concept and also of its role. Different scholars contribute to the debate, like communication, library and information science, organizational science and policy making (Rowley, 1998). A general definition is stated in the Oxford English Dictionary:

> "*information is informing, telling: thing told, knowledge, items of knowledge, news*" (Guton, 1990 in Rowley, 1998, p. 244).

The definition is placed in the context with related terms like knowledge and data. Consensus exist that information is associated with activities, like communication or information processing. A knowledge transfer is made, data and observations of the world are distributed by communication towards an individual (Rowley, 1998).

2.3.2 Role of information in the strategic decision making process

The link between information and decision making has been studied often in the organisation science. Two related themes can be set out in the classical theories, the earlier mentioned rationality approach and bounded rationality approach (Rowley, 1998). Choo (1996) divides three areas in which organisations use information strategically, the first area is that of sense making, looking back in time. Organisations need to know what kind of changes occur in their environment, and why these changes occur. Another area is knowledge creation, looking around in the present, to obtain information for potential innovations that an organisation wants to accomplish. The last area that Choo distinguishes is the area of decision making,

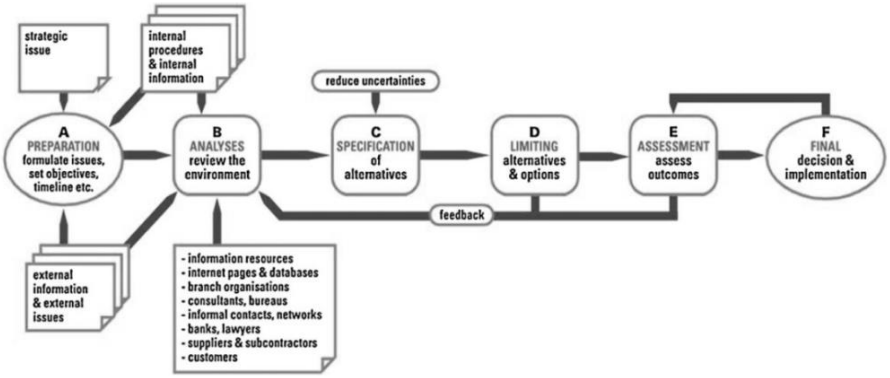
relating to the future. According to Drucker (1993) knowledge is the only meaningful economic resource in a knowledge based economy, other than the mainstream view of capital and labour as the meaningful economic resources.

Citroen (2011) focuses completely on the role of information in the strategic decision making process. Information is rarely seen as a determining factor, but is more used as an enabler to consider parameters during the decision making process. Moreover, quality, the sources and the use of available information are not taking into consideration during the strategic decision making process. An information management study field exists which deals with the information for management decisions (Crowley, 1998; Meadow & Yuan, 1997; Choo, 2002; Alwis & Chaudhry, 2006). Choo (2002, p. 8) states:

> *"An organization behaves as an open system that takes in information, material and energy from the external environment, transforms these resources into knowledge, processes and structures that produce goods or services which are then consumed somewhere in the world. An organization uses information strategically to make sense of changes in its setting, to create new knowledge for innovation and to make decisions about its course of action".*

The kind of information which is used during the strategic decision making process consists of information on internal organisations, market structures, competitors, customer's behaviour, regulations, technologies and public affairs. During his study Citroen came up with the following model, see figure 2.3, to illustrate the role of information during the different phases of the decision making process (Citroen, 2011). These phases correspond to the different phases and their underlying routines of Mintzberg et al. (1976). (A) The preparation phase matches the identification phase of Mintzberg et al.. Identifying the issue faced by the decision maker and after which the objectives are defined and set. Being capable of doing this an initial amount of information is studied about the environment. (B) The analyses and (C) specification phase corresponds to the development phase of Mintzberg et al., identifying and selecting additional information on internal and external parameters which need to be studied. Moreover, it is possible that the decision maker analyses comparable developments in other organisations. In the end alternatives are specified. (D) The limiting, (E) assessment and (F) final phase matches the selection phase of Mintzberg et al. Adequate information is selected to be able to limit the alternatives which have been specified, towards alternatives which have a chance to succeed. The assessment phase takes place when feedback is needed from additional sources of information, to acknowledge the consequences of each valid alternative. In the end a decision is made and implemented.

Figure 2.3: Model of phases of a rational decision making process

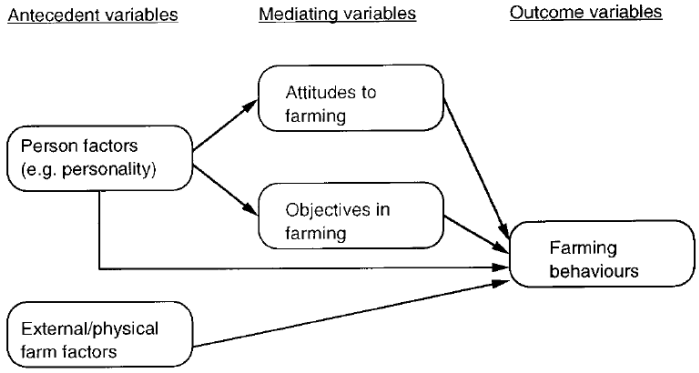


Source: Citroen (2011)

2.4 Behaviour

In the research of Willock et al. (1999) the domains of farmer's attitudes, goals and behaviour are studied extensively. This research is used because cultivating can be seen as a form of farming. The assumption exists, more than in other businesses, that external pressures influence the decisions made by the farmer. This probably has something to do with the more emotional and social meaning of farms for the actors in the surrounding area. Furthermore, the EU always played a huge role in setting restrictions on the possibilities of farmers (Willock et al., 1999). Profit maximisation is not the main task of the farmer, more important is the continuity of the farm. This seems typical for almost all small- and medium-sized firms, but applies even more for the farmer because of being time and spatial bound which refers to long payback time of investments and the historical fixed space (Schnabel, 2001). Willock et al. have tried to set out a broader understanding of the internal pressures of farmers, more specific, on the entrepreneurial behaviour of farmers. The following model on behaviour and decision making has been outlined (see figure 2.4) whereby different kind of variables are taken into consideration. The ones most distant from the dependent variable, in this case behaviour, are antecedent variables. These antecedent variables consist of personal factors, for example personality. The ones closer to the dependent variable, mediating between the antecedent variable and the dependent variable, are mediating variables. In the next section the personal factors which can be in play when making a decision are outlined. After that the mediating variables will be discussed extensively.

Figure 2.4: Relationship among individual differences



Source: Willock et al. (1999)

2.4.1 Personal factors

According to the research of Verstegen et al. (2003b) - on the barriers and drivers of greenhouse entrepreneurs for implementing sustainable energy and energy efficiency innovations - three entities are in play when focussing on personal factors of a greenhouse entrepreneur. These entities consist of the "Big Five personality traits", "Locus of Control" of Rotter (1956) and "Need for Cognition" of Cacioppo and Petty (1982). Further on in this study the greenhouse entrepreneur is referred to as a "he" because most greenhouse entrepreneurs are male.

The "Big Five personality traits", or short "Big Five", consists of five basic factors describing most personality traits. These factors are emotional instability, openness to experience, extraversion, agreeableness, and conscientiousness. They attempt to predict individual differences. If people score high on *emotional instability* they tend to be anxious and angry more easily. Moreover, they are less capable to deal with stress and are insecure which leads to being

susceptible to depressions. When individuals score low on emotional instability they are emotional stable, which refers to calm and poised personal factors. When people score high on the dimension *open to experience* they tend to be open-minded, imaginative, intellectual and sensitive, to themselves and the outside world. The probability exists that the values of those persons will develop and change more easily than for the people that score low on this dimension. Individuals who score low tend to be down-to-earth, insensitive and conventional. Furthermore, the individuals who score higher are more willingly to comply to new ideas and do not hold on to regulations and habits. *Extravert* individuals tend to be active, assertive, talkative and sociable. They are more cheerful and optimistic, where introvert individuals tend to be more reserved, independent and cautious. It is not that they are the total opposite, but just lack extraversion. *Agreeableness* has everything to do with the orientation of an individual to the experiences, interests and goals of other individuals. When an individual scores high this person tends to be cooperative, gentle and helpful. People who score low tend to be inflexible, competitive, irritable and suspicious. The last factor is *conscientiousness*. People who score high tend to be pro-active, which means they can plan and organise well. Moreover, they are goal-oriented, determined and find it hard to lose control. Less conscientiousness people tend to be less strict according to rules, norms and values. Are more likely to be irresponsible and unscrupulous. Furthermore, they tend to be able to deal with setbacks more easily (Roccas et al., 2002).

"Locus of Control" of Rotter (1966) describes the way in which the individual has the feeling he can control the outcome. Moreover, if the individuals can see their behaviour as a reward. "Internal Locus of Control" refers to the notion that the outcome is a product of the individuals own behaviour and characteristics. People who feel internal control want to steer their environment more actively. Moreover, information is collected more actively and used more efficiently so the individual is able to control their environment. If an individual does not see the outcome as a product of their behaviour and characteristics, "External Locus of Control" will apply. The individual sees the outcome as a result of luck, coincidence, destiny or other individuals. Moreover, they are more passive and let things "just happen". Whereas internal focused individuals focus on the achievement of goals, external focused individuals are more concerned with failure (Rotter, 1982).

"Need for Cognition" by Cacioppo and Petty (1982) consists of the tendency of an individual to engage in and enjoy thinking. If an individual scores high on "Need for Cognition", this individual feels challenged to extensively think about matters. Moreover, also evaluating these matters thoroughly. If an individual scores low on "Need for Cognition" this individual does not feel challenged to extensively think about matters (Cacioppo & Petty, 1982).

2.4.2 Mediating variables

Useful mediating variables for farmers, according to Willock et al., consist of objectives and attitudes in farming. More general, these variables deal with coping styles. Willock et al. summarised the literature on the attitudes and behaviour of farmers from 1970 till 1995. Not all the attitudes and objectives will be given in this study, only the ones that seem appropriate for answering the sub-question.

Profit and production maximisation are mostly the outcome of the following attitudes discussed. The first attitude is *risk aversion*. This is an important subject for a farmer and can withhold the farmer from making innovation and new technologies decisions. Moreover, most farmers slowly accept unproved ideas and they have to operate in an uncertain environment.

Closely related to risks are the *innovation attitudes*, implemented to increase the economic viability of the farm according to economists. However, business managers associate innovation with entrepreneurial spirit, doing business by using both strategic (long-term) and tactical (daily) planning based on major management ideas. Another type of attitude useful for this study is the environmental attitude. Where other attitudes mainly have production or profit maximization as a "goal", for this type of attitude it is not certain. Income alone cannot predict the conservation behavior of the farmer, some kind of positive attitude to the environment is needed (Lynne & Rola, 1988; Pampel & van Es, 1977). Others do not see a role for a positive attitude to the environment and say that profit motives will be stronger (Willock et al., 1999).

Objectives are the all-encompassing concept for the goals and the values which the farmer can exercise. These objectives are important to understand the decisions which the farmer makes. To create priorities and pay attention on relevant information, goals are used. Values are also important for farmers and are divided into four dominant values by Gasson (1973). Economic values or instrumental values can be for example the expanding of the business or maximising profit. Second are the social values such as continuing family traditions. As third the expressive values are classified, like pride of ownership. And last intrinsic values are allocated, such as happiness retrieved from work. Two main types of objectives can be identified in the classified values, objectives that are related to economic factors and objectives that are related to job satisfaction (Willock et al., 1999). With the highest rated objective for farmers making profit and the second highest "being good at what you do" according to Robinson (1983).

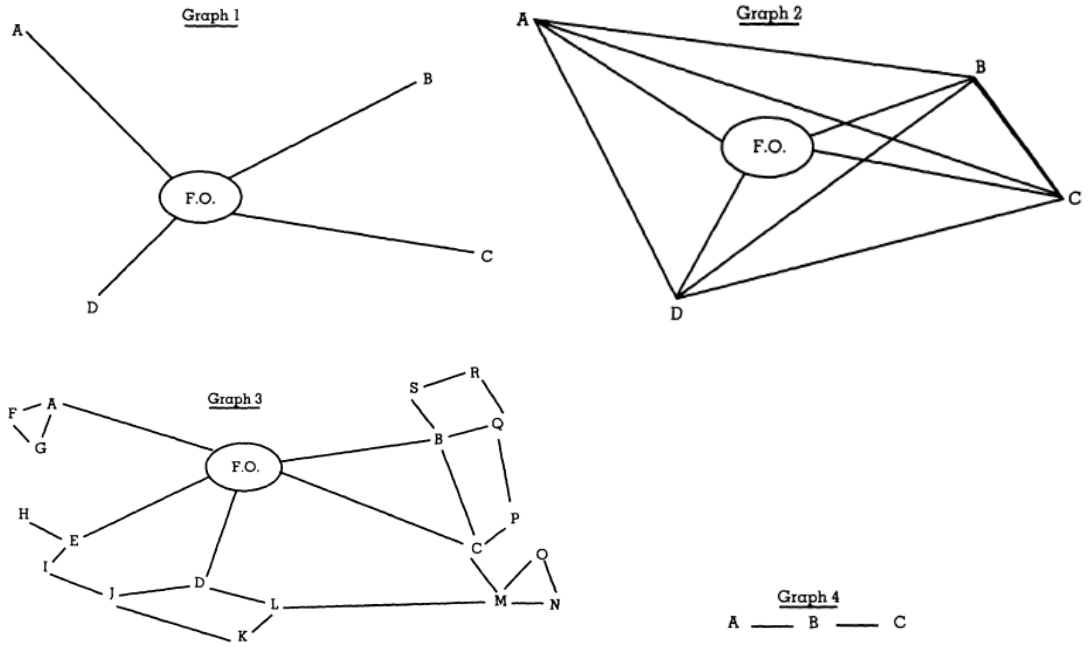
2.5 Stakeholder theory

The organisation's set of stakeholders is a source of external pressures on the behaviour of that organisation (Oliver, 1991). One of the most popular trends in the last century in business and society literature is the identification and management of stakeholders. Freeman was among the first to publish an article, "Strategic management: A stakeholder approach", where others further elaborated on. The outcome of this elaboration provided the knowledge to categorise stakeholders in different groups on ways of influencing the firm's behaviour (Rowley, 1997). "Real" stakeholder theory does not exist, it is a research tradition that developed from a managerial aspect to business ethics, finance, accounting, marketing and strategic management. Within the stakeholder theory studies have shown when more attention is given to stakeholders, the organisation's performance improves (Gooyert, 2016). As said before, no clear definition of stakeholders exist, but it is clear that management decisions are influenced by stakeholders. When identifying the different categories of stakeholders nothing is said about the response of an individual firm. The firm's behaviour is not based on responding to one stakeholder, but on the interaction of multiple influences from the different stakeholders (Rowley, 1997).

In figure 2.5, graph 1, the dyadic ties between a firm and its stakeholders are drawn. Only direct relations with the central organisation – the focal organisation – and the stakeholders are seen (Freeman, 1984). In graph 2 Freeman together with Evan (1990) came to the recognition that the firm's stakeholders can also be in relationship with each other. This in-between position of the focal organisation will influence their behaviour, but it is not realistic that all stakeholders will be in contact with each other. Which led to the development of graph 3 by Rowley (1997). The focal organisation does not necessarily need to be the centre of the stakeholder set, but

the position of the organisation is an important explanation for its behaviour (Rowley, 1997). With the valuable insides addressed by network theories, Rowley tried to broaden the stakeholder theories by focussing on the relationship patterns influencing the organisation's behaviour. For this study it is important to get an understanding on how the relationship patterns of the entrepreneur influences the information collection and in the end the decision made. By using this theory the researcher recognises the importance of the interaction of multiple influences from different stakeholders. In the next section the network concepts, density of the network and centrality of the focal organisation within this network, are set out. Both concepts elaborate on a different aspect of the network. Density is characterised by the network as a whole, whereas centrality refers to the individual position of the actor relative to others.

Figure 2.5: Network structures and patterns of relationships



Source: Rowley (1997)

2.5.1 Density

Density refers to the environment's interconnectedness and is a characteristic of the whole network. It measures the relative numbers of relationships within the network. It can be calculated as a ratio of the total of relationships in the network, compared to the maximum number of relationships possible if every stakeholder would be linked to each other. A complete relationship would result in a density of one. When looking again at the graphs, graph 2 has a density of one, where all the stakeholders are in relation with each other. There are two relevant characteristics of density to examine the responsiveness of organisations to stakeholder pressures. First, communication across the network will become more efficient when density is higher. The information will distributed through the whole network because of the extensive ties between stakeholders. Collectively monitoring of the focal organisation by the different stakeholders can occur and coordinating the pressure on this organisation. Second, within the network the norms will be spread out easily. Patterns of exchange will be formed through extensive ties, whereby shared behavioural expectations are produced. Eventually this will lead to behavioural change of the firm at stake, densely high networks will cause restrictions to the focal organisation's actions. When stakeholders are putting pressure on the focal organisation it is hard to resist, because the stakeholders are not easy played against each other. Moreover,

it will be difficult for the focal organisation to find a sympathetic group of stakeholders (Rowley, 1997).

This all will lead the organisation towards conformity, the unified pressure of the stakeholders will cause the organisation less discretion over its own actions. Additionally, when a network is not connected to a large extent this will lead to more conflicting stakeholder influences. In the end this means that the focal organisation is unable to conform to every stakeholder expectations, because they are wide spread (Rowley, 1997).

2.5.2 Centrality

Centrality implies the position of status of the actor in the network. Density is characterised by the network as a whole, whereas centrality refers to the individual position of the actor relative to others. Three types of centrality are found in the social network literature. First, "degree" centrality which looks at the number of ties the actor has with other actors in the network. When an actor is "well connected", he or she has many ties in the network. This leads to the availability of many information sources and resources to choose from for the actor. Second, "closeness" centrality refers to the ability of the actor to reach out to the other actors in the network independently. This can be calculated by measuring the length of the different ties to the other actors, where the most central actor has the shortest aggregate distances to all other actors. This will lead to an independent access and efficient communication, whereby fewer message transmissions are needed with a shorter time and lower costs. At last, "betweenness" centrality looks at the position of an actor in the ties of other actors. It measures the frequency the actor is placed on the geodesic paths between pairs of actors, as shown in graph 4 of figure 2.5. This will give the actor, which is located "in between", the possibility to control the other actors' accesses to other parts of the network. They can be brokers or gatekeepers, because they facilitate the exchanges which happen between the other actors. This measurement is most appropriate to find out which actors have the ability to control the information flows in a network (Rowley, 1997).

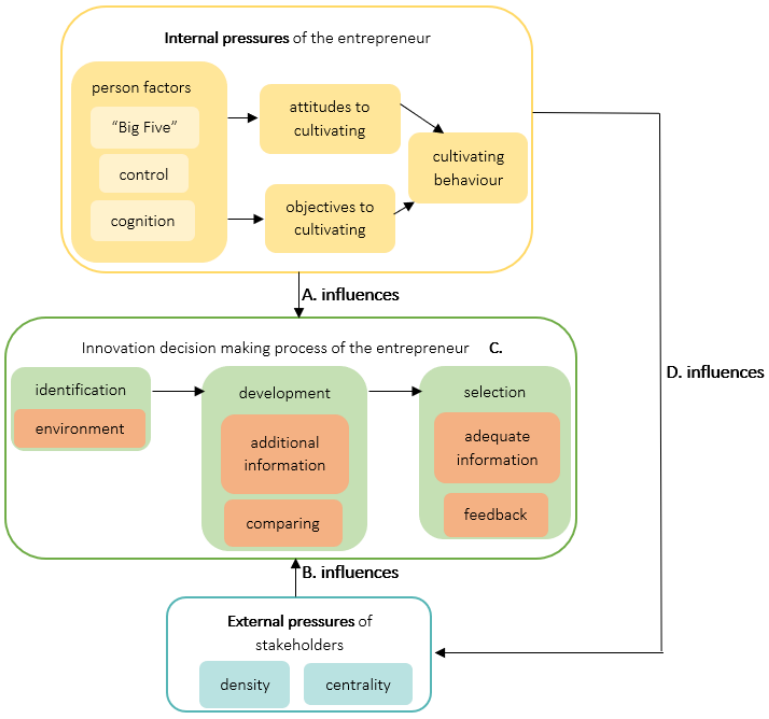
3. Methodology

Social science consists of three basic aspects: theory, data collection and data analysis (Babbie, 2010). This chapter discusses and accounts for the methodological approach which is used during this study. It consists of the ways in which data is collected and the justification of this data collection. It clarifies which research methods are used to answer the research question. Before doing so, a conceptual model is drawn which combines the different theories used, leading to four expectations. In addition, the research stages for this study are given in paragraph 3.2. Paragraph 3.3 starts with the philosophical position of the researcher to clarify the source, nature and development of knowledge. After that the research strategy and design are given in paragraph 3.4. In paragraph 3.5 the methods of the data collection are described. Paragraph 3.6 provides justification for the cases chosen for this study. In paragraph 3.7 the ways of analysing the cases and the operationalisation is defined. At last, in paragraph 3.8, research ethics are described.

3.1 Conceptual framework and expectations

An ideal type of a strategic decision making process is visualised in figure 3.1, of which the basis was already shown in figure 2.1. It provides the most important concepts and relations of the research project. Moreover, this model is a starting point to answer the central question of this study: *"In what ways do stakeholders influence the greenhouse horticulture entrepreneur in making innovation decisions, especially with regard to the "New Cultivation Concept"?"*

Figure 3.1: Conceptual model



The conceptual model provides a schematic presentation of the different relations between the theories explained before. It is an "ideal" type of decision making process leading to some expectations of the conducted research. The different relations with their expectations are indicated by a letter in the conceptual model and discussed in the next paragraph.

3.1.1 Relation A: Influence of internal pressures on the information collection of the greenhouse entrepreneur

Diverse internal pressures lead to the behaviour of the horticultural entrepreneur, of which some have an expected influence on the information collection of the entrepreneur. When looking at the "Big Five personality trait", an entrepreneur who scores high on open to experience and is extravert is expected to collect more information. Furthermore, if the entrepreneur scores high on agreeableness and low on conscientiousness he is expected to collect more information. If an entrepreneur scores high on conscientiousness he is expected to collect information more efficiently. When the entrepreneur is internal focused - "Internal Locus of Control" - information is expected to be collected more actively and used more efficiently. If the entrepreneur has a high cognition he is expected to collect more information. Looking at the mediating variables, an entrepreneur who scores high on openness and success in farming will collect more information. At last, if the entrepreneur finds sustainability matters important this will lead to collecting more information with regard to the NCC. This can also be tested when looking at the notion of CSR of the entrepreneur.

3.1.2 Relation B: Influence of external pressures on the information collection of the greenhouse entrepreneur

The external pressures comprise of stakeholders who are located in a network with the entrepreneur. Moreover, these are the interactions of multiple influences from different stakeholders. How information is collected depends on the density of this network and the role of the entrepreneur within the network. When the entrepreneur operates in a high dense network communication becomes more efficient which is expected to result in a distribution of the information through the whole network. If the entrepreneur is well connected to the stakeholders within the network the expectation arises that the entrepreneur has easier access to information and will collect more information. The independent relation of the entrepreneur with the different stakeholders is expected to result in more and efficient information collection. When an entrepreneur is able to control the information flows within the network it is expected that those entrepreneurs have more easily access to information.

3.1.3 Relation C: Information collection by the greenhouse entrepreneur will influence the decision making process

In the conceptual model the orange boxes represent the information collection by the greenhouse entrepreneur which influences the different stages in the decision making process (green boxes) and in the end the decision made. In the different phases, or actions, of the decision making process different kind of information is useful. It is expected that the amount of information used during the decision making process will influence the decision making process. It is not yet clear how this will influence the decision making process and the decision made, but it is expected that a correlation will appear.

3.1.4 Relation D: Influence of internal pressures on external pressures

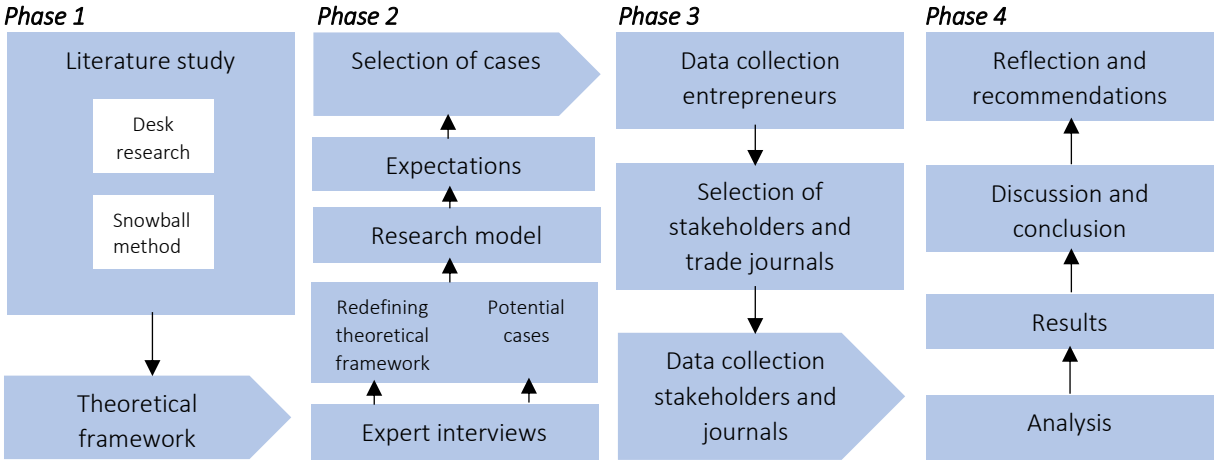
Relation D represents the influence of the internal pressures of the greenhouse entrepreneur on the external pressures. Not stated in the theories used for this study, but it is expected that the

behaviour and/or the CSR of the entrepreneur will influence the position of the entrepreneur within the network, so the centrality.

3.2 Research phases

This research consists of several phases divided in different stages. This process can be seen in figure 3.2, whereof phase 1 and a part of phase 2 have already taken place. Below the stages per phase are explained.

Figure 3.2: Research phases and stages



After the research proposal *phase 1* started. Literature used when writing the proposal is utilised again, but also complementary literature was found. Eventually this led to the basis of the theoretical framework. In *phase 2* expert interviews were conducted, leading to new insights on the theoretical framework and potential cases for the case study. Eventually a research model was formed and expectations, arising from the theoretical framework, were written down. In the end of phase 2 the selection of the cases was finalised and the greenhouse entrepreneurs were contacted. *Phase 3* started with the data collection. Semi structured interviews and additional questionnaires were conducted with the entrepreneurs. The meetings with the entrepreneurs led to the selection of the stakeholders - cultivation consultants and suppliers - involved in the decision making process of the entrepreneur. Furthermore, horticultural journals were selected based on the information of the entrepreneurs. In the end of phase 3 data of the involved stakeholders and horticultural journals was collected. During *phase 4* the collected data was analysed. The results were written down and led to the verification of some of the expectations. In the conclusion the central question has been answered, after which the reflection on the research and recommendations on further research have been given.

3.3 Research philosophy

The research philosophy provides information on the researcher's philosophical position in the study. In this way the perspective of the researcher on the empirical data will be given and by that the believes and assumptions of the researcher. It clarifies the source, nature and development of knowledge (Bryman, 2016). Concerning ontology, there are two extremes; the positivist and the constructivists. The positivist believes that reality can be observed, measured and generalised. In contrast, the constructivist says that reality is based on social constructions (Guba & Lincoln, 1994). In this study the researcher takes a postpositivist position, situated in

between the positivist and the constructivist point of view (see table 3.1). Science is seen as a systematic attempt expressing the concepts to know reality. It is a way of knowing instead of reflecting reality as the positivist would think. In this study the decision making process, the cultivating behaviour of the entrepreneur and the network in which the entrepreneur operates exist independently of human thoughts and beliefs. However, these constructs are interpreted through social conditions, so reality can only be approached and not known for sure.

What kind of consequences does a postpostivist position have for the epistemological position of the researcher, so focussing on what can be known and how can this be known. Objectivity of the data collected cannot be formed by an individual, but can be approached by a group of people. This is done by being critical on each other's research and findings (Bryman, 2016). The theories chosen for this study approach reality according to the researcher, because the theories have "survived" critical sounds from the academic field (Trochim, 2006). Regarding the case study different interviews are carried out per case, leading to different views on the cases. However, the framing of the questions and the interpretation of the answers by the researcher influences the collected data. Doing this in a semi structured way will help to avoid total subjectivity. Besides, different views on the cases will create the bigger picture and helps to try to approach reality. However, the researcher might be biased because of her affinity with the greenhouse horticultural sector.

Table 3.1: Basic beliefs (metaphysics) of alternative inquiry paradigms

Item	*Positivism*	*Postpositivism*	*Critical Theory et al.*	*Constructivism*
Ontology	naive realism—"real" reality but apprehendable	critical realism—"real" reality but only imperfectly and probabilistically apprehendable	historical realism—virtual reality shaped by social, political, cultural, economic, ethnic, and gender values; crystallized over time	relativism—local and specific constructed realities
Epistemology	dualist/objectivist; findings true	modified dualist/objectivist; critical tradition/community; findings probably true	transactional/subjectivist; value-mediated findings	transactional/subjectivist; created findings
Methodology	experimental/manipulative; verification of hypotheses; chiefly quantitative methods	modified experimental/manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods	dialogic/dialectical	hermeneutical/dialectical

Source: Guba and Lincoln (1994)

3.4 Research strategy and design

This is a descriptive research, in which a description is given of the ways in which a stakeholder can influence the greenhouse horticulture entrepreneur. But as Babbie (2010) outlines, descriptive research is often not limited to a descriptive purpose. Moreover, an explanation of certain patterns is given. The focus of this research is on why certain patterns can be found regarding innovation decisions, by reconstructing the decision making process followed by the different entrepreneurs. Furthermore, reconstructing the network in which the entrepreneur operates.

The main distinction in research is the one of quantitative and qualitative research, but this distinction is not watertight. This is also not the purpose of a research strategy, the purpose is to provide a link between the theory, ontology, epistemology and research design (Bryman,

2016). For this research qualitative methods are used with a postpositivist orientation of the researcher. Qualitative methods used during this study will emphasise words, which makes a connection between the data collection and the use of theories. Focussing on how the individual interpreters their social world (Bryman, 2016), which in this study entails the social world of the greenhouse horticulture entrepreneur. The conceptual model consists of different theories from different researchers throughout the years. Providing the basis of this study from where on data is collected. This is called a deductive approach, testing theories which have been used (Bryman, 2016). One cannot speak of a fully deductive approach because data collected from experts contributed to the theories chosen by the researcher of this study.

The research design of this study is a case study design. The cultivating behaviour and the decision making process of the entrepreneur are studied with a focus on the complexity and particular nature of those cases. Focussing on the relationships of different stakeholders within this decision making process. According to Bryman (2016) this is done best by a case study, because the complexity of the case can be analysed thoroughly. The focus in a case study is on a single illustration of some social phenomenon (Babbie, 2010). In this study it is the in-depth study of the greenhouse horticulture entrepreneur regarding the NCC which will lead to explanatory insights. Although generalisation is not the main purpose of this study it can be called a exemplifying case, whereby the case embodies a suitable context for certain kind of questions and exemplifies a dimension of interest (Bryman, 2016). It is a single-case study design, which entails the NCC, with multiple units of analysis. The units of analysis are the objects of study (Bryman, 2016). Consisting in this study of two types of entrepreneurs: the innovators and the early adaptors. Those two different units of analysis will be compared to each other by using the same methods of analysis (Bryman, 2016). In the next paragraph the methods on how the data is collected is outlined.

3.5 Data collection

Secondary data and primary data were collected from March to October 2017. Both types of data contributed to the background information and the descriptive part of the study. Secondary data consists of literature study and the media analysis. Primary data contains the interviews and additional questionnaires which are conducted. All these types of data collection will be described in detail below.

3.5.1 Literature

Desk research - by the use of search engines - is conducted to find academic articles regarding the greenhouse horticultural sector. Furthermore, theories have been found for the basis of the theoretical framework. A snowball method has been used, looking at the reference list of different academic articles and theories, to find more relevant information regarding the topic of study.

3.5.2 Semi structured interviews

A second method used for collection data are the semi structured interviews. This method is used so the researcher has control over what needs to be known. Moreover, the concepts can emerge out of the data more easily than when using unstructured interviews (Bryman, 2016). Different interviews were conducted. First, four semi structured expert interviews (see table 3.2), provided background information and influenced the conceptual model made. Moreover, these expert interviews influenced the cases which have been selected. These experts were

chosen because they all have some specified knowledge in a particular field, which contributes to the research project.

Table 3.2: Expert participants

#	Name participant	Function	Organisation	Date interview
1	Aat Dijkshoorn	Project manager "New Cultivation Concept"	LTO Glaskracht Nederland	24-04-2017
2	Jan Buurma	Reseacher	WEcR	25-04-2017
3	Leo Oprel	Policy specialist	Ministry of LNV	09-05-2017
4	Kees Vijverberg	Bell pepper greenhouse entrepreneur	FA. C. & R. Vijverberg	26-05-2017

As mentioned earlier the "Golden Triangle" provides a steady flow of innovative technological approaches. The fields in which the experts operate consist of the parties within this "Golden Triangle". Aat Dijkshoorn, working at LTO Glaskracht Nederland, is the project manager of the action plan NCC. He is in contact with all the parties which are involved in the research on and implementation of the action plan. Research on the NCC is, among others, done by the Jan Buurma, a sociological researcher at the WEcR. The person of the Ministry of LNV who is in contact with these parties is Leo Oprel. Promoting research and formulating legislation for the greenhouse horticultural sector and part of the working group of the action plan NCC. The entrepreneur as an expert in the field of innovations is Kees Vijverberg, former owner of a bell pepper nursery and involved in many innovation projects.

Secondly, six semi structured interviews were conducted with the entrepreneurs. The same structured but open-ended questions were asked to all the entrepreneurs (see Appendix II). Eventually leading to the concepts and the theories which needed to emerge out of the data (Bryman, 2016). Besides the questions asked, the participants also needed to draw the network in which they were located regarding the information collection of the NCC. This drawing represents the view of the entrepreneur on the relations among stakeholders and the stakeholders and himself. Third, the cultivation consultants and suppliers of the entrepreneurs were interviewed. Using a snowball method by asking each entrepreneur the contact details of their cultivation consultant and supplier. Also structured but open-ended questions were asked to the cultivation consultants and suppliers. Again these questions led to the concepts and theories which needed to emerge out of the data (see Appendix III & IV).

3.5.3 Additional questionnaire

The data on personal factors, attitudes and objectives which lead to the cultivating behaviour of the entrepreneur are collected by a questionnaire to minimize the influence of the researcher. The questions come from different surveys which have been used for other studies. The researcher did make a choice in which questions were asked in the questionnaire, but the formulation of the questions has been done by other researchers. Furthermore, the researcher conducted the questionnaire before the interview was held, so minimum information on the research was given. The questionnaire is used as an additional tool to the qualitative data of the study, not for the purpose of statistical analysis or generalisation of the data. There are only six participants and these participants are not a sample of the wider population.

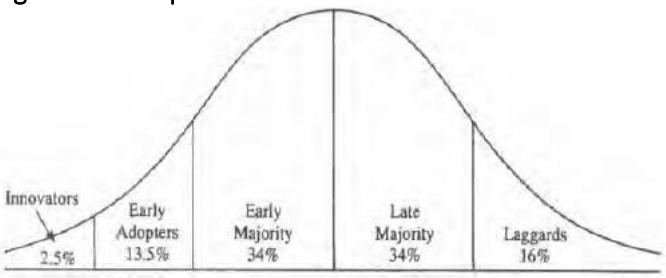
3.5.4 Media analysis

At last a media analysis is conducted. The entrepreneurs were asked which horticultural journals they consult. Eventually the journals which were consulted the most were chosen to conduct the media analysis. Data of these journals is collected through the website of those journals. Looking at the time period from 2009, when the NCC was introduced, till the end of June 2017.

3.6 Case selection

The cases chosen refer directly to the central question in order to generate patterns. In total 17 semi structured interviews were conducted to collect information on the six cases. As noted before these cases were selected with the help of expert participants. Besides, the knowledge and expertise centre Delphy provided names of entrepreneurs who were involved in guidance committees regarding the NCC. The units of analysis of this study consist of the entrepreneurs who are the innovators regarding the NCC and the entrepreneurs who are the early adopters regarding the NCC. Three of each different type of entrepreneur were sampled, called context sampling (Bryman, 2016). In figure 3.3 the adoption curve of Rogers (1962) concerning innovations is used to explain those different types of entrepreneurs. The spread of an innovative idea is influenced by the innovation itself, time, the social system in which it operates and the communication channels. The innovators are the first individuals who integrate the innovation in their firm. They are willing to take risks, have a high social status, financial liquidity, are social and have close contacts with research institutions. Moreover, the innovators are in contact with each other. The early adopters are, according to Rogers (2010), more discreet in adoption choices than the innovators. Furthermore, they score second on all the factors where innovators score first. The greenhouse horticulture entrepreneurs who are the innovators want to be distinctive by implementing new technics. Moreover, they want to command respect from their greenhouse entrepreneur colleagues and want to learn about every tiny technical detail. Whereas the early adopters want to know at forehand what the added value will be of the innovation before implementing it in practice (Buurma & Smit, 2013).

Figure 3.3: Adoption innovation curve



Source: Rogers (2010)

The New Cultivation Concept has not yet been implemented by a lot of entrepreneurs. Only the innovators and a part of the early adopters have implemented measures of the NCC in their greenhouse (see Appendix I, 3). That is why it is only possible to use the innovators and early adopters as unit of analysis. The entrepreneurs in these groups made innovation decision with regard to the NCC. The New Cultivation Concept can apply to different kind of cultivations, both vegetables, flowers and plants (see Appendix I, 3). The categories within the case selection are based on this distinction. Seeking within the distinguished cultivations and matching the guidance committee of the NCC, the following categories can be defined: bell pepper, chrysanthemum and gerbera. Table 3.3 shows the different cases which have been selected.

Table 3.3: Case study participants - entrepreneurs

#	Name participant	Function	Firm	Cultivation and position	Date interview
1	Danny van der Spek	Owner	Van der Spek bv.	Bell pepper – Innovator	30-05-2017
2	Maikel van der Berg	Owner	Leo van den Berg bv.	Bell pepper – Early adopter	30-05-2017
3	Bert van Ruijven	Co-owner	Arcadia	Chrysanthemum - Innovator	01-06-2017
4	John Krijger	Co-owner	Zijdezicht	Chrysanthemum – Early adopter	06-06-2017
5	Aad Zuijderwijk	Co-owner	Zuijderwijk-Witzier	Gerbera - Innovator	08-06-2017
6	Ruud van Leeuwen	Co-owner	Klondike Gardens	Gerbera – Early adopter	08-06-2017

The entrepreneurs were asked to provide the names of their cultivation consultant and supplier of plant material or technical systems. Not for every entrepreneur it was possible to give the contact details of their consultant or supplier who provided the information during the decision making process before implementing the NCC. Different reasons underlying this problem, including illness, job differentiation and end of collaboration. Most of the time the NCC is implemented gradually, or techniques which can be used change overtime. Eventually leading to different decision momentums for the entrepreneur when executing the NCC. When the contact details of the cultivation consultant or supplier - which were consulted before implementing the NCC - could not be given, the cultivation consultant or supplier when already adopting the NCC was contacted. Table 3.4 provides the names of the cultivation consultants and table 3.5 shows the names of the suppliers.

Table 3.4: Case study participants - cultivation consultants

#	Name participant	Firm	Entrepreneur's name	Date interview
1	Jeroen Zwinkels	Delphy	Danny van der Spek	06-06-2017
2	Rick van der Burg	Delphy	Maikel van den Berg	13-06-2016
3	René Corsten	Delphy	Bert van Ruijven	14-06-2017
4	Theo Roelofs	Delphy	John Krijger	09-06-2017
5	Marco de Groot	FloriConsultGroup	Aad Zuijderwijk & Ruud van Leeuwen	21-06-2017

Table 3.5: Case study participants - suppliers

#	Name participant	Firm	Entrepreneur's name	Date interview
1	Paul Arkesteijn	Svensson	Danny van der Spek	14-06-2017
2	Kees de Jong	Rijkzwaan	Maikel van den Berg	08-06-2016
3	Hans van Tilborgh	Technokas	Bert van Ruijven	29-08-2017
4	Martien Vis	Dümmen Orange	John Krijger	13-06-2017
5	Rene Beerkens and Jan Voogt	Hoogendoorn	Aad Zuijderwijk	19-06-2017
6	Eric Boerlage	Dümmen Orange	Ruud van Leeuwen	23-10-2017

3.7 Analysis and operationalisation

All the conducted interviews were audio taped and later transcribed by the researcher. The majority of the interviews were conducted physically in meeting rooms at the interviewees' firm locations, whereas some interviews had to be conducted by phone. Subsequently the transcribed text has been analysed in ATLAS.ti. The first step was to code the text into different themes, the so called "initial-coding" (Boeije, 2014). Exploring the data by using the themes CSR, decision making process, information, behaviour and stakeholder theory, described before in the research. This is a so called deductive approach. Eventually the coding scheme has been specified by "axial coding". Adapting and complementing the codes during the process by looking at the data, an inductive approach. In the end "selective coding" is in place, integrating the data to answer the sub-questions by verifying and connecting different codes (Boeije, 2014). The code list can be found in Appendix IIX. For analysing the questionnaires no quantitative software method has been used. With only six participants and 43 question in the questionnaire this did not seem necessary. That is why the results of the questionnaire were analysed by the researcher. Looking at the mean of the personal factors and the mediating variables and the deviation of the mean, shown in Appendix V. At last, the horticultural journals were analysed by searching for certain word combinations in the articles of the journals. Furthermore, twenty percent of the articles was read to judge if the message was positive or negative regarding the New Cultivation Concept.

After the concepts of study have been specified in the theoretical framework and the methods to come to the data necessary for this study are given, the next step is the operationalisation (Babbie, 2010). Operationalisation of the media analysis will be done in chapter 6 on Media analysis, because information described in chapter 4 is necessary to give a complete description. Operationalisation translates theoretical concepts into measurable constructs. The sub-questions, which cover the central question, were given in paragraph 1.2 on Research aim and research questions. They are guided by five themes: (1) Corporate Social Responsibility, (2) decision making process, (3) information in the decision making process, (4) behaviour and (5) the stakeholder theory. The internal and external pressures eventually, as outlined by the conceptual framework, influence the decision made by the entrepreneur. The sub-questions will all be operationalised below.

(1) Why do firms want to innovate in sustainable matters? (Corporate Social Responsibility)

In order to identify the motives of the entrepreneur to adopt the NCC in their firm different questions were asked. Motives refer to the reasons for the entrepreneurs to engage in the NCC. Examining each participant's motives could provide insights on how the interests of the different participants are linked and how these linked interests could have supported the decision making process of the entrepreneur. It could affect the position of the entrepreneur in the adoption innovation curve of Rogers. Questions were asked about what the NCC entails according to the participants; the goals of the participants when adopting the NCC; whether those goals have been achieved; and the future of the greenhouse horticultural sector. These questions are, like sub-question one, displayed in purple in appendices II, III and IV.

(2) What does a decision making process consist of when talking about innovations with a goal and having ambitions in mind? (decision making process)
(3) What is the role of information in the decision making process? (information in the decision making process)

To design the decision making process of the entrepreneur different questions were asked to the different participants. Furthermore, the role of information in the decision making process had to be made clear with the help of the questions. The entrepreneur participants were asked about their incentive to implement NCC; which alternatives of the NCC have been taken into consideration; which alternative has been chosen; which party/parties has/have been involved in each phase of the decision making process; if the information of the party/parties was positive regarding the NCC; and which party/parties was decisive per phase. The consultant and supplier participants were asked questions about how the contact with the entrepreneur was established; with what other actors the participant is in contact regarding the NCC; what the message is of the participant about the NCC; and in which phases of the decision making process the participant is involved. The questions are, like sub-questions two and three, displayed in green in appendices II, III and IV.

(4) In what ways can the (cultivating) behaviour of the entrepreneur be influenced? (behaviour theory)

As said before the data of the growing behaviour of the entrepreneur is collected by a questionnaire. The first part of the questionnaire focuses on the "Big Five personality traits" with emotional instability, open to experience, extravert, agreeableness and conscientiousness as the traits which are in play. Costa and McCrae (1989) invented the NEO Five Factor Inventory (NEO: FFI) method to measure personality traits. In the questionnaire twenty questions were used of this method, four for each trait. Measuring with one "totally disagree" till five "totally agree", called a five-point Likert scale. Leading to four as lowest score and twenty as highest score obtained per trait (see Appendix V, 1). For the reserved questions the Likert scale is exactly the other way around when calculating the scores, with one "totally disagree" having a score of five and five "totally agree" having a score of one.

To measure the "Locus of Control" Schippers (1998) selected twelve questions of the literature of Andriessen (1971). A six-point Likert scale has been used with one representing "totally disagree" and six representing "totally agree". In this study a total of three questions are incorporated in the questionnaire, with the lowest score possible of three (suggesting "Internal Locus of Control") and the highest score of eighteen (suggesting "External Locus of Control") (see Appendix V, 2). For the reversed questions the six-point Likert-scale is exactly the other way around when calculating the scores, with one "totally disagree" having a score of six and five "totally agree" having a score of one.

A Dutch survey consisting of eighteen questions to measure the "Need for Cognition" was issued by Henk Aarts (Verstegen et al., 2003b). An eight-point Likert scale was used, from one "totally disagree" to eight "totally agree". Three questions of the survey of Henk Aarts are included in the questionnaire for this research project, with no reversed questions (see Appendix V, 3).

The attitudes and objectives have been described by the literature study of Willock et al. (1999), different factors underlie those attitudes and objectives. For the attitudes used in this study the factors in play are: achievement in farming; pessimism about farming; openness in farming; and financial risks. The Edinburgh Farming Attitudes Scale (EFAS) is the basis for the questions which Willock provided for the factors, consisting of 130 items. A five-point Likert scale was used to measure the respondent's preference, starting with one "totally disagree and five "totally agree". Eventually 64 items remained of the EFAS for the research of Willock et al (1999) of which nine have been used for the questionnaire of this study. Furthermore, these nine items

are distributed along the four factors, leading to two or three items per factor (see Appendix V, 4).[1] The Edinburgh Farming Objectives Scale (EFOS) measures the factors underlying the growing objectives in the research of Willock et al., which consists of 27 items categorised by five factors. Three factors seems important for this study: success in farming; sustainability; and status, containing eight items in total (see Appendix V, 5).[2]

(5) With which stakeholders is the entrepreneur in contact for making decisions regarding the NCC? (stakeholder theory)

To define the position of the greenhouse entrepreneur and its relation to the different stakeholders in the network different question were asked to the different participants. The entrepreneur participants were asked what kind of information sources are used regarding innovation decisions and which parties are involved when making innovation decision. Moreover, the entrepreneur participants had to draw the network in which they operate regarding the NCC. Furthermore, the cultivation consultants and suppliers were asked how often they are in contact with the entrepreneur and if there are other parties with which they are in contact regarding the NCC. The questions are, like sub-question five, displayed in blue in appendices II, III and IV.

3.8 Research ethics

Generalisation of the data collected and research's own interpretation of the data is harder to justify for qualitative research than for quantitative research. Although it is impossible to "freeze" social conditions there are some ways to come to a more reliable study in which it is possible to more or less make a replica (Bryman, 2016). This is done by providing all the steps which are taking during the study in the methodology chapter. Besides, the questions for the semi structured interviews are carefully chosen and checked by the supervisors of the Ministry of LNV. Furthermore, the questions of the questionnaire are based on other research projects. The conducted semi structured interviews are audio-taped and later transcribed. This is the raw data in which the ideas of the researcher are not in cooperated and total subjectivity is avoided. If necessary this information can be used to check the analysed results.

Validity can be divided in internal validity and external validity. Internal validity refers to the extent in which the methods to collect data indeed measure what the researcher claims to measure (Bryman, 2016). The data of the different cases is collected in the same way. A difference exists between the questions asked to the entrepreneurs and the cultivation consultants and suppliers. This because the interviewees have a different role in the cases studied. The consistence in the interview and questionnaire questions will show the variation in the interviewees answers, instead of a variation in the way of conducting the interviews and questionnaire. Furthermore, in the previous paragraph the operationalisation of the concepts leads to measurable constructs. External validity refers to the ability of the outcomes to be generalised (Bryman, 2016). It is not the main purpose of this study to generalise the data collected to a larger number of cases of the same population. A better understanding of the decision making process to come to innovation decisions by greenhouse horticulture entrepreneurs needs to be found. In which similarities and differences between the studied cases will be given.

[1] The original questions of Willock et al.'s research are displayed, but for the translation in Dutch the questions are changed in a way it fits the greenhouse horticulture entrepreneur.
[2] The original questions of Willock et al.'s research are displayed, but for the translation in Dutch the questions are changed in a way it fits the greenhouse horticulture entrepreneur.

4. The New Cultivation Concept

As the central question indicates this research project is mainly focused on innovation decisions with regard to the New Cultivation Concept, but what this concept entails is not yet clear. This chapter will give an explanation of the New Cultivation Concept and by doing so providing the background information of chapter 5 on Case study results. In paragraph 4.1 the reasons for setting up the NCC action plan are given. Furthermore, paragraph 4.2 explains the different measures of the NCC.

4.1 Start of the NCC action plan

The European Environment Agency (2016) describes a role for energy to reduce CO_2 emissions. Therefore, renewable energy and energy efficiency targets are set out by the European Commission for the Member States. A reduction of twenty percent energy use in the year 2020 - compared to the baseline of 1990 - needs to be achieved. The Energy Efficiency Directive (EED) requires Member States to set their own targets which are non-binding and can be attached to either primary or final energy consumption for 2020 (EEA, 2016). The New Cultivation Concept action programme exists since 2009 and derived from the transition programme "Greenhouse as Energy Source" which exists since 2002. In this transition programme the Ministry of LNV and LTO Glaskracht Nederland work together to reduce CO_2 emission in the horticultural sector, to meet the targets which are set up by the Dutch government (Velden, van der & Smit, 2013).

With the NCC the Ministry of LNV and LTO Glaskracht Nederland want to spread the message on how the entrepreneurs in the greenhouse horticultural sector can reduce the energy use of their cultivation. However, not all people working in the greenhouse horticultural sector are happy with the name "New Cultivation Concept". "New" in the name "New Cultivation Concept" gives the feeling that the other methods, used before or still used, are not good enough. Although the emissions per product and the energy consumption per product have also decreased during the years before the NCC was introduced (CE Delft, 2015). It is not mandatory for the greenhouse entrepreneurs to apply the measures of the NCC, so the government is not allowed to impose any sanctions on the entrepreneurs. That is why other ways need to be found to steer the entrepreneur in the right direction to implement the NCC measures (see Appendix I, 3).

In the early days the focus of the NCC message was on energy savings, rather than quality and quantity of the crops (see Appendix I, 1). Moreover, investments were the core factor to achieve the goals. Nowadays the key of the NCC is to collect new insights on the physic and plant physiological principles, energy savings became a logical consequence rather than the main focus. An active and favourable climate needs to be achieved in the greenhouse with low energy costs. The entrepreneur needs to change his behaviour and put this in practice, where practical experience based on trial and error is replaced by science (Geelen et al., 2016). During the years different studies are carried out regarding the NCC, where different

measures are examined on different cultivations. Different actors have an interest in these studies, these actors are displayed in figure 1.1. The transition programme "Greenhouse as Energy Source" partly finances these studies. Wageningen University and Research is the main research institute contributing to the these studies. Moreover, research regarding the NCC for the gerbera cultivation is facilitated by the WUR. Besides, Delphy, where different cultivation consultants are employed, operates as a knowledge and expertise centre. This actor works together with the Improvement Centre where research projects can be conducted. Besides, together they facilitate NCC studies regarding chrysanthemum and bell pepper cultivation (see Appendix I, 1& 2). Furthermore, training courses on the NCC are provided to the greenhouse horticulture entrepreneurs, cultivation consultants and suppliers. These training courses, facilitated by the transition programme "Greenhouse as Energy Source", are offered to greenhouse horticulture entrepreneurs, cultivation consultants and suppliers. Knowledge and advice from the "pioneers" of the NCC, Peter Geelen, Jan Voogt and Hans Pronk, is given to the participants of the training course. Furthermore, the participants share their experiences with each other (Kas Als Energiebron, 2017a).

4.2 Basic principles of the NCC

The basic principles of the New Cultivation Concept vary per cultivation, because different cultivations need different measures to achieve the envisaged goals (Geelen et al., 2016). Moreover, not for every cultivation the NCC is applicable, it strongly dependents on a number of factors. These factors consist of technical systems as well as the cultivation itself (see Appendix I, 3). The five basis principles of the NCC are: (1) insulation; (2) cultivation activation; (3) removal of moisture; (4) prevention of temperature differences; (5) and avoiding too much emission of light. Whereof the first three basic principles are most important for the NCC, put in order of importance (see Appendix I, 1 & 4).

First insultation (1), heath is used to let the crops evaporate, but this heath also gets lost at the exterior of the greenhouse. Insulating the greenhouse - by using removable double energy screens - will prevent this. Furthermore, these screens can avoid (5) too much emission of light into the area in which the greenhouse is situated. Second, activation of the cultivation (2) is necessary to stimulate growth. This activation is mostly done by natural light or through assimilation lighting. To keep activating the cultivation when not enough daylight is available, or it is not allowed to use assimilation lighting, the temperature of the minimum pipe increases. When the minimum pipe temperature increases this will (3) remove moisture. The NCC stimulates the use of fans to circulate air in the greenhouse to keep activating the cultivation. Less energy is needed using this method compared to the temperature increase of the minimum pipe. Besides, it will also transport moisture. The same applies when investing in hose systems which transport air from outside into the greenhouse. Another method to transport moisture is by opening the windows above the closed screens so condensation is stimulated. The last basic principle of the NCC is (4) the prevention of temperature differences in the greenhouse which is the basis of every efficient method of climate control in a greenhouse (Geelen et al., 2016; Kas Als Energiebron, 2017b).

5. Case study results

This chapter presents the results of the empirical research on the two units of analysis, covering two types of entrepreneurs: the innovators and the early adaptors. In paragraph 5.1 the cases of innovators are discussed and in paragraph 5.2 the cases of early-adopters. Every case starts with a brief description of the organisation. Subsequently, the five sub-questions written down in paragraph 1.2 are answered per case. Using the semi structured interviews, additional questionnaires and information from the websites of the entrepreneurs and stakeholders. Each question focuses on one of the following themes: CSR, the decision making process and information, behaviour or stakeholder theory. Besides, extra information is given per case on the stakeholders which are the focus of this research: the cultivation consultant, supplier of technical systems or plant materials and the horticultural journals. Furthermore, for each case the network structure and the patterns of relationships regarding the NCC are displayed in a figure. Showing the interconnectedness of the whole network. The length of the arrows show the distance between the stakeholders. Furthermore, the circle around the network displays the joint transition programme of the Ministry of LNV and LTO Glaskracht Nederland, "Greenhouse as Energy Source" (GES).

5.1 The innovators

Innovators consist of the three cases: Van der Spek bv., Arcadia and Zuijderwijk-Witzier. The cases are discussed in this order.

5.1.1 Van der Spek bv.

Danny van der Spek, owner of a bell pepper nursery of nine hectares situated in Bergschenhoek, implemented the double energy screen in his greenhouse in 2013. This can be seen as the first step of carrying out measures of the NCC in the company. In 2015 he participated in the NCC training course. Besides, he became a member of the guidance committee bell pepper at the knowledge and expertise centre Delphy, where different ways of implementing the NCC in a bell pepper nursery are studied. The names of stakeholders which Danny van der Spek provided are supplier Paul Arkesteijn of Svensson and cultivation consultant Jeroen Zwinkels of Delphy, both part of the guidance committee.[3] Svensson is a company which supplies climate and environmental solutions of textiles and delivered the double energy screens to Danny van der Spek.[4]

[3] Cultivation consultant Jeroen Zwinkels is not the main cultivation consultant of Danny van der Spek, but it was not possible to reach his main cultivation consultant.

[4] As can be found on http://www.ludvigsvensson.com/nl-climatescreens/over-ons.

(1) Corporate Social Responsibility

"The less you use, the better it is for the environment as well"
- Danny van der Spek

The main goal of implementing the NCC measures in the greenhouse is to save energy while at the same time maintaining quality and quantity of the crops. Rising natural gas prices led to the implementation of the double energy screens in the greenhouse. The entrepreneur does not see this innovation as a NCC investment, but more as a cost saving measure. Besides, the entrepreneur sees the cultivations methods – how to use the double energy screens – as a part of the NCC. Furthermore, the decreased temperature of the minimum pipe is also seen as a NCC method. With these cultivation methods further energy saving was accomplished. Besides, leading to crop quality improvements. The environmental benefits of using as less energy as possible are mentioned by the entrepreneur. So the first (1) notion of using the NCC was to save energy so costs could be minimised. Second (2) the environment was taking into consideration by the entrepreneur. Finally (3) breeding improvements are noticed by the entrepreneur when adopting the NCC. In the end the future of the greenhouse horticultural sector will depend less on natural gas according to van der Spek (2017), although no use of natural gas in the bell pepper nurseries seems impossible.

(2; 3) Decision making process and the role of information

Implementing double energy screens in the greenhouse of Danny van der Spek was the start of the NCC within his company. Although the entrepreneur was not aware that this was already a measure of the NCC. He started to consciously adopt the NCC when participating in the guidance committee at Delphy. This decision making process will focus on consciously adopting the measures of the NCC. Looking at the information which the stakeholders provide and the message they bear regarding the NCC.

BOX 5.1 Main message of stakeholders Svensson and Delphy

According to Paul Arkesteijn of Svensson the NCC is an energy saving measure which can be applied in existing greenhouses. The double energy screen is a tool to steer more on the vegetative and generative development of the crops. Subsequently, moisture can be removed more easily and temperature differences can be avoided. In the end the quality and quantity of the crops will improve (Arkesteijn, 2017).

With a lower amount of energy the same quantity can be produced according to Jeroen Zwinkels of Delphy. The energy use decreases when using the screens more intensively, because of better insulation. Besides, a decrease in temperature of the minimum pipe will lower energy use. Quality of the crops is maintained by air movement around the plant (Zwinkels, 2017).

1. Identification phase

In the *decision recognition routine* a *problem* was recognised by the entrepreneur. The costs of natural gas were increasing, further energy savings were necessary to decrease those costs. This can be seen as a *stimuli from outside the organisation* (see Appendix IX, 1). Besides, the NCC can be seen as an *opportunity* which presented itself to the entrepreneur. Other *stimuli from outside the organisation,* fellow growers and horticultural journals, showed the benefits of implementing measures of the NCC. *Information about the environment* is collected during this routine, focusing on the costs of natural gas and the developments of energy saving methods in the greenhouse horticultural sector (see Appendix IX, 1). The *opportunity* arose for Danny van der Spek to participate in the guidance committee bell pepper at Delphy. Van der Spek

bv. is located near to the Improvement Centre of Delphy and since the National Committee Bell Pepper needed to present a participant the choice was easily made. This is called *matching*, the opportunity matched the need of the entrepreneur to achieve further energy savings (see Appendix IX, 1).

During the *diagnosis routine* the entrepreneur used the *new information channels* which were formed by the guidance committee. The supplier of energy screens, Svensson, provided information on the possibilities when using the double energy screens (see BOX 5.1 & Appendix IX, 1). Furthermore, the cultivation consultant of Delphy provided information on the measures of the NCC and how to use them within the greenhouse (see BOX 5.1 & Appendix IX, 1). Another *new formed information channel* was the NCC course. Besides, also an *existing information channel* was used during the diagnosis routine. Obtaining advice from the regular cultivation consultant, who was not positive regarding the NCC according to van der Spek. The consultant did not see the need to save energy by changing the cultivation methods. Probably he thought this would cause unnecessary risks (see Appendix IX, 1).

2. Development phase
During the development phase the different members of the guidance committee cooperated to come to different methods of the NCC to be applied in the greenhouse. They searched for different alternatives, called *trap search*. Also the entrepreneur, as a member of the guidance committee, contributed to this search, this can be seen as *active search*. In the *design routine* these alternatives were adjusted to the specific circumstances, called *modified solutions* (see Appendix IX, 1).

3. *Selection phase*
In the selection phase the guidance committee *screened* the different modified solutions which were designed in the design routine. The screening took place with information based on the experiences gathered during the research process of the guidance committee. Eventually the choice of methods was done by the entrepreneur himself, based on the features which seemed most important to him (see Appendix IX, 1).

(4) Behaviour

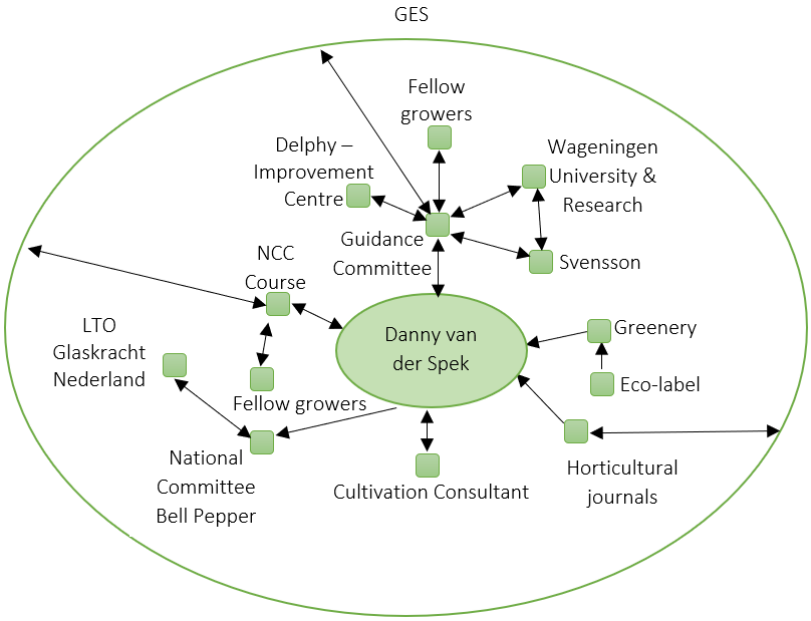
Appendix V shows the results of the questionnaires completed by the entrepreneurs. First, for the personal factors Danny van der Spek scores a lot of the time in between the two extremes. It seems that the entrepreneur is a bit more introvert than extravert. Besides, the results show the entrepreneur is more internal focused ("Internal Locus of Control"). Which could lead to a more active collection of information and more efficient use of this information. In the end, steering the environment more actively. The attitude towards achievement in cultivating shows that the entrepreneur finds it important to have a tidy farm and problems should be tackled head on. Furthermore, the entrepreneur receives high satisfaction from cultivating and is willing to entertain the ideas of others and learn about innovations in cultivating practice. When looking at the objectives in cultivating the entrepreneur finds sustainability important.

(5) Stakeholder theory

Figure 5.1 shows that a lot of stakeholders have relationships with other actors in the network besides the relationship with Danny van der Spek. Especially this is seen in the connection with the guidance committee in which, besides Danny van der Spek, two other participant bell pepper growers, Delphy, Svensson and WUR take part. The guidance committee meets once a week at the Improvement Centre of Delphy and the participants exchange information (van

der Spek, 2017; Arkesteijn, 2017; Zwinkels, 2017). Another *dense* connection is found in the NCC training course. A different kind of relationship is seen between Danny van der Spek and the National Committee Bell Pepper. This committee is part of LTO Glaskracht Nederland and consists of bell pepper growers from all over the Netherlands. They appointed Danny van der Spek to take part in the guidance committee because of practical reasons (van der Spek, 2017). An *in between* position can be observed here. Within the National Committee Bell Pepper information regarding the NCC is distributed to the fellow growers by the entrepreneur. In this way the information flow is controlled by the entrepreneur. Furthermore, the entrepreneur has six ties within the network. The ability of the entrepreneur to reach out to these actors individually is not possible for all these ties. The horticultural journals and the Greenery (the sales representative) only send information and the National Committee Bell Pepper only receives information. The NCC training course consists of multiple actors of which it is most common to have contact within this training course. Although it is possible to reach out to the different actors independently by the entrepreneur. The same applies to the guidance committee. The only actor for which it is normal to reach independently is the cultivation consultant.

Figure 5.1: Network structure and patterns of relationships regarding NCC[5]



Source: based on Rowley (1997)

Stakeholders

In the identification phase, during the decision recognition routine, horticultural journals were used to provide information about the environment in which the entrepreneur is situated. The journals conducted by the entrepreneur are "Onder Glas" and "Groenten en Fruit". During the diagnosis routine in the identification phase, information was collected from the regular cultivation consultant. But since this consultant was not positive regarding the NCC this information channel has not further been used during the decision making process. The guidance committee replaced the role of the regular cultivation consultant. During every phase in the decision making process this committee provided information. Besides, together with the entrepreneur they developed modified solutions to apply in the greenhouse. The cultivation consultant of the guidance committee, Jeroen Zwinkels of Delphy, provided

[5] Fellow growers are also in relationship with the National Committee Bell Pepper, but to keep the figure clear this relationship is not drawn.

information on the measures of the NCC and how to apply them in the greenhouse. His message focused on saving energy while maintaining quantity and quality of the crops. This corresponds with the goals of the entrepreneur, saving energy to reduce the costs and keeping quantity and quality constant. The supplier of energy screens, Paul Arkesteijn of Svensson and part of the guidance committee, stresses the importance of these screens to achieve the energy savings.

5.1.2 Arcadia

Bert van Ruijven is the co-owner of Arcadia, a chrysanthemum company with five nurseries and a total surface of 21 hectares. Ten years ago, when research was conducted regarding closed greenhouses, he got in touch with the NCC. This study can be seen as a first step towards the NCC, of which information was distributed by horticultural journals and information evenings. Four years ago Arcadia participated in the guidance committee chrysanthemum, using a part of their greenhouse as the practical field in which research was conducted. This research project looked at the consequences of using hose systems to circulate air in the greenhouse. Contact details of the supplier of hose systems, Hans van Tilborgh of Technokas, and the cultivation consultant, René Corsten of Delphy, were provided by the entrepreneur. Technokas is specialised in technical systems within the greenhouse horticultural sector.[6] René Corsten is one of the three cultivation consultants at Delphy specialised in chrysanthemum cultivation. He is not the main cultivation consultant of Arcadia, this is Theo Roelofs who also has been interviewed for a different case. The data of this interview will also be used during the analysis.

(1) Corporate Social Responsibility

Quality improvement of the crops was the main goal when hose systems were installed in the nurseries. During the years the focus shifted from quality improvements to decreasing the need of using fossil fuels. Decreasing the use of natural gas in the nurseries without investments by decreasing the temperature of the minimum pipe and applying different other measures. Communicating about the adopted sustainability measures to the customers who buy the products of Arcadia is seen as an important marketing strategy. So the first (1) notion of using the NCC was to improve crop quality. Second (2) the recognition came that fossil fuels should be used less. Finally (3) communicating about the applied measures of the NCC shows the customer what Arcadia stands for. In the end the future of the greenhouse horticultural will be electric according to van Ruijven (2017), although innovations to storage energy should be developed. Besides, the exchange of energy should be made easier and cheaper by the government.

> "It is in my nature"
> - Bert van Ruijven

(2; 3) Decision making process and the role of information

Participating in the guidance committee chrysanthemum led to the implementation of hose systems in a part of the greenhouse of Arcadia. This was a first step to implement measures of the NCC in the entire company. These measures did not need any investments and were, among other things, derived from the NCC training course. This decision making process will focus on the implementation of the hose systems in a part of the greenhouse of Arcadia, looking at the information which the stakeholders provide and the message they bear regarding the NCC.

[6] As can be found on http://www.technokas.nl/kiezen-voor-expertise.html.

BOX 5.2 Main message of stakeholders Technokas and Delphy

Hans van Tilborgh of Technokas describes the NCC as a collection of new techniques which should activate the climate in the greenhouse. This is done best by investing in a separate tool to remove moisture. This will lead to quality improvement of the crops and energy savings (van Tilborgh, 2017).

According to René Corsten of Delphy the NCC was a chance in the chrysanthemum cultivation to reflect on the way in which climate regulations take place in the greenhouses. Innovations are initiated by the NCC to save energy and increase quantity of the crops (Corsten, 2017). Also Roelofs (2017) sees the connection between the NCC and climate regulations and would not speak of the NCC because of its name. This name has a negative connotation to the cultivating measures which have been used before the NCC was introduced. Quality improvement and increasing quantity are the goals of applying the NCC. Energy saving is more a result of a costs and benefits analysis (Roelofs, 2017).

1. Identification phase

In the *decision recognition routine* the entrepreneur witnessed a *problem*. Some crops showed damages because of a disease, this is a *stimuli from inside* the organisation (see Appendix IX, 2). Furthermore, the NCC presented itself to the entrepreneur as an *opportunity*. Horticultural journals and the cultivation consultant of Delphy provided information to the entrepreneur about the developments within the NCC. This information shows the entrepreneur the *environment* in which he operates and can be seen as *stimuli from outside* the organisation (see Appendix IX, 2). Being part of the guidance committee chrysanthemum was an *opportunity* which presented itself to the entrepreneur because of his interest regarding innovations. In addition, the cultivation consultant provided information on the developments within the research. A *match* was found between the problems that occurred because of a disease in the crops and the opportunity to be part of the guidance committee.

When the *diagnosis routine* was in place the entrepreneur used *existing and new information channels.* An existing information channel is the cultivation consultant of the entrepreneur. This consultant is also part of the guidance committee, providing information on regulating the climate within the greenhouse when using different systems (see BOX 5.2 & Appendix IX, 2). A new information channel is the supplier of Technokas, who provided information on the different techniques which were available to keep the climate in the greenhouse active and remove moisture (see BOX 5.2 & Appendix IX, 2).

2. Development phase

During this phase the guidance committee, consisting of Delphy, Technokas, WUR, sales representatives, fellow growers and the entrepreneur, searched for already existing solutions. This is part of the *search routine* and consists of *trap search* and *active search*. The existing solutions were adjusted in the *design routine*, leading to *modified solutions* (see Appendix IX, 2). Besides, the entrepreneur also obtained advice from the Horticultural Technological Development department of Demokwekerij on which techniques to apply in the greenhouse (see Appendix IX, 2). This information is based on *comparable developments* because of similar studies done by this organisation.

3. Selection phase

The modified solutions were compared to each other during the selection phase. *Feedback* was given by the cultivation consultant and fellow growers on the different alternatives (see Appendix IX, 2). The hose systems were eventually chosen. This choice is made by the entrepreneur and the fellow owners of Arcadia. Based on the amount of money needed to implement the different alternatives and the features which seemed most important to them (see Appendix IX, 2).

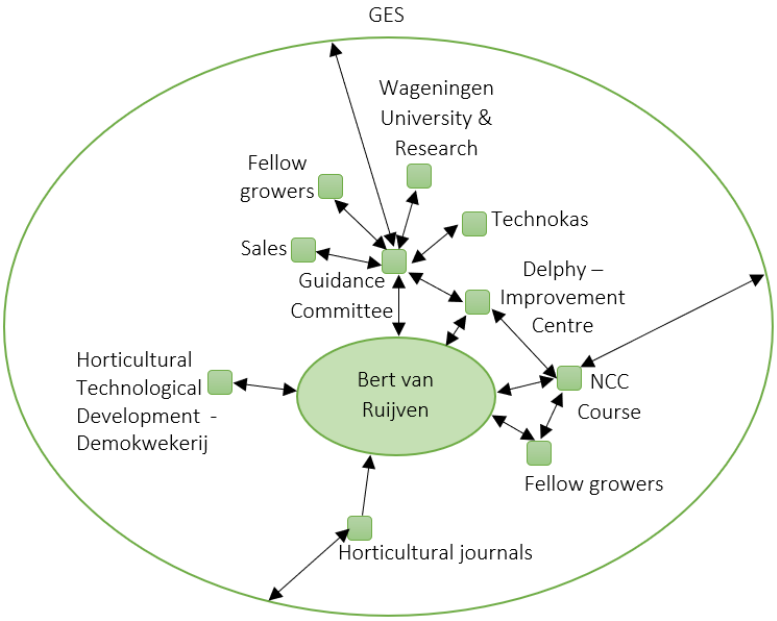
(4) Behaviour

The results of the questionnaires are displayed in Appendix V. For the personal factors Bert van Ruijven is open to experience and more extravert than introvert according to the results. Besides, scoring high on conscientiousness, so being pro-active and goal-oriented. Furthermore, the entrepreneur scores high on "Need for Cognition", extensively thinking about matters. The attitude towards achievement in cultivating shows that the entrepreneur finds it important to have a tidy nursery and problems should be tackled head on. Furthermore, the entrepreneur receives high satisfaction from cultivating and is willing to entertain the ideas of others and learn about innovations in cultivating practice. Besides, he is not very positive regarding financial risks. Looking at the objectives, the entrepreneur finds sustainability matters important and values status.

(5) Stakeholder theory

In figure 5.2 the NCC training course is also displayed although this relationship was developed after the hose system was implemented in the greenhouse. This relationship is important to show the interconnectedness of the whole network. Besides the relationship with the entrepreneur the stakeholders are also linked to each other. Especially this is seen in the relationships with participants of the guidance committee. This guidance committee met once every month/ once per two months. Exchanging information on how features of the NCC could be best implemented in a chrysanthemum nursery (van Ruijven, 2017; van Tilborgh, 2017; Corsten, 2017; Roelofs, 2017). Another *dense* network is that of the NCC training course. Facilitated by the transition programme "Greenhouse as Energy Source", but organised by knowledge and expertise centre Delphy (Corsten, 2017). All co-owners of Arcadia participated in this training course (van Ruijven, 2017). The entrepreneur has five ties within the network. It is not possible for the entrepreneur to reach out to all those actors individually. Horticultural journals only send information and the NCC training course and guidance committee both consist of multiple actors. The normal procedure is to have contact with those stakeholders within the NCC training course or guidance committee, although it is possible to reach out to the different actors independently by the entrepreneur. Within the guidance committee this is especially the case with Delphy, since this is also the organisation at which the cultivation consultant of the entrepreneur works.

Figure 5.2: Network structure and patterns of relationships regarding NCC



Source: based on Rowley (1997)

Stakeholders

In the identification phase, during the decision recognition routine, horticultural journals were used to provide information about the environment in which the entrepreneur is situated. The journals conducted by the entrepreneur are "Bloemisterij", "KASmagazine" and "Onder Glas". Also the cultivation consultant of the entrepreneur, Theo Roelofs, provided information during the decision recognition routine on the developments within the NCC. Besides, this cultivation consultant participated in the guidance committee, which played a role in all the phases of the decision making process of the entrepreneur. Moreover, together with the entrepreneur they developed modified solutions to apply in the greenhouse. The message the cultivation consultant bears is to improve quality and quantity when applying measures of the NCC. This does not totally fit the goals of the entrepreneur. Where the first intention was to improve quality, this developed to saving energy when applying measures of the NCC. Supplier of technical systems, Hans van Tilborgh of Technokas also part of the guidance committee, focuses on the technical systems which are necessary to activate the climate in the greenhouse and by doing so quality will improve and energy will be saved.

5.1.3 Zuijderwijk-Witzier

Entrepreneur Aad Zuijderwijk is owner of gerbera nursery Zuijderwijk-Witzier with a surface of 2.5 hectare. From the start when darkening screens were introduced in the gerbera cultivation the entrepreneur saw the need of air circulation in the greenhouse. Many different kind of techniques, including fans, have been installed in the greenhouse. Of which some were implemented before the NCC was introduced. The names of stakeholders which Aad Zuijderwijk provided were supplier René Beerkens of Hoogendoorn and cultivation consultant Marco de Groot of FloriConsultGroup. Hoogendoorn is a company which supplies automation innovations in the greenhouse horticultural sector.[7] FloriConsultGroup is an organisation consisting of three cultivation consultants in the gerbera cultivation (de Groot, 2017).

[7] As can be found on https://www.hoogendoorn.nl/over-ons/waarom-hoogendoorn/.

(1) Corporate Social Responsibility

The fluctuations in the natural gas prices are seen as a problem by the entrepreneur. To maintain the competitive position of the Dutch greenhouse horticultural sector rethinking the energy need is necessary. When darkening screens had to be implemented in the gerbera nursery the entrepreneur saw the possibility to keep more energy inside the greenhouse. Measures of the NCC can used to do this. Besides, the measures are used to anticipate on the problems which can occur in the gerbera cultivation. In the future the entrepreneur sees a net zero energy greenhouse horticultural sector. Developments in techniques which focuses on CO_2, heath and energy will make this possible (Zuijderwijk, 2017).

"Actually I want to experience that we cultivate with net zero energy" - Aad Zuijderwijk

(2; 3) Decision making process and the role of information

The entrepreneur has used many different air circulation methods in the greenhouse. This decision making process will focus on the implementation of these air circulation methods. Looking at the information which the stakeholders provide and the message they bear regarding the measures of the NCC. The entrepreneur purchased the first air circulation techniques in 2008, so before the NCC was introduced in the sector. This shows the innovator's position of the entrepreneur.

BOX 5.3 Main message of stakeholders Hoogendoorn and FloriConcultGroup

René Beerkens and Jan Voogt of Hoogendoorn focus on the balance of the plant when talking about the NCC. If the plant is in balance the plant's resistance and health will improve. Preventing the need of intervention and maintaining quality. The focus should not be on energy savings, when quality improves energy savings will follow (Beerkens & Voogt, 2017).

According to Marco de Groot of FloriConsultGroup the NCC is represents the way of using tools to regulate the climate to keep the plant in optimal condition. Moreover, to protect the plant from different kind of diseases. Quality of the crops is the main purpose of adopting the NCC measures. Energy saving is important as well, but not the main goal (de Groot, 2017).

1. Identification phase

The *decision recognition routine* of the entrepreneur started with the mandatory purchase of darkening screens. The *opportunity* arose to keep energy inside the greenhouse, because of the insulation possibilities when using darkening screens. Because these screens were mandatory it can be seen as a *stimuli from outside* the organsiation (see Appendix IX, 3). The opportunity the entrepreneur witnessed is a *stimuli from inside* the organisation. In the mind of the entrepreneur the link was made between the purchase of darkening screens and the possibilities it created to keep energy inside the greenhouse (see Appendix IX, 3). The fluctuating natural gas prices caused the recognition of the entrepreneur to be less dependent on natural gas. Within the decision recognition routine this can be seen as a *stimuli from outside* the organisation (see Appendix IX, 3).

New information channels were developed during the *diagnosis routine*. Contact was made with the WUR and Hoogendoorn (see Appendix IX, 3). Together with the entrepreneur they rethought already existing techniques and used the greenhouse of the entrepreneur as a practical example. Hoogendoorn gave advice with a focus on plant balancing, in which all the factors of the greenhouse should be manageable (see BOX 5.3) An *existing information*

channel is the cultivation consultant of the entrepreneur of FloriConsultGroup. Providing information on innovations within the greenhouse horticultural sector. Focusing on the climate regulations which have to be applied to keep the plant in optimal condition (see BOX 5.3 & Appendix IX, 3).

2. Development phase
Modified solutions were developed during the *design routine* by WUR, Hoogendoorn and the entrepreneur. Already existing techniques were redesigned to be applicable in the greenhouse horticultural sector. All three actors delivered information during this routine, whereof the WUR and Hoogendoorn delivered the theoretical foundation of possible techniques. This information is collected by the stakeholders in the *search routine* using *trap search* and the entrepreneur used *active search* (see Appendix IX, 3).

3. Selection phase
The different air circulation techniques derived from the *design routine* were compared to each other by the WUR, Hoogendoorn and the entrepreneur. *Feedback* was given to each other and in the end the alternative with the highest chance to succeed was chosen (see Appendix IX, 3).

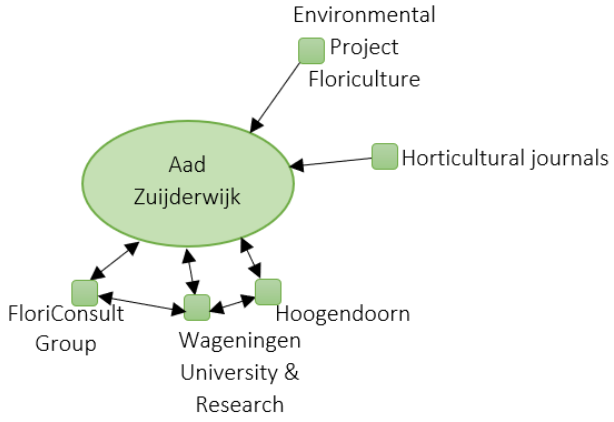
(4) Behaviour

A few personal factors in Appendix V show that Aad Zuijderwijk scores in between the two extremes. A high score can be witnessed regarding to conscientiousness, being pro-active and goal-oriented. Furthermore, the entrepreneur seems to focus on external factors which influence the outcome ("External Locus of Control"). The attitude achievement in cultivating shows that the entrepreneur finds it important to have a tidy nursery and problems should be tackled head on. Besides, the entrepreneur is very willing to entertain the ideas of others and learn about innovation in cultivating practice. At last, the entrepreneur values status and sustainability matters.

(5) Stakeholder theory

Figure 5.3 displays the network of Aad Zuijderwijk before the air circulation techniques were implemented. Multiple patterns of relationships have developed since, but do not have a function for this analysis. This is why they are not shown. It is a highly *dense* network in which the ideas on the air circulation techniques are developed with information of the WUR, Hoogendoorn and the entrepreneur. They had similar expectations and this was also the reason they started to collaborate (Zuijderwijk, 2017). The entrepreneur has five ties in the network of which two ties cannot be reached independently. These are the horticultural journals and Environmental Project Floriculture, which only send information. The other ties can be reached independently showing the 'closeness' of the entrepreneur to these actors. Leading to independent accesses and efficient communication between the entrepreneur and these actors.

Figure 5.3: Network structure and patterns of relationships regarding NCC



Source: based on Rowley (1997)

Stakeholders

In the identification phase, during the diagnosis routine, the entrepreneur got in contact with Wageningen University and Research and supplier of automation systems Hoogendoorn. The three actors worked together to come to modified solutions. They all had the same expectations, wanting to develop tools to regulate climate in the greenhouse. The NCC was not yet introduced when the decision making process of the entrepreneur took place. The cultivation consultant did provide information on the innovations within the horticultural sector in the diagnosis routine of the identification phase, but did not provide further information in the other phases.

5.2 Early adopters

Early-adopters consist of the three cases: Leo van den Berg bv., Zijdezicht and Klondike Gardens. The cases are discussed in this order.

5.2.1 Leo van den Berg bv.

Maikel van den Berg is the owner of Leo van den Berg bv., a bell pepper company with 2 nurseries and a total surface of nine hectares. Before the NCC was introduced in the greenhouse horticultural sector the entrepreneur was already interested in research on the different needs of the crops. In 2012 and 2016 the entrepreneur participated in the NCC training course. Besides, for the second year in a row he is a member of the guidance committee bell pepper at the knowledge and expertise centre Delphy. The names which the entrepreneur provided were Kees de Jong of plant material supplier Rijkzwaan and Rick van der Burg project supervisor at Delphy. At this moment in time the entrepreneur does not have a cultivation consultant, that is why it was not possible to get contact details of a cultivation consultant.

(1) Corporate Social Responsibility

The interest of the entrepreneur to collect data on the growth process of the plant led to the implementation of measures of the NCC in the nurseries. Instead of using his intuition, quantified data is used to base the decisions on. By doing so the entrepreneur tries to develop a homogeneous cultivation, leading to a constant supply of bell peppers. This will result in higher profits for the entrepreneur. Energy saving is seen as a consequence of better understanding of the needs of the crops. Moreover, the entrepreneur recognises the competition of other

European countries for supplying bell peppers. Efficient production – maximum production per cubic metre of natural gas - will lead to an advantage for the Dutch cultivators regarding this competition. According to the entrepreneur geothermal heat is needed to sustain the future of the Dutch greenhouse horticultural sector. Especially in the winter the use of energy should decrease, a way of doing this could be by shifting the cultivation periods (van den Berg, 2017).

"Using less natural gas should be based on facts and not trial and error "
- Maikel van den Berg

(2; 3) Decision making process and the role of information

Participating in research on the needs of the plant in 2008 was the first time the entrepreneur got in touch with certain measures of the NCC. The NCC training course of 2012, and especially the training course in 2016 motivated the entrepreneur to implement the different measures in his two nurseries. Besides the energy screens, data is collected on the growth process of the crops so the needs of the crops can be fulfilled. This decision making process focuses on the implementation of different measures of the NCC after participating in the training course of 2016 and the guidance committee. Looking at the information which the stakeholders provide and the message they bear regarding the NCC.

BOX 5.4 Main message of stakeholders Rijkzwaan and Delphy

According to Kees de Jong of Rijkzwaan the NCC focuses on a better understanding of the different measures which influence the crops. Instead of following intuition, actions in the greenhouse are based on data collected by observing the crops by using sensors. Rijkzwaan does this as well and develops crops which will respond best to the measures of the NCC (de Jong, 2017).

Rick van der Burg of Delphy sees the NCC as a plant physiological way to shift goals. Focusing on the data registration of the crops, so settings can be changed based on facts. Leading to a healthier cultivation which results in a better and more stable quality and quantity (van der Burg, 2017).

1. Identification phase

During the *decision recognition routine* the entrepreneur recognised the future problem of the Dutch greenhouse horticultural sector. In order to compete with other European countries the Netherlands should focus on sustainable cultivation. These bigger problems have always been of interest of the entrepreneur, this can be seen as a *stimuli from inside the organisation* (see Appendix IX, 4). *Information about the environment of the organisation* is collected during this routine, of which the Financial Newspaper provides information on the bigger problems in the world, a *stimuli from outside the organisation* (see Appendix IX, 4).

In the *diagnosis routine* the entrepreneur, based on the knowledge obtained from the NCC training course of 2012, wanted to learn more about the measures of the NCC. He participated in two *new information channels* to obtain information on the measures of the NCC. He participated again in the NCC training course and became a member of the guidance committee. This guidance committee is the same as the one in which Danny van der Spek participates, of which the project supervisor from Delphy provides information on the quantitative data which needs to be collected to better understand the crops (see BOX 5.4 & Appendix IX, 4). An *existing information channel* is Rijkzwaan, supplying the plant materials to Leo van den Berg bv. The intensity of this relationship varies with the periods in the cultivation. In the recent years the relationship is not that intensive anymore. Rijkzwaan also sees the

importance of understanding the crops based on data and focuses on developing crops which respond best to the different measures of the NCC (see BOX 5.4 & Appendix IX, 4).

2. Development phase
When the development phase was in place the different members of the guidance committee provided information on the measures of the NCC, called *trap research*. Moreover, new methods are tested at the Improvement Centre which resulted in *modified solutions* during the *design routine*. Besides, the entrepreneur himself also came up with information on different alternatives, known as *active search*. The NCC training course provides *ready-made solutions* without any need for search by the entrepreneur, so a form of *trap search* (see Appendix IX, 4).

3. Selection phase
During the selection phase the guidance committee *screened* the different *modified solutions* in their research. Besides, *feedback* was obtained from the NCC training course where the participating growers shared their ideas. Moreover, the father of the entrepreneur also gave *feedback* on the measures which will be implemented in the greenhouse. In the end the decision was made by the entrepreneur himself (see Appendix IX, 4).

(4) Behaviour

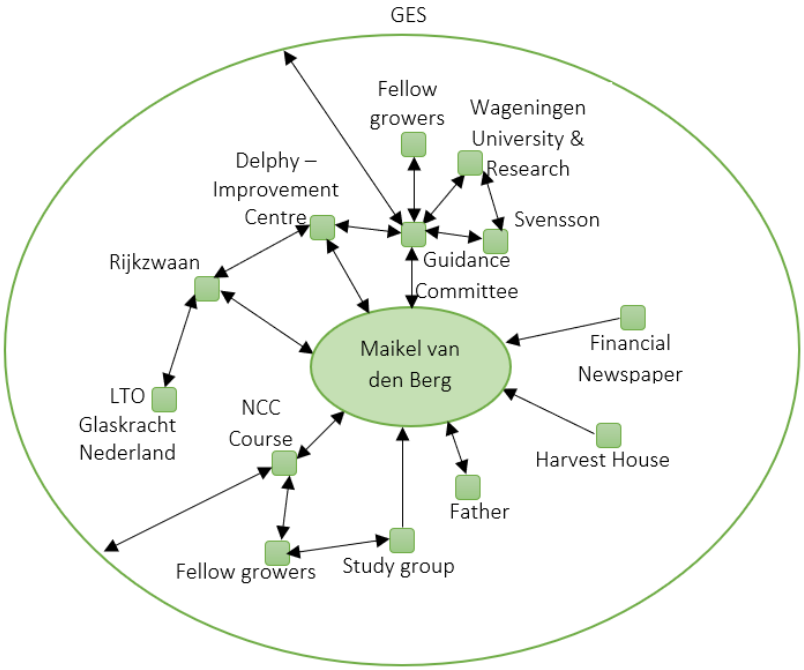
For the personal factors of the entrepreneur the results of the questionnaire in Appendix V show that the entrepreneur is open to experience. Besides, being pro-active and goal-oriented. Furthermore, scoring high on "Need for Cognition, presenting need to extensively think about matters. The attitude achievement in cultivating shows that the entrepreneur finds it important to have a tidy nursery and problems should be tackled head on. Besides, receiving high satisfaction from cultivating and willing to entertain the ideas of others and learning innovations in farming practice. Objectives on cultivating show that the entrepreneur finds sustainability matters important.

(5) Stakeholder theory

Figure 5.4 shows that a lot of stakeholders have relationships with other actors besides the entrepreneur. The guidance committee is one of those *dense* connections which involves stakeholders that are also in relationship with each other. They meet every week at the Improvement Centre of Delphy (van den Berg, 2017; van der Burg, 2017). Another *dense* connection can be found within the NCC training course, in which the entrepreneur participated two times (van den Berg, 2017). Furthermore, the entrepreneur has eight ties within the network, this means eight information channels to choose from. Not all of these ties can be reached by the entrepreneur independently. For the two dense networks mentioned before it is not common to reach them independently, although this is possible. Besides, Harvest House, the Financial Newspaper and the study group only send information. Harvest House is a cooperation which provides information on innovations. The study group only send information to the entrepreneur, because the participants of this group are not developing at the same speed as the entrepreneur does (van den Berg, 2017). The entrepreneur can reach Delphy, Rijkzwaan and his father independently. A special position is the one of Delphy, which is also part of the guidance committee. Delphy provides cultivation advice to the entrepreneur, although Rick van der Burg is not the entrepreneur's cultivation consultant (van den Berg, 2017; van der Burg, 2017). The relationship with Rijkzwaan depends on the state of the cultivation (van den Berg, 2017; de Jong, 2017). In the end advice of the father of the entrepreneur is

being obtained, since the entrepreneur took over the company of his father (van den Berg, 2017).

Figure 5.4: Network structure and patterns of relationships regarding NCC



Source: based on Rowley (1997)

Stakeholders

In the identification phase, during the decision recognition routine, the Financial Newspaper was used to provide information about the environment in which the entrepreneur is situated. This gave the entrepreneur a bigger picture of the world he lives in. The cultivation consultant of the entrepreneur, which he does no longer have, did not play a role in the decision making process of the entrepreneur with regard to the NCC. The guidance committee provided information on the NCC in the diagnosis routine of the identification phase and the phases that fallowed. Moreover, together with the entrepreneur they developed modified solutions to apply in the greenhouse. A special role in the guidance committee is for Rick van der Burg of Delphy, who kind of replaces the cultivation consultant of the entrepreneur. According to Rick van der Burg data registration of the crops is important to come to a healthier cultivation. This is in line with the goals of the entrepreneur, using data of the growth of the plant to base decisions on. The supplier of plant materials, Kees de Jong of Rijkzwaan, provides information in the diagnosis routine of the identification phase. He also focuses on data collection of the crops, by using sensors. Besides, the NCC training course plays a role in every phase of the decision making process. This course made the entrepreneur curious for more information with regard to the NCC and provided the entrepreneur with information on the different measures of the NCC.

5.2.2 Zijdezicht

John Krijger is the co-owner of Zijdezicht, a chrysanthemum company with three nurseries and a total surface of 7 hectares. Climate control has been of interest of the entrepreneur already for several years. He participated in a climate control course 15 to 20 years ago organised by Peter Kamp. Besides, now he takes part in the NCC course for the third time in a row. New

insights on the physic and plant physiological principles are put in practice in the nurseries, without technical investments. Contact details were given of the supplier of plant materials, Martien Vis of Dümmen Orange, a breeding company. Furthermore, contact details of cultivation consultant Theo Roelofs of Delphy were provided.

(1) Corporate Social Responsibility

Reliable quality of the crops is very important according to the entrepreneur. This is the main goal when putting the physic and plant physiological principles in practice. In this way quality standards can be guaranteed when selling the product. Energy savings can be a consequence of the implemented measures of the NCC, but should not be the main purpose. If risks can be avoided when using more natural gas, this should be done. In the future the greenhouse horticultural sector will make use of geothermal heat. Besides, more and more research will be done in the field of physic and plant physiological principles. The most important goal for the greenhouse horticultural sector according to Krijger (2017) is to get to know the characteristics of the crops and how they develop.

"When you produce 20 percent more you also save 20 percent natural gas"
- John Krijger

(2; 3) Decision making process and the role of information

The entrepreneur started to implement measures of the NCC in the chrysanthemum nurseries in 2015, when participating in the NCC training course. The decision making process will be a representation of the different measures implemented. Looking at the information which the stakeholders provide and the message they bear regarding the NCC.

BOX 5.5 Main message of stakeholders Dümmen Orange and Delphy

Martien Vis of Dümmen Orange describes the NCC as consciously adopting climate control measures. More discussion arises between the different parties involved in the greenhouse horticultural sector due to the NCC. Consciously adopting climate control measures will improve the quality of the crops and increase quantity. These measures do not necessarily consist of technical investments, but it will broaden the possibilities. Energy saving is the result of entrepreneurs which do see that high temperatures are not needed (Vis, 2017).

Theo Roelofs (2017) has been mentioned before in the case study of Arcadia. This cultivation consultant sees the connection between the NCC and climate regulations and would not speak of the NCC because of its name. This name has a negative connotation to the cultivating measures which have been used before the NCC was incorporated. Quality improvement and increasing quantity are the goals of applying the NCC. Energy saving is more a result of a costs and benefits analysis (Roelofs, 2017).

1. Identification phase

In the *decision recognition routine* an *opportunity* was witnessed by the entrepreneur to further develop knowledge on climate regulations within the greenhouse. The entrepreneur has always been interested in new climate regulations, this is a *stimuli from inside the organisation* (see Appendix IX, 5). *Information about the environment,* especially with regard to climate regulations, was provided by Peter Kamp. He did not mention the NCC explicatively. The information Peter Kamp provided can be seen as a *stimuli from outside* the organisation (see Appendix IX, 5). Another *stimuli from outside* the organisation, which provides information about the environment, are the horticultural journals. Showing the benefits of implementing measures of the NCC (see Appendix IX, 5).

During the *diagnosis routine existing information channels* were used by the entrepreneur. These consist of the supplier of plant materials of Dümmen Orange, providing information on the different varieties of crops and participating in the discussion on climate regulations with the entrepreneur. Not providing any advice on which measures should be taken (see BOX 5.5 & Appendix IX, 5). Furthermore, the cultivation consultant of Delphy provided information on the measures of the NCC and how to use them within the greenhouse (see BOX 5.5 & Appendix IX, 5). Another *existing information channel* is the colleagues study group where *comparable developments* are shared between the participants. Especially Arcadia provided information on the measures they had implemented in their greenhouse (see Appendix IX). Besides, the cultivation consultant set up a *new information channel* regarding the NCC. The NCC training course organised by knowledge and expertise centre Delphy. The participants obtain information on the different measures which could be implemented in the greenhouse and share experiences with each other (see Appendix IX, 5). Another *new formed information channel* is the guidance committee with different participating parties studying different possible measures which could be implemented in a chrysanthemum nursery (see Appendix IX, 5).

2. Development phase
During the *search* routine the entrepreneur did not need to *actively search* for different ways of applying the climate regulation in the greenhouse. The *ready-made solutions* presented itself by the different actors which have been mentioned in the identification phase, except for stakeholder Dümmen Orange. This is known as *trap search*, with a main role for Peter Kamp, who inspires the entrepreneur to keep innovating (see Appendix IX, 5).

3. Selection phase
In the selection phase the entrepreneur himself decided together with the fellow owner of Zijdezicht on which measures to implement. Based on *screening* of the different alternatives obtained from the *new and existing information channels* (see Appendix IX, 5). Eventually the NCC measures were chosen with the features which seemed most important to them. Although the benefits of investing in different other innovations are recognised by the entrepreneur, this was not possible because of large amount of money needed (Krijger, 2017).

(4) Behaviour

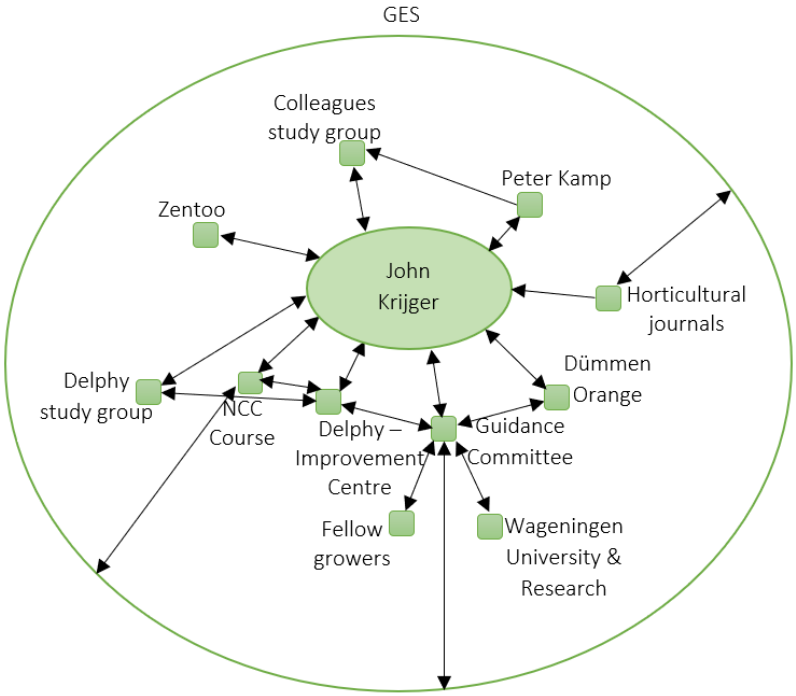
The personal factors of the entrepreneur displayed in Appendix V show that he is open to experience. Besides, being less strict to rules, norms and values. Furthermore, the entrepreneur seems to focus on external factors which influence the outcome ("External Locus of Control"). The entrepreneur finds it important to have a tidy nursery and problems should be tackled head on shows the attitude achievement in cultivating. He gains high satisfaction from cultivating and is willing to entertain the ideas of others. Financial risks should be avoided according to the entrepreneur. When looking at the objectives the entrepreneur find it important to succeed in farming and staying up-to-date. Also sustainably matters are important according to the entrepreneur.

(5) Stakeholder theory

The network of the entrepreneur, displayed in figure 5.5, includes different smaller *dense* networks. These smaller networks consist of actors who come together to share information and experiences. In these networks the actors have a relationship with the entrepreneur, but also with other actors in the network. Delphy study group is such a network in which chrysanthemum cultivators are located and guided by the knowledge and expertise centre Delphy. This group

of actors does not yet share a lot of information regarding the cultivation concept (Krijger, 2017). The guidance committee brings together different actors to conduct research with regards to the NCC within chrysanthemum nurseries. Supplier of plant materials Dümmen Orange also participates in this network. A lot of actors are involved and they do not participate altogether at the same time. The group changes every week and every two or four weeks a participant will participate (Krijger, 2017; Vis, 2017). Another smaller dense network is the one of Zentoo. A sales cooperation in which different chrysanthemum cultivators participate. Moreover, a lot of those growers also participate in the NCC training course organised by Delphy (Krijger, 2017; Corsten, 2017). The NCC training course in which the entrepreneur participates is the same group for the third season this course is held (Krijger, 2017). The last smaller dense work is the colleagues study group. This group mainly receives information of Arcadia as an example of implementing NCC measures in the nursery. Besides, this group is also influenced by information of Peter Kamp (Krijger, 2017). The entrepreneur has nine ties within the network of which six ties are not possible to reach individually by the entrepreneur. These six consist of the small dense networks mentioned before and the horticultural journals. In the small networks the normal procedure is to have contact with the actors within the group, although it is possible to reach out to the different actors individually by the entrepreneur. Horticultural journals only send information regarding the NCC. The entrepreneur reaches *independently* to Peter Kamp, who has a special position for the entrepreneur. This actor's knowledge is seen as adequate and inspirational by the entrepreneur (Krijger, 2017). The knowledge will be passed through to the smaller *dense* networks by the entrepreneur. This can be seen as an *in between position* of the entrepreneur. Information obtained of Peter Kamp is distributed to the fellow growers by the entrepreneur. In this way the information flow is controlled by the entrepreneur.

Figure 5.5: Network structure and patterns of relationships regarding NCC[8]



Source: based on Rowley (1997)

[8] Fellow growers are connected to Zentoo, colleagues study group and the NCC course, but to keep the figure clear these relationships are not drawn.

Stakeholders

In the identification phase, during the decision recognition routine, horticultural journals were used to provide information about the environment in which the entrepreneur is situated. The journals conducted by the entrepreneur are "Bloemisterij" and "Onder Glas". The supplier of plant materials, Martien Vis of Dümmen Orange, only provided information during the diagnosis routine of the identification phase. But not any advice is giving by him on which NCC measures should be taken. His message of the NCC is that adopting climate control measures will improve the quality of the crops and increase quantity. The cultivation consultant, Theo Roelofs of Delphy, provided information on the measures of the NCC and how to use them within the greenhouse. Starting to spread this information in the diagnosis routine of the identification phase. He message corresponds to the message of Martien Vis. This fits the goal of the entrepreneur to improve quality and quantity of the crops. Moreover, the cultivation consultant also provides information in the other phases. The individual role of the cultivation consultant is not really recognised in the decision making process. But he has a role in the smaller dense networks which are important to the entrepreneur. For instance, in the NCC training course and the guidance committee.

5.2.3 Klondike Gardens

Ruud van Leeuwen is co-owner of gerbera greenhouse Klondike Gardens situated in Berkel en Rodenrijs. This greenhouse consists of two nurseries with a total surface of four hectares. No technical investments have been done regarding the NCC, but different measures of the NCC have been implemented in the two nurseries. The names of the stakeholders which Ruud van Leeuwen provided were supplier Eric Boerlage of Dümmen Orange and cultivation consultant Marco de Groot of FloriConsultGroup, the same cultivation consultant as the one of entrepreneur Aad Zuijderwijk.

(1) Corporate Social Responsibility

The quality improvement is the most important feature when implementing the NCC measures according to the entrepreneur. When quality improves higher returns can be achieved. Energy savings have been achieved, but will never be the main goal. No technical investment have yet been done, because these investments cannot be covered by the energy savings it yields. Choices are always based on a cost-benefit calculation. Moreover, the choices are based upon a vision of six/seven years. Future visions will not be taken into account when changing cultivation methods or invest, because this future is uncertain. Furthermore, the entrepreneur sees a huge role for geothermal heat in the greenhouse of the future. Besides, LED lightning could be a big step towards sustainability in the gerbera cultivation (van Leeuwen, 2017).

"When sustainable choices are much more expensive you make another decision"
- Ruud van Leeuwen

(2; 3) Decision making process and the role of information

Participating in the guidance committee gerbera in 2010 on hose systems led to the first contact with the NCC for the entrepreneur. In the years after participating in the guidance committee the entrepreneur decreases the temperature of the minimum pipe and makes use of techniques to measure the status of the crops. This decision making process focuses on the implementation of these measures of the NCC. Looking at the information which the stakeholders provide and the message they bear regarding the NCC.

BOX 5.6 Main message of stakeholder Dümmen Orange

Besides the different techniques which require investments, the NCC is more a way to use existing features of a greenhouse according to Eric Boerlage of Dümmen Orange. Knowing how the crops respond to changing settings of different techniques. This is achievable by taking the physic principles of the plant into consideration (Boerlage, 2017).

According to Marco de Groot of FloriConsultGroup the NCC is represents the way of using tools to regulate the climate to keep the plant in optimal condition. Moreover, to protect the plant from different kind of diseases. Quality of the crops is the main purpose of adopting the NCC measures. Energy saving is important as well, but not the main goal (de Groot, 2017).

1. Identification phase
During the *decision recognition routine* an *opportunity* presented itself to the entrepreneur. The entrepreneur was able to participate in the guidance committee gerbera, because of its location near to the Improvement Centre and the age of the entrepreneur. This can be seen as a *stimuli from outside the organisation* (see Appendix IX, 6). Besides, the entrepreneur recognised that NCC could improve quality and energy savings, which would lead to decreasing costs. This is a *stimuli from inside the organisation* (see Appendix IX, 6). Moreover, horticultural journals and the study group of the FloriConsultGroup kept the entrepreneur updated about the *environment* in which the entrepreneur operates (see Appendix, IX 6).

In the *diagnosis routine* the entrepreneur used *existing information channels* to clarify the opportunities the measures of the NCC could bring. *Comparable information* of fellow growers, who participate in the study group of FloriConsultGroup, was collected by making use of LetsGrow. This is a programme which saves cultivation data of the participating growers (see Appendix IX, 6). Another *existing information channel* is the cultivation consultant of FloriConsultGroup providing information on innovations within the greenhouse horticultural sector by describing practical examples (see BOX 5.3 & Appendix IX, 6). The guidance committee is a *new information* channel which provided research on implementing hose systems in the greenhouse (see Appendix IX, 6). Showing the entrepreneur that these investments were not possible for his greenhouse. Another *new information channel* is the NCC training course which provides information on the NCC measures which can be implemented in the greenhouse (see Appendix IX, 6).

2. Development phase
In the *search routine* the different stakeholders, mentioned in the identification phase, provided different *ready-made solutions* to the entrepreneur. This is known as *trap search* (see Appendix IX, 6). The supplier of plant material of Dümmen Orange does not have a role in providing information on the NCC. Although he has his own view on the NCC (see BOX 5.6), he does spread this message to his customers if this subject is coming by (Boerlage, 2017).

3. *Selection phase*
During the selection phase the different ready-made solutions are *screened* by the entrepreneur and the fellow owners of Klondike Garden. Also the second cultivation consultant has a role in the screening process. This cultivation consultant reviews the solutions using theories (see Appendix IX, 6). Eventually the choice of the owners of Klondike Gardens is based on a cost-benefit analysis of the different ready-made solutions which can be applied in the greenhouse (see Appendix IX, 6).

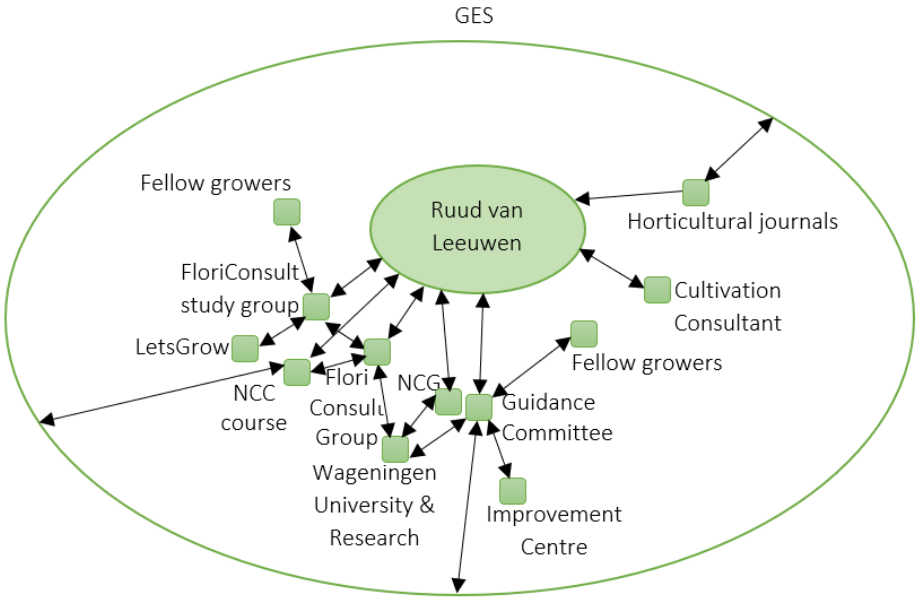
(4) Behaviour

The results of the questionnaire in Appendix V show for the personal factors of Ruud van Leeuwen that he is very much open to experience. Besides, he is scores high on agreeableness, being cooperative and helpful. He is more internal focused ("Internal Locus of Control"). Which could lead to more actively collecting information and more efficient use of this information. In the end, steering the environment more actively. Furthermore, scoring high on "Need for Cognition", showing that the entrepreneur extensively thinks about matters. When looking at the attitudes in farming the entrepreneur finds it important to have a tidy farm and problems should be tackled head on. Furthermore, the entrepreneur receives high satisfaction from cultivating and is willing to entertain the ideas of others and learn about innovations in cultivating practice. At least, the entrepreneur is not willing to take financial risks. For the objectives the entrepreneur is willing to succeed in cultivating and want to stay up-to-date.

(5) Stakeholder theory

The network of Ruud van Leeuwen, shown in figure 5.6, is interconnected. Displaying four smaller *dense* networks which are also connected to each other. In this networks the actors have a relationship with the entrepreneur, but also with the other actors in the network. The first of these four dense networks is the FloriConsult study group which gets together once every four weeks. The participants visit each other's greenhouses and share information on the gerbera cultivation with the help of programme LetsGrow guided by the cultivation consultant of FloriConsultGroup (van Leeuwen, 2017; de Groot, 2017). Second, the NCC training course provides information on different measures of the NCC which can be implemented. FloriConsultGroup has organised these training courses in the past (de Groot, 2017). Third, the National Committee Gerbera consists of fellow growers and research used from the WUR (van Leeuwen, 2017). At last, the guidance committee is a dense network where fellow growers, the WUR and the Improvement Centre participate (van Leeuwen, 2017). In these four small dense networks the normal procedure is to have contact with each other within the group. The entrepreneur will normally not reach out to these actors independently. Of the seven ties within the network of the entrepreneur, two can be reached out independently by the entrepreneur. These independent ties are the relationships with the cultivation consultants. The cultivation consultant of FloriConsultGroup has a big role in the network of the entrepreneur and as shown in the figure this consultant has many ties to the different stakeholders (van Leeuwen, 2017; de Groot, 2017).

Figure 5.6: Network structure and patterns of relationships regarding NCC[9][10]



Source: based on Rowley (1997)

Stakeholders

In the identification phase, during the decision recognition routine, horticultural journals were used to provide information about the environment in which the entrepreneur is situated. The journals conducted by the entrepreneur are "Bloemisterij", "Groenten en Fruit" and "Onder Glas". The supplier of plant materials, Eric Boerlage of Dümmen Orange, does not have a role in providing information with regard to the NCC in the decision making process of the entrepreneur. Marco de Groot, the cultivation consultant of FloriConsultGroup, starts to provide information in the diagnosis routine of the identification phase. Also in the other phases of the decision making process the cultivation consultant provides information. Both the cultivation consultant and the entrepreneur see quality improvements as the main goal to apply measures of the NCC. The individual role of the cultivation consultant is not really recognised in the decision making process. But he has a role in the smaller dense networks which are important to the entrepreneur. For instance, the NCC training course and the study group.

[9] Abbreviation NCG stands for: National Committee Gerbera.

[10] Fellow growers are connected to the NCG and the NCC course, but to keep the figure clear these relationships are not drawn.

6. Media analysis

In this chapter the horticultural journals are analysed. As mentioned in paragraph 3.7 on Analysis and operationalisation the operationalisation of the media analysis could not be given because information of chapter 4 on The New Cultivation Concept was necessary. So besides the analysis of the horticultural journals, the operationalisation of the media analysis is also given in this chapter. Paragraph 6.1 starts with the introduction of the three horticultural journals which will be analysed and the operationalisation of theoretical concepts into measurable constructs. In paragraph 6.2 the results if the media analysis are given.

6.1 Horticultural journals and search terms

Three horticultural journals were often mentioned when asking the greenhouse horticulture entrepreneurs which horticultural journals they conduct. These horticultural journals are "Onder Glas", "Bloemisterij" and "Groenten en Fruit" (see Appendix II). "Onder Glas" is a free monthly horticultural journal which is send to all the greenhouse horticulture entrepreneurs (Onderglas, 2017). Horticultural journal "Bloemisterij" is published every week and focusses on the floriculture, so cut flowers and plants (Hortipoint, 2017). "Groenten en Fruit" focusses on vegetables and fruit cultivations and is published every two weeks (GFactueel, 2017). All the horticultural journals provide information on current trends in the market, technical systems, cultivation, marketing, services and politics (Onderglas, 2017; Hortipoint, 2017; GFactueel, 2017). It is interesting to know how often those horticultural journals provide information on the NCC. Moreover, in which period what kind of association with the NCC is made. As outlined in chapter 4 on The New Cultivation Concept two periods can be distinguished which focus on a different kind of message that should be spread. These periods with their search terms are:

- Period one, from 2009 to 2012, with energy saving as the main message: energy efficient cultivation, energy saving and CO_2 emissions;
- Period two, from 2012 till June 2017[11], with physic and plant physiological principles as the main message: plant balance and plant physiological.

For some of those search terms other terms, which are very similar, are used as well to make sure that the search scope is broad enough (see Appendix VI). In both periods of time all search terms have been searched for, this leads to a possible comparison of the results. The expectation arises that the search terms displayed in period one will be used more in that period than in period two. Not surprisingly the other expectation is that the search terms displayed in period two will be used more in that period than in period one. Furthermore, the message the articles bear, positive or negative regarding the NCC, is analysed by reading twenty percent of the articles of the total hits per search term.

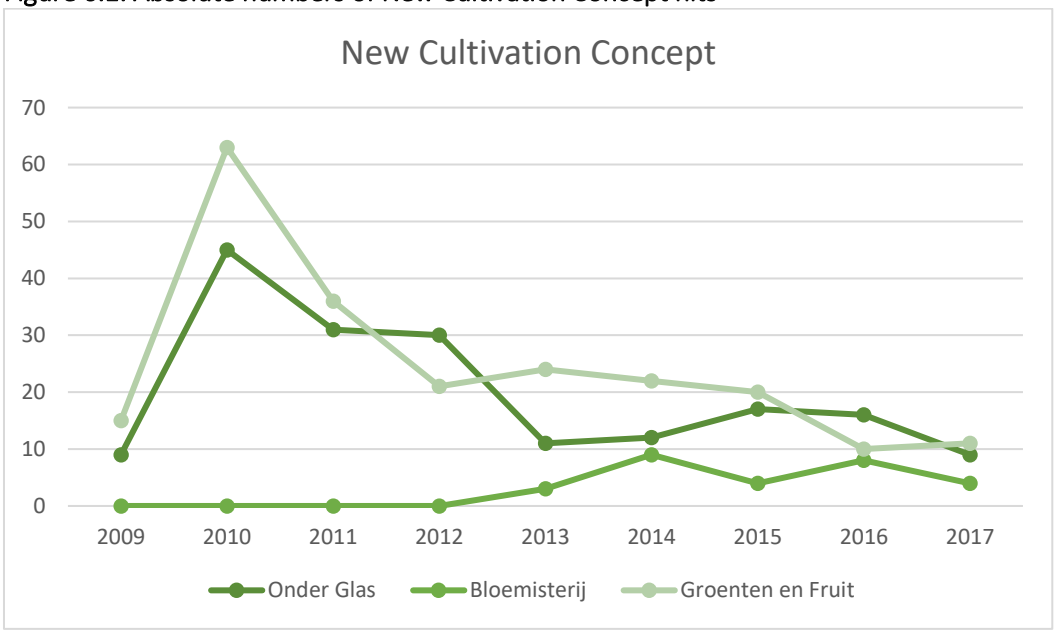
[11] The media analysis is carried out in the first week of July 2017, that is why period two lasts until June 2017.

6.2 Results of the media analysis

The results of the amount of hits on the different search terms are displayed in Appendix VI. Each search term is used in combination with the New Cultivation Concept. The results show that there is no difference between period one and period two. In both periods, for all three the horticultural journals, the focus is on energy savings. Furthermore, the message these journals bear regarding the NCC is positive, providing the readers information on studies with regard to the NCC, the developments in the NCC and practical examples.

Besides, the different journals do not publish the same amount of articles with regard to the NCC. This can be seen in Appendix VI, 1 to Appendix VI, 6. The absolute numbers of the amount of times the NCC is mentioned per year are given. Leading to the line chart as displayed in figure 6.1. When looking at the amount of times the NCC is mentioned per year, and for six months in 2017, figure 6.1 shows that the horticultural journal "Groenten en Fruit" published the most articles in which the NCC is mentioned. Journal "Bloemisterij" has very few articles in which the NCC is mentioned. Furthermore, the frequency of the used term has decreased since the start of the action programme in 2009. Where most hits in "Onderglas" and "Groenten en Fruit" appear in 2010.

Figure 6.1: Absolute numbers of New Cultivation Concept hits



7. Conclusion

The objective of this study is to contribute to the understanding of the decision making process of innovation decisions made by greenhouse horticulture entrepreneurs. Especially the influence of stakeholders on the innovation decision made is studied. Leading to the following central question: *"In what ways do stakeholders influence the greenhouse horticulture entrepreneur in making innovation decisions, especially with regard to the "New Cultivation Concept"?"* This last chapter starts with discussing and comparing the empirical data of the different cases in paragraph 7.1, using the expectations which have been formulated in paragraph 3.1 on Conceptual framework and expectations. In paragraph 7.2 the answer will be given on the central question of this research project. The limitations of this study are given in paragraph 7.3, providing a critical reflection. Paragraph 7.4 gives a description of recommendations for further research.

7.1 Discussion of the case study results

In paragraph 3.1 four different expectations have been formulated, describing four different relationships to connect the different theories which have been used during this study. Each expectation, dealing with another part of the case study results, will be introduced and discussed in a separate sub-paragraph.

7.1.1 Relation A: Influence of internal pressures on the information collection of the greenhouse entrepreneur

The internal pressures are discussed in the case study results on CSR and behaviour. Different internal pressures lead to the behaviour of the horticultural entrepreneur, of which some have an expected influence on the information collection of the entrepreneur. When looking at the "Big Five personality trait", an entrepreneur who scores high on open to experience and is extravert is expected to collect more information. Furthermore, if the entrepreneur scores high on agreeableness and low on conscientiousness he is expected to collect more information. If an entrepreneur scores high on conscientiousness he is expected to collect information more efficiently. When the entrepreneur is internal focused – "Internal Locus of Control" – information is expected to be collected more actively and used more efficiently. If the entrepreneur has a high cognition he is expected to collect more information. Looking at the mediating variables, an entrepreneur who scores high on openness and success in farming will collect more information. At last, finding sustainability matters important will lead to collecting more information with regard to the NCC. Besides, the notion of CSR of the entrepreneur, also known as the motivation, can influence the information collection of the entrepreneur. Furthermore, the expectations are focused on the amount of information which is collected by the entrepreneur.

The behaviour of the entrepreneur of the case of Arcadia could lead to the biggest amount of information collected according to the expectation. The results of the questionnaire show that this entrepreneur scores high on the different internal pressures which lead to this bigger

information collection. For instance, the entrepreneur scores high on open to experience, is extravert and scores high on "Need for Cognition". But the information collection in this case does not seem to be greater than for the other cases. Partly because it is hard to search for differences in the amount of information which has been collected. Moreover, the results of the internal pressures of the different cases do not differ that much either. A lot of the times all cases are located around the mean of the internal pressures. Besides, for the internal pressures "Need for Cognition" and "openness in cultivating" all the entrepreneurs score high. The cases probably differ not that much because, as Rogers (2010) already described, innovators and early adopters have a lot in common when it comes to adopting innovations.

But, the notion to start collecting information regarding the NCC is different for the different cases. This is described in the CSR of the different cases. Where Van der Spek bv. and Zuijderwijk-Witzier were looking for energy saving methods. Van der Spek bv. to reduce the natural gas costs and Zuijderwijk-Witzier to sustain the competitive advantage of the Dutch greenhouse horticultural sector. Arcadia, Zijdezicht and Klondike Gardens were looking for new ways of improving the quality of the crops. Furthermore, Leo van den Berg bv. wanted to obtain a better understanding of the plant by using quantitative data. For Leo van den Berg bv., Zijdezicht and Klondike Gardens saving energy was seen as a consequence of applying measures of the NCC. But, for Arcadia the notion came that energy savings should be achieved when the NCC developed. So it can be said that the innovator cases – Van der Spek bv., Arcadia and Zuijderwijk-Witzier – see energy savings as the main goal for implementing the NCC measures. Although for Arcadia this focus was not there at the start. Additionally, these cases score high on the objective "importance of sustainability matters" when looking at the internal pressures of behaviour. The innovator cases were the first to start with the NCC, so it can be said that motivation influences the need to start to collect information on the NCC. When energy savings and sustainability seems important to the entrepreneur this entrepreneur will start collecting information on the NCC more soon.

The kind of information collected by the different cases cannot be categorised by the different motivations of those cases. All cases looked for information about the environment, where Zijdezicht and Klondike Gardens also looked at comparable developments of fellow growers in the greenhouse horticultural sector. It has to be said that for innovators it would have probably been impossible to look at comparable developments of fellow growers, because those comparable development hardly existed. Arcadia used the comparable developments in other studies as an information source. The ways of collecting information was different, referring to the type of search, when looking at the different types of motivation of the entrepreneurs of the cases. The cases Zijdezicht and Klondike Gardens made use of trap search, where the stakeholders situated in the network provided the ready-made solutions. Besides trap search the other cases also used active search. So when energy savings and sustainability seem important to the entrepreneur this entrepreneur will actively search for different measures of the NCC to apply in the greenhouse. Besides, in the case of Leo van den Berg bv. active search also applied. The motivation to have a better understanding of the plant leads to active search for different alternatives.

To conclude, the influence of internal pressures on the information collection of the greenhouse entrepreneur can be partially verified. Not as stated as in the expectation of relation A, where the different internal pressures influence the amount of information collected. Differences in the amount of information collected are hard to find and the results on the internal pressures show too many similarities. But, the motivations of the entrepreneurs to apply measures of the

NCC do differ for the different cases and show also a difference in information collection. Not when looking at the amount of information collected, but when looking at (1) the need to start collecting information and (2) the way of collecting information.

7.1.2 Relation B: Influence of external pressures on the information collection of the greenhouse entrepreneur

The external pressures are the stakeholders who are located in a network with the entrepreneur. Moreover, the interactions of multiple influences from different stakeholders. How information is collected depends on the density of this network and the role of the entrepreneur within the network. When the entrepreneur operates in a high dense network communication becomes more efficient which is expected to result in a distribution of the information through the whole network. If the entrepreneur is well connected to the stakeholders within the network the expectation arises that the entrepreneur has easier access to information and will collect more information. The independent relation of the entrepreneur with the different stakeholders is expected to result in more and efficient information collection. When an entrepreneur is able to control the information flows within the network it is expected that those entrepreneurs have more easily access to information.

Looking at the different networks which are drawn for every case in chapter 5 and the explanation of those figures, it can be seen that the networks of the different cases show many of the same stakeholders. This is because the selection of the cases is based on the participants of the guidance committees regarding the NCC. Furthermore, all cases used already existing information channels and developed new information channels with regard to the NCC. The new formed information channels are often the same, because new groups were set up in the horticultural sector specialised in the NCC. For instance, the guidance committee and the NCC training course are set up because of the NCC. A difference in these networks is seen when looking at the density. The networks of Zijdezicht and Klondike Gardens consist of more smaller dense networks which are also connected to each other. These smaller dense networks consist for instance of the guidance committee, the NCC training course and study groups. In all these small dense networks fellow growers participate as well. Besides, together with the case of Leo van den Berg bv. the centrality of these entrepreneurs show more ties within the network. Zijdezicht has nine ties, Klondike Gardens seven ties and the case Leo van den Berg bv. eight ties. But, for all the cases of this study the number of stakeholders which can be reached independently is around the two or three. Looking at the length of the ties from the entrepreneur to the stakeholders, the ties which can be reached independently seem to be situated closer to the entrepreneur. With an exception for the guidance committee, located close to the entrepreneur but not reached independently. Besides, an in between position is found for the entrepreneurs of cases Van der Spek bv. and Zijdezicht. The entrepreneur of Van der Spek bv. distributes information with regard to the NCC to the National Committee Bell Pepper. The entrepreneur of Zijdezicht distributes information of Peter Kamp to the fellow growers in the smaller dense networks in which he is located. Leading to the ability for those entrepreneurs to control the information on these subjects to the other stakeholders.

First, the influence of density of the network on the information collection will be described. As said in the previous sub-paragraph Zijdezicht and Klondike Gardens look at comparable developments of fellow growers in the greenhouse horticultural sector. It seems that this is a consequence of being in more smaller dense networks in which fellow growers participate as well. Moreover, more small dense networks seems to lead to less need of active searching by the entrepreneur for different alternatives. The stakeholders of the small dense networks provide

the ready-made solutions to the entrepreneur, called trap search. Second, when focusing on the centrality of the entrepreneur in the network the other cases, of which Zuijderwijk-Witzier is an extreme example, show that closer situated stakeholders to the entrepreneur have the possibility to come up with modified solutions. These modified solutions are the result of research and cooperation between the different stakeholders. For those modified solution the entrepreneur also searches actively. The case of Zuijderwijk-Witzier is an extreme example because the NCC was not yet introduced at the time the entrepreneur, Wageningen University and Research and Hoogendoorn cooperated to come up with modified solutions. This cooperation had to be intensive to come with the alternatives which could be applied in the greenhouse, because no other information sources on this subject were available.

To conclude, the density of the network influences the way of collecting information by the entrepreneur. In a more dense network the need for the entrepreneur to actively search decreases. As said in the theory the information is distributed more efficient through the network. This can be verified, less time is needed by the entrepreneur to search for different measures of the NCC. Nothing can be said about the difficulty of collecting information and the amount of information collected. As said in the previous sub-paragraph it is hard to trace back the amount of information collected for the different cases. Besides, it does not seem that the entrepreneurs had any difficulties collecting information regarding the NCC. Furthermore, closer situated stakeholders will cooperate with the entrepreneur and come up with modified solutions, in which the entrepreneur also plays an active role in searching for relevant information.

7.1.3 Relation C: Information collection by the greenhouse entrepreneur will influence the decision making process

The decision making process consist of the identification phase, development phase and identification phase. Phases can be skipped and/or the order of the phases can differ per decision making process. In the different phases different kind of information is useful. It is expected that the amount of information used during the decision making process will influence the decision making process. It is not yet clear how this will influence the decision making process and the decision made, but it is expected that a correlation will appear.

Information collection is more intertwined with the decision making process than expected at the start of this study. The theory of Mintzberg et al. (1976) used during this research project already shows this connection. Besides, the theory of Citroen (2011) especially focuses on information collection during the decision making routine. During the analysis of the empirical data on the six cases the information collection and the decision making process are already connected to each other. Information is collected in every phase of the decision making process and cannot be seen as something separate. Where in the identification phase information about the environment is collected, the development phase provides information on ready-made and/or modified solutions. In the selection phase information for screening the different alternatives is collected. The only difference between the cases within the decision making process is seen when looking at the different routines which are in play. The cases of Van der Spek bv., Arcadia, Zuijderwijk-Witzier and Leo van den Berg bv. consist of an extra routine in the development phase. Besides the search routine the design routine is used in these cases. During the design routine different modified solutions are designed. The development phase of the cases with a design routine probably takes longer, because of this extra step.

To conclude, the expectation cannot be verified. It is not possible, as said before, to look at the amount of information obtained during the decision making process of the cases. But, the kind of information, the need to develop modified solutions, will influence the decision making process. In the development phase an extra routine is necessary to develop these modified solutions, which probably leads to extended duration of the decision making process.

7.1.4 Relation D: Influence of internal pressures on external pressures

The expectation is that the behaviour and/or the CSR of the entrepreneur will influence the position of the entrepreneur within the network, so the centrality. As said before, the behaviour of the entrepreneurs of the different cases do not differ that much. That is why it is impossible to say anything about the influence of behaviour on the position of the entrepreneur in the network. The motivation, CSR, to apply the measures of the NCC do differ per case. The cases with more or less the same motivation are Van der Spek bv,, Arcadia and Zuijderwijk-Witzier, focussing on energy savings. These three cases have less ties, but the stakeholders in the network are closer situated to the entrepreneur, which leads to an more intensive and active relationship.

To conclude, the influence of the kind of motivation, to implement measures of the NCC, on external pressures can be verified. When energy savings are the motivation it seems that the position of the entrepreneur is closer to the stakeholders which are situated in the network.

7.2 Answering the central question

During this study the following central question is tried to be answered:
"In what ways do stakeholders influence the greenhouse horticulture entrepreneur in making innovation decisions, especially with regard to the "New Cultivation Concept"?"

The findings demonstrate that both internal and external pressures influence the information collection by the greenhouse horticulture entrepreneur. This information collection cannot be seen as something separate from the decision making process. Information collection has a function in every phase of the decision making process and is different for every phase. First of all the internal pressures influence the need to start to collect information. Entrepreneurs who find energy savings and sustainability important seem to start collecting data on the NCC more soon. Secondly, the way of collecting information is influenced by the internal pressures. Energy savings, sustainability and a better understanding of the plant leads to active search for different measures of the NCC to apply in the greenhouse.

When looking at the external pressures, which is the focus of this study, the density of the network of the entrepreneur influences the way of collecting information. In a more dense network the need for the entrepreneur to actively search decreases. Furthermore, the closer situated stakeholders will cooperate more with the entrepreneur leading to modified solutions in which all parties search for relevant information.

A special focus in this study was on the cultivation consultants, suppliers of plant material or technical systems and horticultural journals. In almost all the cases the horticultural journals provide information about the environment during the decision recognition routine in the identification phase of the decision making process. Except for the cases of Leo van den Berg bv. and Zuijderwijk-Witzier. The entrepreneur of the case of Leo van den Berg made use of the

Financial Newspaper instead of the horticultural journals. For the case of Zuijderwijck-Witzier no information was available with regard to the NCC, because the decision making process took place before the NCC was introduced. For the other cases especially three horticultural journals are mentioned by the entrepreneurs, "Onder Glas", "Bloemisterij" and "Groenten en Fruit". The media analysis shows that the information which is spread by these journals is positive regarding the NCC, focusing on the studies with regard to the NCC, the developments in the NCC and practical examples. Furthermore, the journals publish to a different extent articles about the NCC. The "Bloemisterij" published very few articles during the years the NCC has been in play. "Groenten en Fruit" and "Onder Glas" published a lot of articles about the NCC in 2010, but this number has decreased during the years.

In the diagnosis routine of the identification phase the role of the cultivation consultant is recognised in the cases of Van der Spek bv., Arcadia, Zuijderwijk-Witzier, Zijdezicht and Klondike Gardens. But for the cases of Van der Spek bv. and Zuijderwijk-Witzier the role is only witnessed in the diagnosis routine and cannot be found in the other phases. Furthermore, in the case of Leo van den Berg bv. there is even no role for the cultivation consultant in any phase of the decision making process. When the cultivation consultant cannot provide the right information with regard to the NCC, the entrepreneur will not use or will use the information of the cultivation consultant to a limited extent. Other stakeholders are used (when it is an already existing information channel) or found (when it is a new formed information channel) to provide the entrepreneur with information regarding the NCC. For the cases of Zijdezicht and Klondike Gardens the individual role of the cultivation consultant is limited after the diagnosis routine. The cultivation consultant in these cases does spread information in the other phases of the decision making process. But, this is done by being part of the small dense networks, rather than giving individual advice to the entrepreneur with regard to the NCC. Looking at the message the cultivation consultants bears it corresponds to the goals of the entrepreneur, when the cultivation consultant gives information in multiple phases of the decision making process.

The role of supplier is recognised in the diagnosis routine of the identification phase in all cases, except of Klondike Gardens. Moreover, when it is the supplier of plant materials the role sticks to the diagnosis routine, whereas suppliers of technical systems also have a role in the other phases (and routines) of the decision making process. This role in the other phases is fulfilled by the supplier, because he is part of the guidance committee in which the entrepreneur also participates. Furthermore, the importance of the information provided by the suppliers differs per case. The suppliers of technical systems, for the cases of Leo van den Berg bv. and Arcadia, use the NCC to promote their product and mainly focuses on the specific features of the NCC which are important for their products. This promotion also applies for the suppliers of plant materials. But, for the cases of Leo van den Berg bv. and Zijdezicht the suppliers of plant materials recognise that all the measures of the NCC will influence the crops. These suppliers do provide information on all these different measures, but no real advice is given.

A special role for the guidance committee is seen in the cases of Van der Spek bv., Leo van den Berg bv. and Arcadia. This dense network of different stakeholders is situated close to the entrepreneur and together they come up with modified solutions. For the case Leo van den Berg bv. a stakeholder in the guidance committee took over the role of cultivation consultant from the original cultivation consultant.

7.3 Critical reflection

During this research the researcher considered the limitations of the research project. These limitations will be given in this paragraph, being critical on the conducted research, but also on the theories chosen and the measures of which the New Cultivation Concept consists of.

A general limitation in many studies is the amount of time which is available to conduct the research. The time limitation in this study led to the focus on the influence of external pressures when making innovation decisions. Eventually these external pressures were also specified on certain stakeholders, which might led to the wrong focus of the influences on the innovation decisions. Besides, this specification maybe caused a one-sided image of the innovation decisions made, where not every influence on the decision making process is valued to the right extent. Secondly, the selected cases show a limited variation of greenhouse horticulture entrepreneurs, concentrating on the categories of innovators and early adopters. Although the reasons for this are backcloth and justified in the case selection, it makes it impossible to generalise the findings to the wider group of entrepreneurs. Generalisation is not the main goal of this research, but the NCC also needs to be spread to the other categories of entrepreneurs. This will lead to a lot of uncertain factors when trying to imagine how their decision making process would be like. Third, a difficult factor when conducting research on decision making processes is that it happened in the past. This makes it difficult for the participants to remember it all correctly. That is why it is not certain that the decision making processes really proceed as described in chapter 5 on Case study results. Fourth, the interviewees knew that the research was conducted at the Ministry of LNV. This can possibly influence the answers given by the participants. A last limitation of the conducted research is that the researcher could be biased, because of a strong connection with the greenhouse horticultural sector. This is partly corrected by the supervisor of the Radboud University who does not has any connection with this sector.

Furthermore, the theories which are chosen for this research project are carefully considered by the researcher. Different alternatives have been compared and the ones that fits the central question and sub-questions the best were chosen. For the behaviour theory on the personal factors of the "Big five personality traits" this was not possible. No unpaid research method which explained the methods behind the questions was found. That is why the questions are based on an online test.

The last limitation concentrates on the New Cultivation Concept. The NCC is not seen as a complete concept by the researcher. When focusing on an active and favourable climate in the greenhouse many aspects which are connected to cultivating are disregarded. Although the link with energy savings has been made immediately, the name of the concept could entail many more measures. Eventually the measures of the NCC should lead to a decrease in CO_2 emissions, but the focus is only on direct CO_2 emissions by the horticultural sector. Reducing the carbon footprint when cultivating also means using different kind of materials for growing crops or use the materials in a more efficient way. For example a lot of disposable plastic is used in the sector for which cruel oil is needed. The production of these plastics leads to CO_2 emissions. Moreover, a lot of plastic end up in landfills and the oceans, causing serious problems for ecosystems. The New Cultivation Concept should incorporate those kind of measures as well.

7.4 Recommendations for further research

In this paragraph recommendations for further research will be given, so the Ministry of LNV knows which factors need to be taken into consideration when new research is carried out.

If in the future this research will be conducted again a larger sample should be used. Besides, this sample should contain more units of analysis then the innovators and early adopters used for this research project. This is only possible when the entrepreneurs in the other categories of Rogers - early majority, late majority, laggards - have implemented measures of the NCC in their greenhouse. Because this takes a while and the idea of these kind of studies is to figure out how the implementation of innovations can be accelerated, it would be a better idea to focus on different stakeholders. When looking at the results of this study it can be seen that for the early adopter cases the small dense networks are very important when it comes to information collection by the entrepreneur. It would be interesting to know how the intercommunication in those small dense networks takes place. A study which observes these intercommunications in a focus group would gain insights on those processes.

Furthermore, the motivation of the entrepreneur is very important for the information collection in the decision making process. Further research should get a better understanding of those different kind of motivations and how this influences the information collection in the decision making process.

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Appendices

Appendix I: Expert interviews

1. Interview Aat Dijkshoorn

Doel: inzicht krijgen in "Het Nieuwe Telen" en de stakeholders die hierbij horen
Datum: 24 april 2017
Tijd: 14.00 uur
Locatie: Ministerie Economische Zaken

1. Wat zijn de kenmerkende maatregelen die voor het "Het Nieuwe Telen" van belang zijn? (4 á 5 kenmerken)

2. Wat wordt verstaan onder "Het Nieuwe Telen" door verschillende partijen?

3. In welke gradaties van intensiteit wordt "Het Nieuwe Telen" verdeeld?

4. Heeft u voorbeelden van bedrijven voor elk van de gradaties?

5. Welke stakeholders hebben een rol bij het maken van beslissingen omtrent "Het Nieuwe Telen" door glastuinbouwondernemers?

Type stakeholder	Tegenwerken	Aanmoedigen

6. Wat is de reden van aanmoediging of het tegenwerken door stakeholders?

7. Hoe belangrijk wordt de informatie bevonden die deze stakeholders aan de ondernemer verschaffen?

8. Wanneer in het besluitvormingsproces van de ondernemer wordt welk soortige stakeholder geraadpleegd?

2. Interview Jan Buurma

Doel: inzicht krijgen in sociale innovaties in de glastuinbouw (besluitvormingsproces, stakeholders)
Datum: 25 april 2017
Tijd: 14:30 uur
Locatie: WEcR

1. Welke factoren zijn van belang voor de glastuinbouwondernemer bij het maken van een investeringsbeslissing?
   - Verschilt dit per beslissingsonderwerp?

2. Hoe ziet het besluitvormingsproces van deze glastuinbouwondernemer eruit?

3. Op welke momenten in het besluitvormingsproces wordt informatie verzameld?

4. Waar komt de informatie vandaan die de glastuinbouwondernemer verzamelt?
   - Welke informatiekanalen gebruikt de glastuinbouwondernemer?

Bijvoorbeeld: social media, vakblad

5. Wie zijn de stakeholders om de glastuinbouwondernemer heen?

6. Wat is de volgorde van "belangrijkheid" van deze stakeholders?

- Van welke stakeholders zal de glastuinbouwondernemer het snelst iets aannemen?

7. Welke dynamiek is te zien tussen stakeholders in de glastuinbouw?

- Naast de dynamiek tussen ondernemer en verschillende stakeholders, is er waarschijnlijk ook contact tussen andere stakeholders onderling.

3. Interview Leo Oprel

Doel: caseselectie vaststellen
Datum: 12 mei 2017
Tijd: 10:00 uur
Locatie: Ministerie Economische Zaken

4. Interview Kees Vijverberg

Doel: inzicht krijgen in hoe nieuwe innovaties leven onder de glastuinbouwondernemers
Datum: 26 mei 2017
Tijd: 10:00 uur
Locatie: Berkel en Rodenrijs

1. Hoe wordt er over innovaties gedacht door ondernemers binnen de glastuinbouwsector?

2. Welke factoren zijn van invloed bij het doorvoeren van innovaties binnen het glastuinbouwbedrijf?

3. Welke stakeholders worden benaderd voor informatie bij het maken van innovatie beslissingen?

4. Welke stakeholders worden het belangrijkst bevonden door de ondernemer bij het maken van innovatiebeslissingen?

5. Welke stakeholders leveren informatie die van meeste invloed zal zijn op de innovatiebeslissing?

6. Wat is de reden van aanmoediging of tegenwerking door stakeholders?

7. In welke fase van het besluitvormingsproces worden welke stakeholders geraadpleegd?

- identificatie fase, ontwikkelingsfase en selectie fase

8. Hoe wordt er over Het Nieuwe Telen gesproken door ondernemers?

9. In welk stadium bevindt Het Nieuwe Telen zich? Wordt het al vaak toegepast door ondernemers?

Appendix II: Entrepreneur interviews

Naam:
Bedrijf:
Datum:
Tijd:
Plaats:

Introductie
Ik doe op dit moment onderzoek naar het gedrag van de glastuinbouwondernemer met betrekking tot "Het Nieuwe Telen". Hierbij kijk ik specifiek naar het besluitvormingsproces dat heeft plaatsgevonden voorafgaand aan de doorvoering van "Het Nieuwe Telen" binnen het bedrijf. De informatie inwinning van de ondernemer speelt daarbij een rol. Ik probeer te weten te komen welke partijen betrokken waren in het besluitvormingsproces en welke informatie zij aan de ondernemer hebben geleverd.

Doel: Inzicht krijgen in het besluitvormingsproces van de ondernemer omtrent "Het Nieuwe Telen", zodat er aanbevelingen gedaan kunnen worden hoe dit besluitvormingsproces eventueel zou kunnen worden ondersteund door het ministerie van Economische Zaken en LTO Glaskracht Nederland.

Algemene vragen

1. Wat is de omvang van het bedrijf?

2. Wat is uw leeftijd?

3. Welke opleiding heeft u gevolgd?

4. Wat is uw functie binnen het bedrijf?

5. (Is er een bedrijfsopvolger binnen het bedrijf?)

6. Sinds wanneer bent u betrokken bij "Het Nieuwe Telen"?

7. Hoe bent u betrokken bij "Het Nieuwe Telen"?

8. Wat verstaat u onder "Het Nieuwe Telen"?

9. Met het oog op welke doel(en) past u "Het Nieuwe Telen" toe?

- kwaliteit
- productie hoeveelheid
- energie besparing

10. Welke maatregelen van "Het Nieuwe Telen" heeft u toegepast binnen uw bedrijf?

- Immateriële innovaties: wijziging in teeltwijze maar geen (grote) investeringen
- Materiële innovaties: zowel wijziging in teeltwijze als investeringen

11. Bent u tevreden/ worden de doelen behaald?

12. Hoe ziet u de toekomst van de glastuinbouw met het oog op: geen gas meer in 2050, weinig restwarmte van fossiele brandstoffen en een compleet vernieuwd kassensysteem (uitgaande dat een kas een levensduur van 20 jaar heeft). Hoe denkt u dat een energieverlaging kan worden bereikt en verdere verduurzaming zal worden ingevuld? (rol voor "Het Nieuwe Telen")

13. Hoe ziet u de toekomst van uw bedrijf?

Algemene informatiebronnen voor innovatieontwikkelingen

14. Welke vakbladen raadpleegt u regelmatig?

15. Welke internetnieuwsbrieven/ websites/ social media raadpleegt u regelmatig?

16. Van welke partijen ontvangt u informatie over innovaties binnen de glastuinbouw?

Besluitvormingsproces van de ondernemer

Het besluitvormingsproces bestaat uit een aantal fases die niet per se in de volgorde hoeft voor te komen zoals hier aangegeven: identificatie-, ontwikkeling- en selectiefase. Per fase zal worden gekeken welke partijen zijn benaderd en wat de boodschap was van deze partijen.

Identificatiefase: de kans of het "probleem" wordt geïdentificeerd, informatie wordt ingewonnen om de kans of het "probleem" te verduidelijken

17. Hoe wist u van "Het Nieuwe Telen"? Was er sprake van een probleem binnen uw bedrijf of heeft "Het Nieuwe Telen" u aangezet tot denken en is zo de noodzaak/de mogelijkheden van "Het Nieuwe Telen" tot stand gekomen binnen u bedrijf?

- Welke partijen heeft u benaderd in de identificatie fase?/ Of welke partijen hebben u benaderd?
- Wat was de boodschap van deze partijen? Positief (met kanttekening)/negatief tegenover "Het Nieuwe Telen"
- Welke partij(en) heeft/hebben de doorslag gegeven om verder na te denken over "Het Nieuwe Telen"?
- Welke informatiebronnen heeft u geraadpleegd?

Ontwikkelingsfase: de alternatieven die kunnen worden geïmplementeerd met betrekking tot "Het Nieuwe Telen" worden uiteengezet.

18. Welke alternatieven van "Het Nieuwe Telen" heeft u overwogen om te implementeren binnen uw bedrijf?

- Welke partijen heeft u benaderd in de ontwikkelingsfase?/ Of welke partijen hebben u benaderd?
- Wat was de boodschap van deze partijen? Positief (met kanttekening)/ negatief tegenover "Het Nieuwe Telen"
- Welke partij(en)/person(en) heeft/hebben de doorslag gegeven om verder na te denken over "Het Nieuwe Telen"?
- Welke informatiebronnen heeft u geraadpleegd?

Selectiefase: de verschillende alternatieven worden naast elkaar gelegd, geschikte alternatieven worden gefilterd van de minder geschikte alternatieven en uiteindelijk wordt het "beste" alternatief gekozen.

19. Welk alternatief heeft u uiteindelijk geïmplementeerd binnen uw bedrijf?

- Welke partijen heeft u benaderd in de selectiefase?/ Of welke partijen hebben u benaderd?
- Wat was de boodschap van deze partijen? Positief (met kanttekening)/negatief tegenover "Het Nieuwe Telen"
- Welke partij(en)/ person(en) heeft/hebben de doorslag gegeven om dit alternatief te implementeren binnen uw bedrijf?

Netwerk

20. Kunt u het netwerk tekenen met de verschillende informatiebronnen die invloed hebben gehad op uw besluitvormingsproces met betrekking tot "Het Nieuwe Telen"?

- De positie van uw bedrijf in dit netwerk;
- De verbinding met andere partijen in het netwerk: afstand van de lijnen laten de sterkte van de connectie met de partij zien; pijlrichting laat de richting van informatie zien;

- Hoe vaak bent u in contact met de partijen die u heeft getekend?

Advies

21. Hoe zouden het ministerie van Economische Zaken en LTO Glaskracht Nederland de implementatie van “Het Nieuwe Telen” kunnen stimuleren?

Appendix III: Cultivation consultant interviews

Naam:
Ondernemer:
Bedrijf:
Datum:
Tijd:
Plaats:

Introductie
Ik doe op dit moment onderzoek naar het gedrag van de glastuinbouwondernemer met betrekking tot "Het Nieuwe Telen". Hierbij kijk ik specifiek naar het besluitvormingsproces dat heeft plaatsgevonden voorafgaand aan de doorvoering van "Het Nieuwe Telen" binnen het bedrijf. De informatie inwinning van de ondernemer speelt daarbij een rol. Ik probeer te weten te komen welke partijen betrokken waren in het besluitvormingsproces en welke informatie zij aan de ondernemer hebben geleverd.

Doel: Inzicht krijgen in het besluitvormingsproces van de ondernemer omtrent "Het Nieuwe Telen", zodat er aanbevelingen gedaan kunnen worden hoe dit besluitvormingsproces eventueel zou kunnen worden ondersteund door het ministerie van Economische Zaken en LTO Glaskracht Nederland.

1. Wat is uw functie binnen de organisatie?

2. Hoe bent u in contact gekomen met de ondernemer (naam ondernemer ……..) (met betrekking tot "Het Nieuwe Telen")?

3. Hoe vaak bent u in contact met de ondernemer?

4. Met welke andere partijen staat u nog meer in contact betreffende "Het Nieuwe Telen"?

5. Hoe vaak bent u met deze andere partijen in contact?

6. Wat houdt volgens u "Het Nieuwe Telen" in?

7. Waarom denkt u op deze manier over "Het Nieuwe Telen"? Welke personen/partijen hebben er voor gezorgd dat u hier zo over denkt?

8. Was u al eerder bezig met factoren van het "Nieuwe Telen" toen dit nog niet zo werd genoemd?
- Isolatie: energieschermen
- Gewasactivering: minimumbuis
- Ontvochtiging

9. Welke boodschap draagt u uit over Het Nieuwe Telen?

10. Met het oog op welke doel(en) spreekt u met ondernemers over "Het Nieuwe Telen"?
- kwaliteit
- productie hoeveelheid
- energie besparing

11. Merkt u dat bij de ondernemers deze doelen worden behaald met behulp van "Het Nieuwe Telen"?

12. In welke fase(s) bent u betrokken geweest bij het besluitvormingsproces van de ondernemer om een innovatie in te voeren in zijn kas?

- Identificatiefase: de kans of het "probleem" wordt geïdentificeerd, informatie wordt ingewonnen om de kans of het "probleem" te verduidelijken;
- Ontwikkelingsfase: de alternatieven die kunnen worden geïmplementeerd met betrekking tot "Het Nieuwe Telen" worden uiteengezet;
- Selectiefase: de verschillende alternatieven worden naast elkaar gelegd, geschikte alternatieven worden gefilterd van de minder geschikte alternatieven en uiteindelijk wordt het "beste" alternatief gekozen.

13. Hoe ziet u de toekomst van de glastuinbouw met het oog op: geen gas meer in 2050, weinig restwarmte van fossiele brandstoffen en een compleet vernieuwd kassensysteem (uitgaande dat een kas een levensduur van 20 jaar heeft). Hoe denkt u dat een energieverlaging kan worden bereikt en verdere verduurzaming zal worden ingevuld? (rol voor "Het Nieuwe Telen")

14. Hoe ziet u de toekomst van het bedrijf waar u werkt?

15. Hoe zouden het ministerie van Economische Zaken en LTO Glaskracht Nederland de implementatie van "Het Nieuwe Telen" kunnen stimuleren?

Appendix IV: Supplier interviews

Naam:
Ondernemer:
Bedrijf:
Datum:
Tijd:
Plaats:

Introductie
Ik doe op dit moment onderzoek naar het gedrag van de glastuinbouwondernemer met betrekking tot "Het Nieuwe Telen". Hierbij kijk ik specifiek naar het besluitvormingsproces dat heeft plaatsgevonden voorafgaand aan de doorvoering van "Het Nieuwe Telen" binnen het bedrijf. De informatie inwinning van de ondernemer speelt daarbij een rol. Ik probeer te weten te komen welke partijen betrokken waren in het besluitvormingsproces en welke informatie zij aan de ondernemer hebben geleverd.

Doel: Inzicht krijgen in het besluitvormingsproces van de ondernemer omtrent "Het Nieuwe Telen", zodat er aanbevelingen gedaan kunnen worden hoe dit besluitvormingsproces eventueel zou kunnen worden ondersteund door het ministerie van Economische Zaken en LTO Glaskracht Nederland.

1. Wat is uw functie binnen de organisatie?

2. Hoe bent u in contact gekomen met de ondernemer (naam ondernemer ……..) (met betrekking tot "Het Nieuwe Telen")?

3. Hoe vaak bent u in contact met de ondernemer?

4. Met welke andere partijen staat u nog meer in contact betreffende "Het Nieuwe Telen"?

5. Hoe vaak bent u met deze andere partijen in contact?

6. Wat houdt volgens u "Het Nieuwe Telen" in?

7. Waarom denkt u op deze manier over "Het Nieuwe Telen"? Welke personen/partijen hebben er voor gezorgd dat u hier zo over denkt?

8. Was u al eerder bezig met factoren van het "Nieuwe Telen" toen dit nog niet zo werd genoemd?
- Isolatie: energieschermen
- Gewasactivering: minimumbuis
- Ontvochtiging

9. Welke boodschap draagt u uit over Het Nieuwe Telen?

10. Met het oog op welke doel(en) spreekt u met ondernemers over "Het Nieuwe Telen"?
- kwaliteit
- productie hoeveelheid
- energie besparing

11. Merkt u dat bij de ondernemers deze doelen worden behaald met behulp van "Het Nieuwe Telen"?

12. In welke fase(s) bent u betrokken geweest bij het besluitvormingsproces van de ondernemer om een innovatie in te voeren in zijn kas?

- Identificatiefase: de kans of het "probleem" wordt geïdentificeerd, informatie wordt ingewonnen om de kans of het "probleem" te verduidelijken;
- Ontwikkelingsfase: de alternatieven die kunnen worden geïmplementeerd met betrekking tot "Het Nieuwe Telen" worden uiteengezet;
- Selectiefase: de verschillende alternatieven worden naast elkaar gelegd, geschikte alternatieven worden gefilterd van de minder geschikte alternatieven en uiteindelijk wordt het "beste" alternatief gekozen.

13. Hoe ziet u de toekomst van de glastuinbouw met het oog op: geen gas meer in 2050, weinig restwarmte van fossiele brandstoffen en een compleet vernieuwd kassensysteem (uitgaande dat een kas een levensduur van 20 jaar heeft). Hoe denkt u dat een energieverlaging kan worden bereikt en verdere verduurzaming zal worden ingevuld? (rol voor "Het Nieuwe Telen")

14. Hoe ziet u de toekomst van het bedrijf waar u werkt?

15. Hoe zouden het ministerie van Economische Zaken en LTO Glaskracht Nederland de implementatie van "Het Nieuwe Telen" kunnen stimuleren?

Appendix V: Questionnaire and results

1. "Big Five personality trait"

Costa and McCrae (1989) invented the NEO Five Factor Inventory (NEO: FFI) method to measure personality traits. Normally this method consists of 60 questions, every trait includes 12 questions which can range from one "totally disagree" till five "totally agree", called a five-point Likert scale. With a score of 12 as the lowest score which can be obtained and a score of 60 as the highest score which can be obtained per trait. This method is a paid method on testing the personality factors. A free test was found on the internet and used in the composite survey.[12] This test includes 20 questions, 4 for each trait, with leads to 4 as lowest score and 20 as highest score which can be obtained per trait. **Neutral number: 12.**

Emotional instability: 2, 8, 14, 16
A high score shows that this entrepreneur is emotional instable, where a low score shows this entrepreneur is emotional stable.
2. I worry about things - Ik maak me zorgen over dingen.
8. I rarely get irritated (**reversed**) - Ik raak zelden geïrriteerd
14. I am usually relaxed (**reversed**) - Ik ben meestal ontspannen.
16. I mock about things - Ik mopper over dingen.
Mean 11,83

Openness to experience: 4, 10, 20, 13
A high score shows that this entrepreneur is open to experience, where a low score shows this entrepreneur is not open to experience.
4. I have a vivid fantasy - Ik heb een levendige fantasie.
10. I am having trouble imagining things (**reversed**) - Ik heb moeite me dingen voor te stellen.
13. I take a conversation to a higher level - Ik breng een gesprek naar een hoger niveau.
20. I can process a lot of information at the same time - Ik kan veel informatie tegelijkertijd verwerken.
Mean 14

Extravert: 1, 5, 11, 19
A high score shows that this entrepreneur is extravert, where a low score shows this entrepreneur is introvert.
1. I speak to many different people at parties - Ik spreek op feestjes veel verschillende mensen.
5. I do not like to focus the attention on me (**reversed**) - Ik hou er niet van om de aandacht om te richten.
11. I let others take the lead (**reversed**) - Ik laat anderen het voortouw nemen.
19. I do not mind being in the center of attention - ik vind het niet erg om midden in de belangstelling te staan.
Mean 12,5

Agreeableness: 6, 9, 15, 17
A high score shows that this entrepreneur is agreeable, where a low score shows this entrepreneur is not agreeable.
6. I make time for others - Ik maak tijd vrij voor anderen.
9. I think of others first - Ik denk eerst aan anderen.
15. I make people feel comfortable – Ik laat mensen zich op hun gemak voelen.
17. I notice the emotions of others - Ik voel emoties van anderen aan.
Mean 13,6

[12] The website used for this test is: https://www.123test.nl/. The internal pressures influencing the decision made by the entrepreneur is not the main focus of the research, which is why not is chosen for a sixty question long survey on the "Big Five personality traits".

Conscientiousness: 3, 7, 12, 18
A high score shows that is entrepreneur is conscientious, where a low score shows this entrepreneur is not conscientiousness.
3. I leave my house messy (**reversed**) - Ik laat mijn huis rommelig achter.
7. I work according to a timetable - Ik werk volgens een tijdschema.
12. I am always prepared - Ik ben altijd voorbereid.
18. I fail doing my job activities (**reversed**) - Ik verzaak mijn werkzaamheden.
Mean 13,83

2. "Locus of Control"

With a the lowest score possible of 3 (suggesting "Internal Locus of Control") and the highest score of 18 (suggesting "External Locus of Control"). **Neutral number 10,5.**
Mean 10,5

41. Achieving what you want: is almost entirely dependent on the circumstances - Krijgen wat je bereiken wilt: is vrijwel helemaal afhankelijk van de omstandigheden.
42. Succeeding in your work depends on: working hard - Succes hebben met je werk is een kwestie van: hard werken (**reversed**).
43. Without knowing the right people it is impossible to get ahead - Zonder de juiste kruiwagens kom je niet hogerop.

3. "Need for Cognition"

With a lowest score possible of 3 (suggesting low "Need for Cognition") and the highest score of 24 (suggesting high "Need for Cognition"). **Neutral number 13,5.**
Mean 16,83

38. I would rather have a complicated problem than a simple one. - Ik heb liever een ingewikkeld dan een simpel probleem.
39. I really enjoy a task in which new solutions to problems have to be given. - Ik geniet echt van een taak waarin nieuwe oplossingen voor problemen aangedragen
moeten worden.
40. I gain satisfaction from measuring different options for a long time. - Iets langdurig en precies afwegen geeft me voldoening.

4. Attitudes in farming

With two questions: With a lowest score possible of 2 and the highest score possible of 10. **Neutral number 6.**
With three questions: With a lowest score possible of 3 and the highest score possible of 15. **Neutral number 9.**

Achievement in farming
A high score shows the importance the entrepreneur places on achievement in a variety of aspects of cultivating.
21. It is important to have a tidy farm - Het is belangrijk om een netjes opgeruimd bedrijf te hebben.
22. Farming problems are best tackled head on - Problemen op het bedrijf moeten meteen aangepakt worden.
Mean 8,33

Pessimism about farming
A high score shows high satisfaction of the entrepreneur with cultivating.
23. Farming is satisfying - Ik word blij van tuinder zijn.
24. Farming is a job with a lot of scope to do things your own way - Tuinder zijn is een beroep met veel bewegingsvrijheid om je eigen ding te doen.
Mean 8,16

Openness in farming
A high score shows the entrepreneur's willingness to entertain the ideas of others and to learn about innovations in cultivating practice.
25. It is important to have the occasional member of the public visit the farm - Het is belangrijk om af en toe iemand van buiten de tuinbouw op je bedrijf te laten
rondkijken.
26. Sometimes it is necessary to consult with professional farming advisors before making decisions - Soms is het noodzakelijk om voorafgaand aan een beslissing professionele bedrijfsadviseurs te consulteren.
27. It is important to visit other farms to look at their methods - Het is belangrijk om andere tuinbouwbedrijven te bezoeken om hun bedrijfsvoering te bekijken.
Mean 13,5

Financial risks
A high score shows the entrepreneur is willing to take financial risk.
28. Succesful farmers take financial risks - Succesvolle ondernemers nemen financiële risico's.
29. To farm successfully one must be in debt - Om goed te ondernemen als tuinder moet je schulden hebben.
Mean 6,6

5. Objectives in farming

With two questions: With a lowest score possible of 2 and the highest score possible of 10.
Neutral number 6.
With three questions: With a lowest score possible of 3 and the highest score possible of 15.
Neutral number 9.

Success in farming
A high score shows the entrepreneur is willing to succeed and stay up-to-date.
30. It is important to me to have the best crops - Het is belangrijk voor mij om het beste gewas te hebben.
31. It is important to me to have up-to-date equipment and machinery - Het is belangrijk voor mij om de machines en tools te hebben die up-to-date zijn.
Mean 9,83
32. It is important to me to try new varieties of crops - Het is belangrijk voor mij om nieuwe gewassen uit te proberen.

Sustainability
A high score shows the entrepreneur finds sustainability matters important.
33. It is important to me to prevent pollution - Het is belangrijk voor mij om vervuiling te voorkomen.
34. It is important to me to use biological pesticides - Het is belangrijk voor mij om biologische bestrijders te gebruiken.
35. It is important to me to avoid waste in general - Het is belangrijk voor mij om over het algemeen verspilling te voorkomen.
Mean 13,66

Status
A high score shows the entrepreneur wants to stay in the sector and finds it important to have respect of colleagues and people in the surrounding area.
36. It is important to me to stay in cultivating - Het is belangrijk voor mij om in de tuinbouw te blijven. Wat er ook gebeurt.
37. It is important to me to have the respect of colleagues and people in the surrounding area - Het is belangrijk om respect te krijgen van collega's en andere mensen in de omgeving.
Mean 6,67

Appendix VI: Media analysis

Period one: 2009 to 2012

Search terms and their variations:

- Nieuwe telen:

AND

- Energiezuinige teelt/ energiezuinig telen
- Energiebesparing
- CO2-emissies/ CO2 uitstoot
- Plant balans
- Plantfysiologie/ plantfysologisch

1. Absolute numbers of hits in "Onder Glas"

Search term	Hits 2009	Hits 2010	Hits 2011	Overall positive/negative
Nieuwe Telen	9	45	31	Positive
AND Energiezuinige teelt	0	0	0	-
AND Energiezuinig telen	0	1	0	Positive
AND Energiebesparing	6	25	21	Positive
AND CO2-emissies	0	0	0	-
AND CO2 uitstoot	0	1	0	Positive
AND Plantbalans	0	1	1	Positive
AND Plantfysiologie	1	2	0	Positive
AND Plantfysiologische	0	1	0	Postive

2. Absolute numbers of hits in "Bloemisterij"

Search term	Hits 2009	Hits 2010	Hits 2011	Overall positive/negative
Nieuwe Telen	-	-	-	-
AND Energiezuinige teelt	-	-	-	-
AND Energiezuinig telen	-	-	-	-
AND Energiebesparing	-	-	-	-
AND CO2-emissies	-	-	-	-
AND CO2 uitstoot	-	-	-	-
AND Plantbalans	-	-	-	-
AND Plantfysiologie	-	-	-	-
AND Plantfysiologische	-	-	-	-

3. Absolute numbers of hits in "Groenten en Fruit"

Search term	Hits 2009	Hits 2010	Hits 2011	Overall positive/negative
Nieuwe Telen	15	63	36	Positive
AND Energiezuinige teelt	0	4	1	Positive
AND Energiezuinig telen	2	2	0	Positive
AND Energiebesparing	8	18	18	Positive
AND CO2-emissies	0	0	0	-
AND CO2 uitstoot	0	1	2	Did not mention
AND Plantbalans	0	0	0	-
AND Plantfysiologie	0	0	1	Positive
AND Plantfysiologische	0	0	0	-

Period two: 2012 till June 2017

Search terms and their variations:

- Nieuwe telen

AND

- Energiezuinige teelt/ energiezuinig telen
- Energiebesparing
- CO2-emissies/ CO2 uitstoot
- Plant balans
- Plantfysiologie/ plantfysologisch

4. Absolute numbers of hits in "Onder Glas"

Search term	Hits 2012	Hits 2013	Hits 2014	Hits 2015	Hits 2016	Hits 2017	Overall positive/negative
Nieuwe Telen	30	11	12	17	16	9	Positive
AND Energiezuinige teelt	0	0	0	0	0	0	-
AND Energiezuinig telen	0	0	0	0	2	0	Positive
AND Energiebesparing	20	7	2	11	9	2	Positive
AND CO2-emissies	0	0	0	0	0	0	-
AND CO2 uitstoot	0	0	0	0	0	0	-
AND Plantbalans	0	0	0	0	1	0	Postive
AND Plantfysiologie	1	0	0	0	0	0	Positive
AND Plantfysiologische	0	0	0	0	0	0	-

5. Absolute numbers of hits in "Bloemisterij"

Search term	Hits 2012	Hits 2013	Hits 2014	Hits 2015	Hits 2016	Hits 2017	Overall positive/negative
Nieuwe Telen	-	3	9	4	8	4	Positive
AND Energiezuinige teelt	-	0	0	0	0	0	-
AND Energiezuinig telen	-	0	0	0	0	0	-
AND Energiebesparing	-	1	3	2	2	0	Positive
AND CO2-emissies	-	0	0	0	0	0	-
AND CO2 uitstoot	-	0	0	0	0	0	-
AND Plantbalans	-	0	0	0	1	0	Positive
AND Plantfysiologie	-	0	0	0	0	0	-
AND Plantfysiologische	-	0	0	0	0	0	-

6. Absolute numbers of hits in "Groenten en Fruit"

Search term	Hits 2012	Hits 2013	Hits 2014	Hits 2015	Hits 2016	Hits 2017	Overall positive/negative
Nieuwe Telen	21	24	22	20	10	11	Positive
AND Energiezuinige teelt	0	0	0	0	0	0	-
AND Energiezuinig telen	0	1	1	0	1	1	Positive
AND Energiebesparing	7	10	8	7	3	3	Positive
AND CO2-emissies	0	0	0	0	1	0	Positive
AND CO2 uitstoot	1	0	0	0	1	0	Positive
AND Plantbalans	0	0	0	0	0	0	-
AND Plantfysiologie	0	0	1	2	0	0	Positive
AND Plantfysiologische	1	0	2	1	0	0	Positive

Appendix VII: Energy use agricultural and horticultural sector

Energy use agricultural and horticultural sector

Sectoren en bedrijfstypen	Perioden	Energieverbruik in petajoule					Energieverbruik in fysieke eenheden				
		Aardgas	Overige fossiele brandstof voor warmte	Aanvoer warmte van buiten de landbouw	Elektriciteit	Brandstoffen voor tractoren	Aardgas	Overige fossiele brandstof voor warmte	Aanvoer warmte van buiten de landbouw	Elektriciteit	Brandstoffen voor tractoren
		PJ					mln m3	mln m3 aardgasequivalent		mln kWh	mln kg
Totaal land- en tuinbouw	2011	136,0	1,3	4,8	-13,8	15,0	4 297	42	153	-3 820	351
	2012	127,3	1,3	4,5	-9,3	14,6	4 021	41	142	-2 587	343
	2013*	125,6	1,4	4,2	-7,8	14,7	3 970	43	132	-2 177	345
Glastuinbouw	2011	130,6	0,0	4,8	-21,2	0,1	4 126	1	153	-5 898	2
	2012	121,7	0,0	4,5	-16,8	0,1	3 846	1	142	-4 676	3
	2013*	120,2	0,0	4,2	-15,3	0,1	3 797	1	132	-4 257	2
Totaal overige landbouw, excl. loonbedr.	2011	5,4	1,3	.	7,5	10,4	171	41	-	2 078	244
	2012	5,5	1,3	-	7,5	10,0	175	40	-	2 089	235
	2013*	5,5	1,3	-	7,5	10,2	173	42	-	2 080	238
Openteeltbedrijven	2011	1,3	0,2	.	1,8	3,9	40	5	-	507	92
	2012	1,5	0,2	-	1,9	3,6	47	7	-	514	85
	2013*	.	.	.	.	.	.	.	.	.	.
Paddenstoelbedrijven	2011	0,4	0,0	.	0,2	0,0	14	0	-	56	0
	2012	0,6	0,0	-	0,2	0,0	18	0	-	67	0
	2013*	.	.	.	.	.	.	.	.	.	.
Graasdierbedrijven	2011	0,8	0,1	-	2,6	4,7	25	2	-	725	110
	2012	0,8	0,1	-	2,7	4,8	25	2	-	742	112
	2013*	0,8	0,1	-	2,8	4,6	26	2	-	777	107
Hokdierbedrijven	2011	2,6	0,9	-	2,3	0,6	83	28	-	651	15
	2012	2,4	0,8	-	2,3	0,7	75	26	-	635	16
	2013*	2,5	0,9	-	2,2	0,6	78	28	-	615	14
Combinatiebedrijven	2011	0,3	0,2	.	0,5	1,1	10	6	-	139	25
	2012	0,3	0,2	-	0,5	0,9	10	5	-	130	21
	2013*	.	.	.	.	.	.	.	.	.	.
Loonbedrijven voor de landbouw	2011	-	-	-	-	4,5	-	-	-	-	105
	2012	-	-	-	-	4,5	-	-	-	-	105
	2013*	-	-	-	-	4,5	-	-	-	-	105

LEI/CBS. 16-3-2015

Source: CBS (2014)

Appendix IIX: Code list ATLAS.ti

Code list of software method ATLAS.ti

General information NCC	Corporate Social Responsibility	Decision making process	Information	Stakeholder theory
Cultivation method	Burden on natural resources	Active search	Analysing comparable developments in other organisation	Abroad
Goal	Influencing the environment	Decision recognition routine	Identifying and selecting additional information	Class
Innovation		Development phase	Information about the environment	Cultivation consultants
Message to bear		Diagnosis routine		Density
Negative regarding NCC		Evaluation-choice routine		Fellow growers
Positive regarding NCC		Existing channels are used		Growers
		Identification phase		Guidance Committee
		Matching		Improvement Centre
		New information channels formed		LTO Glaskracht Nederland
		Opportunity decision		Patterns of exchange
		Problem		Relationship between stakeholders
		Screening routine		Research institutes
		Search routine		Stakeholder
		Selection phase		Stakeholder ties
		Start NCC		Suppliers
		Stimuli inside organisation		Wageningen University
		Stimuli outside organisation		Horticultural journals

Appendix IX: Decision making process tables

1. Different phases and routines including the role of information regarding the NCC

Routine	Actor	Information	Information type
1. Decision recognition routine	Gas organisation	Increasing prices of natural gas	Stimuli outside organisation
	Fellow growers	Information about the environment	Stimuli outside organisation
	Horticultural journals	Information about the environment	Stimuli outside organisation
	National Committee Bell Pepper	Opportunity	Matching
1. Diagnosis routine	Svensson	Positive see BOX 5.1	New information channel
	Delphy	Positive see BOX 5.1	New information channel
	NCC course	Applying the measures of the NCC	New information channel
	Cultivation consultant	Negative	Existing information channel
2. Search routine	Guidance committee	Different alternatives	Trap search
	Entrepreneur	Different alternatives	Active search
2. Design routine	Guidance committee	Modified solutions	
3. Selection phase	Guidance committee	Modified solutions	Experiences of guidance committee
3. Decision made	Entrepreneur	Methods of NCC are chosen	Inside the mind of the entrepreneur

Source: based on Mintzberg et al. (1976) and Citroen (2011)

2. Different phases and routines including the role of information regarding the NCC

Routine	Actor	Information	Information type
1. Decision recognition routine	Entrepreneur	Crop diseases	Stimuli inside organisation
	Delphy	Information about the environment	Stimuli outside organisation
	Horticultural journals	Information about the environment	Stimuli outside organisation
	Entrepreneur	Interest	Stimuli from inside organisation
	Delphy	Opportunity	Matching
1. Diagnosis routine	Delphy	Positive see BOX 5.2	Existing information channel
	Technokas	Positive see BOX 5.2	New information channel
2. Search routine	Guidance committee	Different alternatives	Trap search

	Entrepreneur	Different alternatives	Active search
	Horticultural Technological Development	Comparable developments	Trap search
2. Design routine	Guidance committee	Modified solutions	
3. Selection phase	Delphy	Different alternatives	Feedback
	Fellow growers	Different alternatives	Feedback
3. Decision made	Entrepreneurs + fellow owners	Hose system	Discussing

Source: based on Mintzberg et al. (1976) and Citroen (2011)

3. Different phases and routines including the role of information regarding the NCC

Routine	Actors	Information	Information type
1. Decision recognition routine	Regulation	Purchasing darkening screens	Stimuli outside organisation
	Entrepreneur	Saving energy	Stimuli inside organisation
	Gas organisation	Fluctuating natural gas prices	Stimuli outside organisation
1. Diagnosis routine	WUR	New techniques for circulating air	New information channel
	Hoogendoorn	New techniques for circulating air	New information channel
	FloriConsultGroup	Positive see BOX 5.3	Existing information channel
2. Search routine	WUR	Different alternatives	Trap search
	Hoogendoorn	Different alternatives	Trap search
	Entrepreneur	Different alternatives	Active search
2. Design routine	WUR	Modified solutions	
	Hoogendoorn	Modified solutions	
3. Selection phase	WUR	Different alternatives	Feedback
	Hoogendoorn	Different alternatives	Feedback
3. Decision made	Entrepreneur	Air circulation system	Inside the mind of the entrepreneur

Source: based on Mintzberg et al. (1976) and Citroen (2011)

4. Different phases and routines including the role of information regarding the NCC

Routine	Actor	Information	Information type
1. Decision recognition routine	Entrepreneur	Eager to understand world problems	Stimuli inside organisation
	Financial Newspaper	Information about the environment	Stimuli outside organisation
1. Diagnosis routine	NCC course	Applying the measures of the NCC	New information channel
	Delphy	Positive see BOX 5.4	New information channel

	Rijkzwaan	Positive see BOX 5.4	Existing information channel
2. Search routine	Guidance Committee	Ready-made alternatives	Trap search
	Entrepreneur	Ready-made alternatives	Active search
	NCC course	Ready-made alternatives	Trap search
2. Design routine	Guidance committee	Modified solutions	
3. Selection phase	Guidance committee	Different alternatives	Screening
	NCC course	Different alternatives	Feedback
	Father	Different alternatives	Feedback
3. Decision made	Entrepreneur	Methods of NCC are chosen	Inside the mind of the entrepreneur

Source: based on Mintzberg et al. (1976) and Citroen (2011)

5. Different phases and routines including the role of information regarding the NCC

Routine	Actors	Information	Information type
1. Decision recognition routine	Entrepreneur	Interested in climate regulations	Stimuli inside organisation
	Peter Kamp	Information about the environment	Stimuli outside organisation
	Horticultural journals	Information about the environment	Stimuli outside organisation
1. Diagnosis routine	Dümmen Orange	Positive see BOX 5.5	Existing information channel
	Delphy	Positive see BOX 5.5	Existing information channel
	Colleagues study group	Comparable developments	Existing information channel
	NCC course	Applying the measures of the NCC	New information channel
	Guidance committee	Applying the measures of the NCC	New information channel
2. Search routine	Stakeholders mentioned in the identification phase	Ready-made solutions	Trap search
3. Selection phase	Entrepreneur + fellow owner	Ready-made solutions	Screening
3. Decision made	Entrepreneur + fellow owner	Methods of NCC are chosen	Discussing

Source: based on Mintzberg et al. (1976) and Citroen (2011)

6. Different phases and routines including the role of information regarding the NCC

Routine	Stakeholders	Information	Information type
1. Decision recognition routine	Guidance committee	Opportunity	Stimuli outside organisation
	Entrepreneur	Quality improvements and energy savings	Stimuli inside organisation
	Horticultural journals	Information about the environment	Stimuli outside organisation
	Study group of FloriConsultGroup	Information about the environment	Stimuli outside organisation
1. Diagnosis routine	Study group of FloriConsultgroup	Comparable developments	Existing information channel
	FloriConsultGroup	Positive see BOX 5.3	Existing information channel
	Guidance committee	Research on hose systems	New information channel
	NCC course	Applying the measures of the NCC	New information channel
2. Search routine	Stakeholders mentioned in the identification phase	Ready-made solutions	Trap search
3. Selection phase	Entrepreneur + fellow owners	Ready-made solutions	Screening
	Cultivation consultant	Testing alternatives by using theories	Screening
3. Decision made	Entrepreneur + fellow owners	Measures of NCC are chosen	Discussing

Source: based on Mintzberg et al. (1976) and Citroen (2011)