Wageningen UR & ZLTO

Motives, Incentives and Barriers for Sustainable Innovations

MSc Thesis Marketing & Consumer Behavior.

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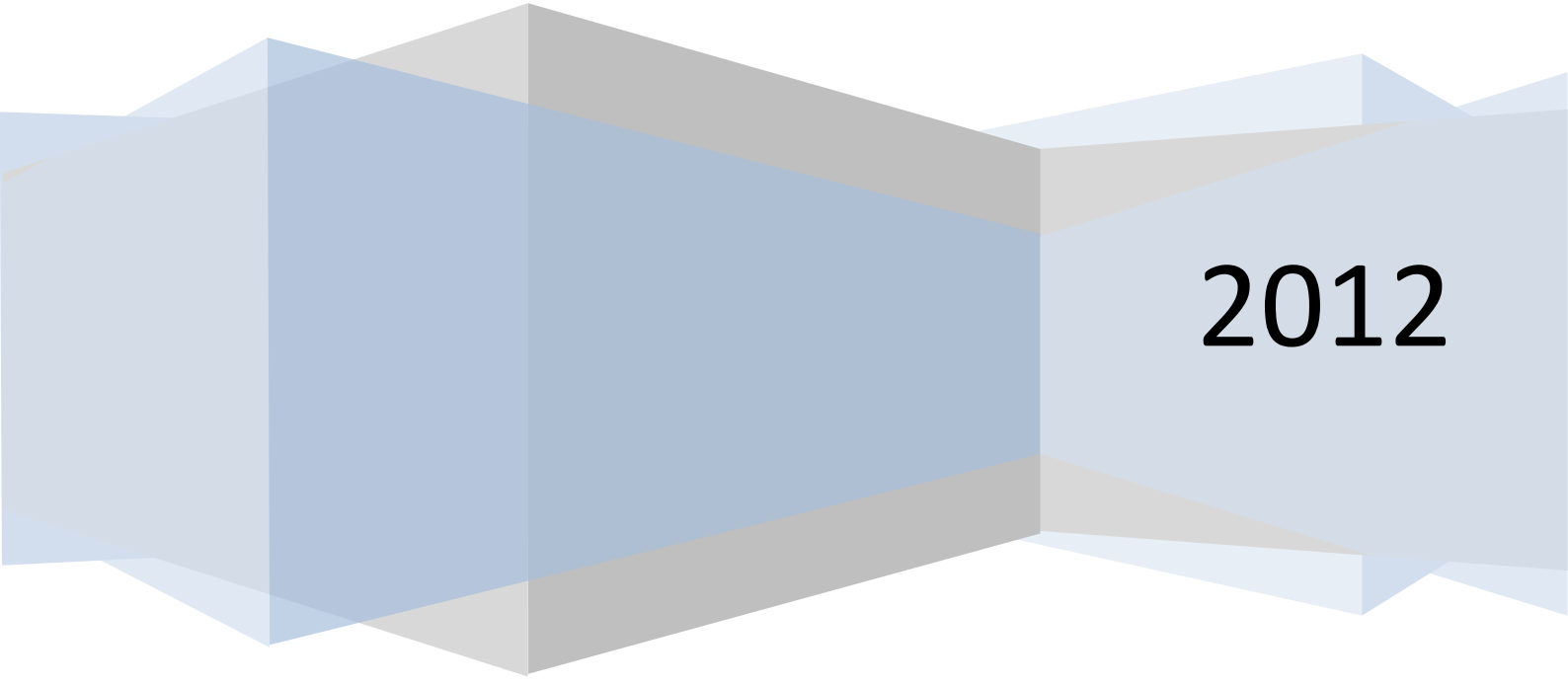

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Foreword.

In order to address, encourage and support their members, ZLTO wants to know which incentives have an impact on the motives of an entrepreneur to invest in sustainable innovation. Therefore I have done research in the field of motives, incentives and barriers for sustainable innovation within micro firms. In order to limit the scope of this research, I focused on the motives, incentives and barriers of poultry entrepreneurs for sustainable innovation.

This research has been written as part of my master thesis which is subjected to my study: Management, Economics and Consumer Studies at Wageningen University and Research Centre in the Netherlands. The assignment was set by ZLTO, an agricultural advocacy association for farmers the Netherlands. For this research I have conducted interviews with an online questionnaire with 700 poultry entrepreneurs in the Netherlands. All the entrepreneurs were members of either: LLTB, LTO Noord or ZLTO. Hereby I would like to thank all persons who have contributed with special notice to my supervisors F.J.H.M. Verhees and A. Verkade – Diphoorn.

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Abstract

Objective

The objective in this research was finding out what the motives, incentives and barriers are for sustainable innovations and whether these motives, incentives and barriers are different between leaders and followers of sustainable innovation. The motives are divided in intrinsic and extrinsic motives.

Method

A cross-sectional design is used in which an online questionnaire is sent to 707 participants. With a response rate of 22%, 155 respondents have been analyzed with an 'independent sample T-test'. Furthermore a 'correlation test' is done to see whether the implementation date and expected realization date of a sustainable innovation is correlated with a certain motive, incentive or barrier and therefore more important for an entrepreneur group.

Results

The average mean scores have indicated that the sustainable innovation "*solar panels"* has been: "considered, implemented or is momentarily under consideration", most often by the respondents. With use of the 'independent sample T-tests', the leaders and followers of sustainable innovations were compared based on their motives, incentives and barriers for sustainable innovations. Results indicated that "*sales of own made products"*, has the most differences between both entrepreneur groups based on their motives, incentives and barriers. The correlation test, in which the adoption date filled in by the respondents was compared with the motives, incentives and barriers, indicated that several motives, incentives and barriers are related to the time (year) of adoption of a sustainable innovation.

Conclusions and implication

From the results can be concluded that the differences in motives between leading and following entrepreneurs are limited. In all three cases it depends on the sustainable innovation how many motives, incentives or barriers are different between both entrepreneur groups. The correlation test has proven that the adoption time of a sustainable innovation is related to several motives, incentives and barriers of an entrepreneur. ZLTO can use this information in order to focus on the sustainable innovations which are currently most under consideration and focus on the motives, incentives and barriers which influence the decision making process of an entrepreneur.

Keywords Sustainable innovation, intrinsic motives, extrinsic motives, incentives, barriers, micro firms, entrepreneurs.

Management summary (EN)

In this research the division of entrepreneur groups based on innovativeness is combined with the search for which incentives influence the motives of an entrepreneur. Main research question is formulated as follow: *Which incentives have an effect on the motives of Dutch poultry farmers to invest in sustainable innovations and is there a difference between leading and following entrepreneurs?* Additional to the main research question, this research has also look at the barriers which are experienced by entrepreneurs during the realization process of a sustainable innovation. The results gave an insight in the motives, the incentives which influence these motives, the potential barriers which might block the realization of a sustainable innovation and whether there are differences in these findings between a leading and a following entrepreneurial group. The focus for this research are Dutch poultry entrepreneurs, often a micro firms.

With help of an online questionnaire, 155 respondents answered the online questionnaire which was sent to a sample of 718 (all members of ZLTO, LLTB or LTO Noord, owner of a poultry farm with a minimum of 10.000 animals). The questions were regarding the motives, incentives and barriers concerning the sustainable innovations which an entrepreneur had at the time he/she considered, implemented or currently has for an sustainable innovation.

From the sustainable innovation, 'solar panels' was most often chosen. Looking at category people, 'change of housing system' (which is a process innovation) has been most often chosen. With concerns to category planet, 'solar panels' (which is a product innovation) had been most often chosen. With regards to category profit, 'change of light bolts to LED light' (which is a process innovation) had been most often chosen. The sustainable innovations categorized as people have on average '*financial favorable'* as highest scoring (extrinsic) motive. The sustainable innovations categorized as planet have on average '*in favor of the image of the poultry industry*' as highest scoring (extrinsic) motive. The sustainable innovations categorized as profit have on average '*improvement of technical results*' as highest scoring (extrinsic) motive.

If all motives which showed a significant result based on the 18% versus 82% division and the 50% versus 50% division are combined, only 6 motives have a significant result indicating a differences between both entrepreneur groups. From these 6 motives, only 4 (*financial favorable, favor surrounding aspect like nature & environment, to meet legislation* and *sustainability: people planet profit)* differ from each other (from a set of 14 motives given in the quantitative questionnaire). We can conclude that there are almost no significant differences between both the leading and following entrepreneur group based on their motives for sustainable innovation with exception of the 4 extrinsic motives mentioned.

Results for the barriers indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 18% versus 82% division, barriers: "*legislative restrictions, financial not feasible, restrictions due to outbreak of animal diseases, project scope feasibility and support, technological not feasible, lack of equipment and or facilities, no continuity, no demand from poultry chain or consumer, private circumstances*", have shown in total 13 times a significant differences between group 1 and group 2. These 9 different barriers presented are (measured over 8 sustainable innovations) part from a set of 10 barriers given in the quantitative questionnaire. Almost all the given barriers indicate a significant difference between group 1 and 2.

Results indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 50% versus 50% division, barrier: "*financial not feasible*" has shown only once a significant results indicating a difference between group 1 and group 2. This indicates that when the division is made bigger (50% instead of 18%), the differences between both entrepreneur groups seem to disappear.

There are differences between leading and following entrepreneur groups when we look at the motives, incentives and barriers for sustainable innovation. But as mentioned, the number of significantly different motives between both entrepreneur groups is rather small. For the main research question we are more concerned about the incentives. From sub research question 3, we found that incentives: "*extreme weather conditions, due to an accident on the work floor, due to private circumstanced, due to local pressure from the community, due to outbreak of animal diseases, due to demand from the poultry chain / consumer, because of favorable accounting gains*", differ between leaders and the followers of sustainable innovations based on a 18% versus 82 division. In total 7 different incentives.

Similar differences can be found based on a 50% versus 50% division but in this case, 9 different incentives (*on advice from family or friends, due to legislative changes, due to demand from the poultry chain/consumer, on advice from company advisor, because of favorable accounting gains, on advice from ZLTO/LTO Noord/LLTB, by attending an open day/field trip, reading media: journals, newspapers, on advice from a study association*) proof that there is an significant difference between both entrepreneur groups.

Samenvatting (NL)

In dit onderzoek is de verdeling tussen twee verschillende ondernemersgroepen op basis van ondernemerschap gecombineerd met het zoeken naar; 'de motieven van een ondernemer om duurzaam te innoveren, de aanleiding waardoor een ondernemer gemotiveerd is geraakt en de belemmeringen (barrières) die een mogelijke realisatie van een duurzame innovatie hebben geblokkeerd'. De hoofdonderzoeksvraag is als volgt geformuleerd: *Welke prikkels hebben een effect op de motieven van de Nederlandse pluimveehouders om te investeren in duurzame innovaties en is er een verschil tussen de voorlopers en de volgers van duurzame innovatie?* Aanvullend op de centrale onderzoeksvraag, zal dit onderzoek ook kijken naar de belemmeringen (barrières) die door ondernemers ervaren zijn tijdens het realisatieproces van een duurzame innovatie. Het onderzoek focust zich op de Nederlandse pluimveehouders. De ondernemers die eigenaar zijn van een pluimveebedrijf met minimaal 10.000 dieren en tevens lid zijn van LLTB, LTO Noord of ZLTO, zijn benaderd via een email om deel te nemen aan dit onderzoek. Dit resulteerde in een steekproef van 718 pluimveeondernemers.

Met behulp van een online vragenlijst, hebben ruim 155 respondenten gereageerd op de online vragenlijst en hebben antwoord gegeven op de vragen over hun motieven, aanleidingen en barrières met betrekking tot de duurzame innovaties die zij hebben overwogen, hebben geïmplementeerd of momenteel in overweging hebben.

De duurzame innovatie 'zonnepanelen' werd het vaakst gekozen. Als we kijken naar de categorie people, 'overstap van huisvestingssysteem' (dit is een proces innovatie) is het vaakst gekozen. Met betrekking tot categorie planet, is 'zonnepanelen' (dat is een product innovatie) het vaakst gekozen. Met betrekking tot categorie profit, 'verlichtingstoepassing' (dit is een proces innovatie) was het meest gekozen. Bij de duurzame innovaties gecategoriseerd als people, is (extrinsieke) motief '*financieel gunstiger*' gemiddeld het hoogst gescoord. Bij de duurzame innovaties gecategoriseerd als planet, is (extrinsieke) motief *'ten gunste van het imago van de sector en of bedrijf'* gemiddeld het hoogst gescoord. Bij de duurzame innovaties gecategoriseerd als profit, is (extrinsieke) motief *'technische bedrijfsresultaten verbeteren'* gemiddelde als hoogst gescoord.

Indien alle motieven die een significant resultaat toonde gebaseerd op een '18% versus 82% verdeling' en een '50% versus 50% verdeling' gecombineerd worden, zijn er slechts 6 motieven die aantonen dat er een significant verschil is tussen de voorlopers en volgers van duurzame innovatie. Van deze 6 motieven, zijn slechts 4 (*financieel gunstiger, ten gunste van de omgeving: natuur & milieu, aan wetgeving voldoen, duurzaamheidsaspect: People Planet Profit*) motieven verschillend van elkaar (uit een set van 14 motieven gegeven in de online vragenlijst). We kunnen concluderen dat er bijna geen significante verschillen zijn tussen beide ondernemersgroepen op basis van hun motieven voor duurzame innovatie, met uitzondering van de 4 genoemde extrinsieke motieven.

Resultaten voor de barrières tonen aan dan wanneer de voorloper van duurzame innovatie (groep 1) wordt vergeleken met de volgers van duurzame innovatie (groep2) op basis van een '18% versus 82% verdeling', de barrières: "*wettelijke beperkingen, financieel/economisch niet haalbaar, beperkingen door uitbraak ziekten, projectomvang/haalbaarheid/procestijd en draagvlak, technisch niet mogelijk, gebrek aan bedrijfsmiddelen en of voorzieningen, geen opvolging (continuïteit), geen vraag van vanuit de markt en of keten, privé omstandigheden* ", in totaal 13x significant verschillen tussen groep 1 en groep 2. Deze 9 barrières zijn gemeten op basis van 8 duurzame innovaties. Van de 10

gegeven barrières in de online vragenlijst, zijn er 9 significant verschillend tussen beide groepen. Echter wanneer de voorloper van duurzame innovatie (groep 1) wordt vergeleken met de volgers van duurzame innovatie (groep2) op basis van een '50% versus 50% verdeling', heeft alleen barrière '*financieel/economisch niet haalbaar'* een significant resultaat en bewijst daarmee dat een grootte groep ondernemers het financiële aspect als barrière ervaren.

Er zijn verschillen tussen de voorlopers en de volgers van duurzame innovatie op basis van motieven, aanleidingen en barrières. Maar het aantal significante verschillen tussen beide ondernemers-groepen voor de motieven is nihil. Voor de hoofdonderzoeksvraag zijn we echter meer benieuwd naar de aanleidingen die ZLTO een inzicht geven in hoe ondernemers te stimuleren. De aanleidingen: "*vanwege extreme weersomstandigheden, vanwege een bedrijfsongeval, vanwege privé omstandigheden, door (onder druk van) de lokale gemeenschap, door uitbraak van ziekten/bacteriën/infecties, door vraag van de afnemer en of consument, vanwege boekhoudkundige voordelen (afgeschreven, gunstiger)*", verschillen tussen voorlopers en de volgers van duurzame innovaties op basis van een 18% tegenover 82 divisie. In totaal 7 verschillende prikkels.

Soortgelijke verschillen zijn te vinden op basis van een 50% versus 50% divisie, maar in dit geval zijn er 9 verschillende prikkels (*op advies van familieleden of vriendenkring, vanwege wettelijke bepaling door de (lokale) overheid, door vraag van de afnemer en of consument, op advies van een bedrijfsadviseur [bijv. voerleverancier of boekhouder], vanwege boekhoudkundige voordelen [afgeschreven, gunstiger], op advies van ZLTO/LTO Noord/LLTB, bijwonen van een open-dag en of congres, door het lezen van media [vakbladen, krant, social media], op advies van een studieclub en of onderzoek)* die aantonen dat er een significant verschil tussen beide ondernemersgroepen. Deze bovenstaande aanleidingen zijn van invloed op de motivatie van de ondernemers. Ondernemers blijken veel waarde te hechten aan deze invloeden. Door hierop te focussen zou ZLTO de ondernemer (een lid) positief moeten kunnen stimuleren.

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1. Introduction

This chapter gives an introduction to the research. It described the problem, objectives and research questions and gives a small scope of the research by some background information relevant to the topic.

1.1 Background Information

ZLTO is an association for entrepreneurs in the 'green sector'. Originally the members of ZLTO were Dutch farmers who together, represented by ZLTO, stood stronger in their presentation to discuss new rules, market chances and policy changes from the local and national government (ZLTO, 2012). Over the years, ZLTO focused more on developing the green sector by helping entrepreneurs to invest in sustainable innovation and to create additional value for the sector. Some of the directors of the ZLTO are agricultural entrepreneurs in order to have a closer link with the agriculture sector for better understanding.

The vision of ZLTO is: "*be leading in creating opportunities for entrepreneurs in the 'green sector' and helping these entrepreneurs to realize these opportunities in order to make them durable, sustainable and therefore successful*" (ZLTO, 2012). But in order to innovate the 'green sector' and help entrepreneurs, ZLTO needs to know which incentives have an effect on the motives for investing in sustainable innovations.

1.1.1 Research contribution

Previous researchers have looked at the motives, incentives and barriers in relation to innovation. Also the different types of entrepreneurs have been investigated by several researchers such as: "Avermaete et al. (2004) and Rogers (1995)". This research contributes to science due to the distinction which is made between leaders and followers of sustainable innovation. This distinction is based on motives, incentives and barriers which an entrepreneur has experienced. It elaborates more extensive what might be the reasons for innovative behavior and the reasons which might block the realization of a sustainable innovation.

1.2 Problem definition

There are very different reasons for entrepreneurs to innovate sustainable. Some sustainable innovations are small while others are very big. Quite similar is the impact of a new sustainable innovations which can be big or small. Some sustainable innovations however change the business drastically in a positive way. These 'new' innovations are often copied by other entrepreneurs pretty fast. But a big group of entrepreneurs does not copy these 'new' innovation directly in their business. ZLTO wants to know why does this group of entrepreneurs not implement these 'new' innovations and more importantly: 'which incentives to use in order to encourage and stimulate the entrepreneurs'. The problem is that ZLTO does not have confirmed data which proves which incentives to use in order to stimulate their members in copying other sustainable innovations.

1.3 Objectives

In this research the main focus will be acquiring more knowledge about the motives of entrepreneurs (Dutch farmers) for sustainable innovations and whether these motives are different between leaders (frontrunners) and followers of sustainable innovation. Leaders of sustainable innovation are

entrepreneurs who are the first to adopt a commercialized sustainable innovation from the market into their firm, while following entrepreneurs adopt these new sustainable innovations later on in their businesses (Avermaete et al., 2004).

For a long time, motivation has been discussed defining two types of motivation: 'intrinsic and extrinsic' motivation (Ryan & Deci, 2000). Intrinsic are the motives which come from the individual him-/herself while extrinsic motives originate from an external source. Incentives can influence/ stimulate the motivation of an entrepreneur (Atkinson & Birch, 1978). But an incentive can also lower a (potential) barrier which is withholding an entrepreneur to innovate. Incentives can be given by external entities such as; 'government, consultants, friends or family, network, research or competitors'. A barrier has the potential to threat the likelihood of realizing the implementation of a sustainable innovation.

1.3.1 Research goal

ZLTO wants to encourage and help its members to innovate. Goal of this research is finding out what the motives, incentives and barriers are of leading and following entrepreneurs for a sustainable innovation and find out if there are any significant differences between leading and following entrepreneurs.

1.4 Research questions

With this research there will be more knowledge about the motives of entrepreneurs in combination with sustainable innovation in the Dutch poultry sector. In order to acquire this information and knowledge, the following research question is formulated:

- ***Which incentives have an effect on the motives of Dutch poultry farmers to invest in sustainable innovations and is there a difference between leading and following entrepreneurs?***

By answering the main research question, ZLTO will have a better insight in how to approach its members in stimulating them to innovate sustainable. To answer the main research question, the following sub research questions are formulated:

- *Which motives do leading entrepreneurs have for a sustainable innovations?*
- *Which motives do following entrepreneurs have for a sustainable innovations?*
- *Which incentives stimulate the motives of an entrepreneur for sustainable innovations?*
- *Which barriers have a possible effect on the realization of a sustainable innovation?*

2. Literature study

This chapter will investigate the different aspects of the literature which are related to the research. In order to answer the main research question, a literature review has to be done to explain and define the concepts which are related to this research. The following 6 concepts are elaborated:

- sustainable innovation
- motives
- incentives
- barriers
- entrepreneur(s)
- small medium enterprises (micro firms)

From the literature, a theoretical framework will be designed and the research hypotheses are drawn. By means of a questionnaire with the members of ZLTO, the sub research questions and thereby the main research question will be answered.

2.1 Sustainable innovation

In order to define sustainable innovation, both terms will be first elaborated separately before combining the terms into one concept. Sustainability will be addressed first.

Sustainability has become important for companies due to the negative effect of; 'fast economic growths, outsourcing of manufacturing sites and seeking new consumer markets', on the planet. These negative effects are pressuring companies to pay attention to the triple bottom line: profit, people and planet (Tang & Zhou, 2012). Sustainability is defined by researchers in several ways, but most definitions are based on the so-called Triple Bottom Line (TBL) approach i.e., with Economic (Profit), Environment (Planet) and Social welfare (People) objectives (Bao & Bodapati, 2011). Looking at the aspects of the triple bottom line, if properly measured, 'profit' is sustainable by definition. When a company is making profit instead of loss, than its continuity is sustainable. If a sustainable innovation is not profitable on the short or long term, a company (an entrepreneur) will not implement this innovation (Goodland et al., 1991). Therefore profit must always be an aspect of a sustainable innovation in order to be implemented and thereby be complementary to the environmental and social welfare aspects.

In 1987, the WCED[1] formulated a definition of sustainable development: "*development which meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Brundtland et al., 1987). According to the WCED, also known as the Brundtland commission (Goodland et al., 1991), sustainability is the implementation of a balanced combination of the triple bottom line. Meaning that one aspect may not withhold the other two aspects. For example: making profit by depleting the environment and thereby influencing the natural habitat (Hansmann et al., 2012). Reaching sustainability is described as a process, a development. But realizing this balance is debated because it involves different levels of interpretation, interests and contributions, (e.g., biodiversity, beauty of landscape vs. costs, profits vs. equity, health and cultural values, etc.) which are not all directly commensurable or related to each other (Hansmann et al., 2012). An important

[1] World Commission on Environment and Development.

aspect of the definition set by WCED, is fulfilling the current needs without compromising the future generation. While sustainable development entails the balance between the triple bottom line, mainly environmental (Planet) issues have been important the last 20 years and referred to as being sustainable (Drexhage & Murphy, 2010). Social welfare (People) and Economic (Profit) well-being are often prioritized and have more emphasis in doing business due to the lifestyles in the developed (Western) countries. In order to restore the balance, structural changes are needed by governments to redesign the system by implementing the triple bottom line as an standard requirement. This can be achieved by sustainable innovating (Drexhage & Murphy, 2010).

There are many different definitions of innovation. Schumpeter was one of the first economist to emphasize the importance of innovation in the business/ entrepreneurial process (Lumpkin & Dess, 1996). According to Schumpeter (1934), innovation of a product, process or business model can be expressed as the level of output novelty. For example: 'a new product, an improved product, a new production method, a new market, a new source of supply, or a new organizational structure' (Lumpkin & Dess, 1996). Meaning that whether a new product can be considered as new, depends on the difference compared to a related product. Does the 'new' product really differ substantially to be considered as 'new'. After Schumpeter, many researchers continued the discussion about the criteria for an invention to qualify as an innovation. For example its necessity (does the market really need it, does it benefit), novelty (differs it substantially compared with exiting items), or its diffusion (speed of adopting by the market) (Crossan & Apaydin, 2010).

The definitions given in research all have in common that there are different ways of innovating mentioning three innovations: 'product, process or management' (Lumpkin & Dess, 1996; Crossan & Apaydin, 2010; Johnson et al., 2012). A product innovation can be the creation (invention) of a new product, or an update (new version) of an existing product. A process innovation can be an improvement or a new production process (method). A management innovation can be for example a structural change in management (legal form), a strategy change, a take-over of a company (competitor) or an additional branch added to the company (Larson, 2000; Avermaete et al., 2004; Gellynck et al., 2007). Bhaduri and Kumar (2011) address the idea that innovation was a culmination of new ideas and defined innovation as: "*an outcome of an interaction between individual and social factors including on the one hand an individual's behavior fed by specific personality traits and achievement needs, and on the other hand the either intrinsically or extrinsically motivated social judgment behavior of others"* (Bhaduri & Kumar, 2011). This gives two different angels to innovation. One, the more 'outcome' related definition in which innovation is more described as measurable and demonstrably item (necessity, novelty, sufficiency, beneficial nature, diffusion). While secondly, as address by Bhaduri and Kumar (2011), the more characteristically aspect (the view translated by the skill-set of an entrepreneur) of an innovation.

To conclude sustainable innovation; the combination of sustainability and innovation can be found already in the report of the WCED were it is defined as sustainable development (Brundtland et al., 1987). In order to achieve sustainable development, innovations are needed which are in balance with the triple bottom line and fulfill the needs of the present generation while not compromising the needs of the future generations. The definition of sustainable innovation for this research is; 'the development or implementation of a new product, process or managerial improvement, which meets the needs of the present without compromising (unbalance the triple bottom line) the ability of future generations to meet their own needs'.

2.2 Motives

Before looking into the possible motives which might influence the decision making process of an entrepreneur to invest in sustainable innovations, it is important to define and explain what a motive is. Motivated actually means to be moved to do something. When a person feels no need or inspiration to move, it is thus characterized as unmotivated. On the contrary, when someone is moved and feels the need to make a move, it is considered as motivated (Ryan & Deci, 2000).

Solomon et al. (2006) define motivation as an internal state (of a person) that activates goal-oriented behavior. Goal-oriented refers to a certain need which wants to be fulfilled. This goal/ need can be 'hedonic' (an experimental need, involving emotional responses) or 'utilitarian'(a desire to achieve some functional or practical benefit) (Solomon et al., 2006). Once a need has been activated, a state of tension exists that drives the consumer to attempt to fulfill, reduce or eliminate the temptation of the need. Fulfilling this need, this goal, becomes a motive for certain behavior. Motivation refers to the processes that cause people to behave as they do.

For a long time, motivation has been discussed defining two types of motivation: 'intrinsic and extrinsic' motivation (Ryan & Deci, 2000). Intrinsic motivation is very strong and a persuasive characteristic of human behavior. It can be seen as the source for curiosity, stubbornness, perseverance, spontaneity etc.. These characteristics do not need an external stimulation/influence to be activated (Ryan & Deci, 2000). This behavior occurs naturally and is critical in the human social and physical development. Intrinsic motivation can be defined as: "*the doing of an activity for its inherent satisfactions rather than for some separable consequence. When a person is intrinsically motivated, he/she is moved to act for the fun or challenge rather than because of external prods, pressures, or rewards*" (Ryan & Deci, 2000). Whereas intrinsic is based on personal and internal aspects, extrinsic motivation is a construct that relates to an activity which is done in order to attain some separable outcome. It can be influences by external sources or factors such as media, governmental policy or friends and family (Bhaduri & Kumar, 2011).The effects of uncertainty on external influences such as risk and results have an high impact on extrinsic motivations. Both types are still part of an internal state. Even if a person is extrinsically motivated, it is still the motivation of that person.

Motivation for sustainable innovation is interpreted in different ways. Research of Gasson (1988); Herslund (2007) and Van Huylenbroeck et al. (2004) proved that farmers are motivated mainly by extrinsic motives when engaging in new activities in order to earn more income and thereby decreasing their dependence of income on agricultural production. Entrepreneurs who start side activities such as agro-tourism and are 'Non-farmers' (do not produce agricultural products) start side activities mainly by intrinsic motivation while farmers are more intrinsically motivated (Markantoni & Strijker, 2012). Interestingly, Bhaduri & Kumar (2011) found that pure extrinsic forms of motivation, drive only a fraction of individual innovative behavior. Entrepreneurs of small or medium enterprises are mainly motivated either by intrinsic motivations or by a combination of intrinsic and extrinsic motivations (Bhaduri & Kumar, 2011). The difference between the researches of Markantoni & Stijker (2012) and Bhaduri & Kumar (2011), is that Bhaduri & Kumar (2011) did not compare farmers with non-farmers.

To conclude motives: this research will look at the difference between intrinsic and extrinsic motivation in relation to an entrepreneurial type. Therefore both motives are defined separately. Intrinsic motivation is: The doing of an activity for its inherent satisfactions rather than for some separable consequence (Ryan & Deci, 2000). Extrinsic motivation is defined as: The doing of an activity in order to attain some separable outcome (Ryan & Deci, 2000). Both definitions are related to the motivation aspect which occur during a decision making process.

2.3 Incentives

Incentives effect entrepreneurs to innovate in two ways: by lowering the 'barriers' for innovating (Madrid-Guijarro et al., 2009) and by stimulating the motives which drive an entrepreneur to invest in sustainable innovations (Atkinson, 1964). In order to explain the effect of incentives on the entrepreneur, we first look at the concept incentive.

An incentive can be tangible or intangible (Atkinson, 1964). A few examples of tangible incentives which might stimulate an entrepreneur to innovate are; 'financial subsidies, attaining resources, acquiring or access to technology'. Examples of intangibles incentives are; 'knowledge, emotional support' which can lead to a behavioral change. Tangible incentives can be measured before input and be based on results. For example the amount of money and the effect it will have on the investment can be measured before really giving the money. While the impact of intangible incentives cannot be measured up front, e.g. knowledge on the results (Webster & Jensen, 2006).

In order to achieve a behavioral change, incentives such as knowledge can influence the intrinsic motivation which might result in a change of opinion/insight. The entrepreneurs learns from the incentives and can act upon this new knowledge. Learning in this case refers to associative learning. This theory refers to two procedures: *"classical conditioning" and "instrumental conditioning"* (Savage, 2000). Both procedures involve two events. The *classical* procedure has two stimuli's (Gray, 1999). The first stimulus acts as a cue or signal for the second stimulus. The stimulus can be conditioned (CS), meaning produced, or unconditioned (UCS), meaning natural occurred. After repetition, the conditioned response (CR) can be the same as the unconditioned response (UCR) (Savage, 2000). For example: A stunt man has a terrible accident causing immense pain while performing a stunt on a motorcycle. Thereafter, motorcycles elicit fear for the stunt man. The UCS is 'the terrible accident' because it was naturally occurred. The UCR is the 'immense pain' which is the naturally occurred response to the terrible accident. The CS is 'the motorcycle' which resembles the idea of an accident for the stunt man and the CR which the stunt man has from the motorcycle is 'fear', fear of another accident (Savage, 2000).

Instrumental conditioning is about learning response–outcome relations, meaning learning from and about the consequences of behavior. An example to explain instrumental conditioning: a student who is rewarded with appraisal (positive reinforcement) by the teacher for raising his/her hand to answer a question during a lecture. It becomes more likely that the student raises his/her hand again to answer a question. A contrary to this example, that same student may also be punished (negative reinforcement) for speaking out of turn if he/she started interruption the teacher while raising his/her hand (Savage, 2000).

In both procedures, the produced incentives can stimulate an effect. In order to influence behavior of an entrepreneur, incentives can be used to stimulate/ influence the motives of an entrepreneur. This might result in a change of behavior and decision making. In order to stimulate the members of ZLTO

to invest in sustainable innovations, this research will look at the incentives which influence the motives for investing in sustainable innovations.

Research has proven that incentives stimulate the diffusion of innovation (Welch & Thompson, 1980). Diffusion is the process by which innovations spread among users (Johnson et al., 2012). Incentives provided by governmental institutes or organizations such as direct fiscal aid (subsidies) are more effective than indirect aid (expositions, network events and advice). However, the average diffusion time was still nearly 30 years with governmental incentives in 1980 (Welch & Thompson, 1980). Currently due to fast communication styles, the average diffusion rate is higher, meaning faster. An example for which the government (EU) introduced incentives is the Kyoto protocol signed in 1997 (Tang & Zhou, 2012). The EU implemented an emission trading mechanism to provide incentives for companies to stimulate them to invest more in controlling their emissions (Tang & Zhou, 2012). Moreover, governmental, research and institutional companies, such as the Dutch ministry, universities and ZLTO, are sharpening market incentives to stimulate entrepreneurial activities to commercialize their ideas, products or technologies (Yusuf, 2009). SME's often have more difficulty in adopting new innovation due to limited access or knowledge. Institutions such ZLTO help SME's (farmers in case of ZLTO) to close the knowledge gap (Yusuf, 2009). Financial or governmental incentives are very common but also research, influence of family and friend can be seen as an incentive (Cannell & Henson, 1974; Zimmermann, 1999; Greiner & Gregg, 2011). The main difference with motives is that incentives can be traced back to a certain point in time. Motives have a longer time period while incentives are related to influential point in time. That certain point can be seen as 'the tipping point', the moment when the incentive had an effect, influencing the decision making process. The study of Alessandri et al. (2012) focusses on the role of managerial incentives in shaping firms growth option values, the managerial incentives play a role in the stock market, proving that at the right moment, a managerial incentive proofs to have more effect on the option value (Alessandri et al., 2012). This would indicated the incentive has a starting point and that it does not originate from internal sources but from external sources, or a separate cause.

To conclude incentives; there are various definitions for incentives. Several examples have been given to explain and define incentives. In this research we will use the following definitions: an incentive (tangible or intangible) is a stimuli used to encourage participation or achievement of a specific goal/activity (Atkinson, 1964; Sauermann & Cohen, 2010).

2.4 Barriers

An entrepreneur can encounter barriers in an innovation process which might withhold him/her from investing in sustainable innovations. A barrier can be internal to the firm or external. For example: internal barriers can be not having enough financial means, the risks and insecurity which an innovation process might bring or troubles with(human-) resources while external barriers can be governmental restriction (rules) which might make it impossible to innovate (Madrid-Guijarro et al., 2009). SME's have mostly resource based barriers, whether it is land, finances, employees or knowledge, these aspects are more difficult to get by for an SME (Madrid-Guijarro et al., 2009). During an innovation realization process , or the implementation of an innovation, a barrier might occur which delays an implementation or even results in ending the implementation. A barriers for an innovation can be very different per entrepreneur, country or industry (Totin et al., 2012). Examples might be: institutional barriers, market barriers, technological barriers or network barriers (Totin et al., 2012). Other barriers might be more related to the entrepreneur. The owner of a micro

firm is often preoccupied with the daily activities of the firm and might not see the opportunities or be busy to invest in finding a solution (Panagiotakopoulos, 2011). Barriers can restrain an entrepreneurs ability or his willingness to innovate (Totin et al., 2012). In order to realize the implementation of an innovation, a barrier must be reduced, overcome or resolved. To solve a barrier problem, one must define and frame the problem / barrier. When it is absolute clear what all aspects are, one can be often very creative in resolving the problem / barrier. Individuals with strong motives and strong incentives, are likely to approach a barrier with more intensity and creativity and will spent more time on reducing the barrier (Sauermann & Cohen, 2010). The more time an innovator, the entrepreneur, spends on defining and understanding the problem, the more likely they will come with a creative solution (Ross et al., 2012). Also an incentive can reduce the barrier. For example institutional institutes which can provide subsidies, a financial incentives, which can lower the financial barrier for an entrepreneur to invest in a sustainable innovation (Panagiotakopoulos, 2011).

To conclude Barriers: in this research a (potential) barrier is defined as: problem for an entrepreneur which can restrain the ability or willingness to develop or effectively make use of an application (Totin et al., 2012).

2.5 Entrepreneur

The concept of entrepreneurship (like innovation) was also introduced by Schumpeter (1934). He defined entrepreneurship and entrepreneurs as follow: "*the carrying out of new combinations we call 'entrepreneurship; the individual whose function it is to carry them out we call the entrepreneur*"(Bjerke & Hultman, 2002). Main aspect of entrepreneurship was the 'new combinations' which was elaborated as all possibilities with which an entrepreneur is able to innovate. Literally it meant innovation. In this literature review, the main focus is on the definition of an entrepreneur due to the fact that we are looking for the motives of an entrepreneur, a living person, for sustainable innovation. Therefore entrepreneurship will be defined as: the commercialization of an innovation by an entrepreneur which creates value from new concepts, products or processes (Knudson et al., 2004). This definition combines the aspect of Schumpeter's 'new combinations' with actually putting it into commercial use.

Schumpeter (1952) also introduced the entrepreneur as an innovator and described it as follows: "*the function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, opening a new source of supply of materials or a new outlet for products, by creating a new industry*"(Bjerke & Hultman, 2002). Nowadays, an entrepreneur is an innovator or developer who recognizes and seizes opportunities. The entrepreneur converts those opportunities into workable/marketable ideas. The entrepreneur does this by adding value through time, effort, money, skills (assumes the risks of the competitive marketplace to implement these ideas) and realizing the rewards from these efforts (Bjerke & Hultman, 2002). Other studies have led to a variety of definitions due to the different angles which were used in the research fields, but there are three ways of identifying an entrepreneur (Davidsson, 2003):

1. using those skills characterizing an entrepreneur,
2. by using the processes and events which are used by the entrepreneur,
3. based upon the results which are made.

Most definitions of the entrepreneur contain one or more of these three elements. For example:

- "*an entrepreneur thinks, reasons and acts based on opportunities in a holistic approach, which is leadership balanced"*(Bjerke, 2007). This definition has clearly a characteristic aspect and emphasizes how the entrepreneurs thinks and acts upon opportunities.
- *"the process whereby an entrepreneur (or a group of entrepreneurs) use organized efforts and means to pursue opportunities to create value and grow by fulfilling wants and needs through innovation and uniqueness"*(Bjerke, 2007). This definition has a process aspect by referring to the different aspects used to innovate.
- *"an entrepreneur is one who creates a new business (-branch), in the face of risk and uncertainty for the purpose of achieving profit and growth by identifying opportunities and assembling the necessary resources to capitalize on of them. Although many people come up with great business ideas, most never act on their ideas while entrepreneurs do*"(Bjerke, 2007). This definition is related to the results based upon the risks, profits and outcome of the innovation.

Entrepreneurs are also often mentioned as, visionaries, risk takers, pushing the boundaries of conventional practices and enjoying new challenges (Knudson et al., 2004). Characteristics which can be seen in an entrepreneur are: "*self-confidence, perseverance, domination, energy, diligence, resourcefulness, ability to take calculated risks, need to achieve, creativity, initiative, flexible, independence, foresight, dynamism, leadership, ability to get along with people and accept criticism, profit orientation, perceptiveness, optimism*"(Pleitner, 1986). These characteristics will have an influence on the motives of an entrepreneur to innovate. But also standard characteristics such as gender, education and age of an entrepreneur can have influence on the motives for innovation (Pyysiäinen et al., 2006). Researchers have proven that age of the entrepreneur can be of influence in the decision making process concerning innovation in small firms. Empirical research found evidence that young entrepreneurs innovate more as compared to older entrepreneurs (Avermaete et al., 2004). Main reason for this evidence is the strong motivation of young entrepreneurs, who still have to work for a long time within the sector/ industry and business (Diederen et al., 2003).

By means of diffusion, it is possible to see what kind of entrepreneurial type an entrepreneur might be. Rogers (1995) described 5 groups: *"innovators, early adopters, early majority, late majority and laggards"*(Rogers, 1995). With these groups, entrepreneurs could be classified based on innovativeness. But this entrepreneurial classification is not standard and researchers have designed different classifications. Entrepreneurs can also be divided into four groups: 'Non-Innovators, Traditionalists, Followers and Leaders' (Avermaete et al., 2004). The classification gives a better insight of the tendency of entrepreneurs to innovate. Non-innovators is related to the firms that have not shown any innovation activities. These entrepreneurs only apply an innovation when it becomes a part of regulation/ policy. Meaning without adopting the innovation, the continuity of the company is at risk. Traditionalists are entrepreneurs that show interest in innovations, but without any concrete realization plans. These two entrepreneurial types have little or no impact on the creation of new innovations because they don't take lead or risks to innovate (Hébert & Link, 2006). The 'Followers' type is similar compared with the 'Leaders' type but the activities concerning innovations are not new because they already have been introduced by the leaders. Leaders are often seen as the developers/introducers of new innovation activities (Hébert & Link, 2006). Results from the research of Avermaete et al. (2004) indicated that only 18% of the entrepreneurs where

leading in innovating and that 44% of the group were followers. Only 16% were non-innovators leaving 22% as traditional innovators (Avermaete et al., 2004). The importance of these entrepreneur types is to investigate the adoption rate of an innovation.

To conclude entrepreneur; there are various definitions for an entrepreneur(s). In this research, we will use the following definitions because it contains the three different angles of an entrepreneur (Davidsson, 2003): An entrepreneur is one who creates a new business (-branch) in the face of risk and uncertainty for the purpose of achieving profit and growth by identifying opportunities and assembling the necessary resources to capitalize one of them (Bjerke, 2007). The characteristic aspect in this definition is the one who creates and identifies opportunities. The entrepreneur can be the leader, follower, traditionalist or non-innovator. The process aspect is mentioned as; 'assembling the necessary resources', whereas the results are formulated as; 'achieving profit and growth'.

2.6 Small Medium Enterprises (Micro firms)

Not only big (international) enterprises have reasons to innovate, also small-medium-enterprises (SME's) need to innovate in order to create new (sustainable) products, or production methods and to be competitive (O'Dwyer et al., 2009). Most SME's have only one establishment and the amount of people working on management level is often low. An SME is often identified by their type of business. There are three types of SME's which can be distinguished (Bjerke & Hultman, 2002):

1. *"Marginal firms; new independent business ventures, often service oriented and quite common,*
2. *Lifestyle firms; usually started based upon the skills and profession of the entrepreneur and aimed for successful business, not necessarily at growth,*
3. *High potential firms; aimed at increasing of sales and profit and becoming a big corporation."*

These three types are common classification in research literature (Bjerke & Hultman, 2002). But these types do not clarify what is small and what is medium? There is quite some discussion about the definition of 'small' and 'medium' businesses. This also depends on origin, culture and comparison. A company in the United States of America might be small with 250 employees while in Europe this might be medium. For European countries, the size of small to medium companies is most often defined at 50 employees (Verhees & Meulenberg, 2004; Löfqvist, 2012). But this definition of small, can still be too big to be representative for the target group. Therefore researchers introduced 'micro' firms which has 1 till 10 employees (van de Vrande et al., 2009). Often the owner of an SME and micro firm, is also the manager and innovator (Hadjimanolis, 2000; Verhees & Meulenberg, 2004). The members of ZLTO (the target group), are also often the owner of a micro firm. Micro firms are not very well-known and therefore do not appear often in former literature reviews. Researchers often mention just SME's or family firms. A family firm is: "*a business governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family*" (Cassia et al., 2012). Family is a variable that can influences behavior at the individual, group and organizational levels of analysis, resulting in a significant impact on the management of the firm (Dyer, 2003). However, also family firms, especially in relation to innovations, play currently a minor role in research considering organizational structures and management due to shortage of research (Cassia et al., 2012). Therefore in this literature review, literature about SME's is used to describe the micro firms.

To be competitive, one must distinguish oneself from its competitors. Therefore a micro firm must be innovative. Innovation processes in micro firms are often informal arranged without good structure. However, due to sharp market and consumer focus, an innovation by a micro firm could be very successful. The problem for micro firm is often the commercialization of an invention (Verhees & Meulenberg, 2004). This is due to a shortage of marketing knowledge and foresight. This makes it difficult to bring the product to the market or get the right attention from customers for the product/service. Another aspect which plays a role in arranging innovation in a micro firm, is maintaining cash flow. Securing enough cash flow is very important to cover the investment costs. The risks of not securing a good cash flow are often also higher due to limitation in risk spread over the company (Hadjimanolis, 2000; Verhees & Meulenberg, 2004; Zahra, 2005; Löfqvist, 2012).

The entire innovation process is therefore often a learning process for the entrepreneur. The characteristics of the entrepreneur, as mentioned before, are considered to be more important in the innovation process on micro firms for this learning process(Pleitner, 1986). Recognizing opportunities, knowing when to endure or to quit are important characteristics which can mean success or failure.

To conclude SME: in this research, the definition of an SME is not applicable. Therefore this research will use 'Micro firms' which is defined as: A small business firm working, related with the Dutch agriculture sector, run and controlled by direct supervision of the owner (entrepreneur/innovator) with less than 10 employees (Hadjimanolis, 2000; Verhees & Meulenberg, 2004; van de Vrande et al., 2009). This definition has a strong relation with the SME and family firm definition, but is reformed to match the micro firm.

2.7 Framework

This research is focused on the Dutch poultry entrepreneurs, defined as micro firms. These micro firms have 10 or less employees. The owner of the firm is the entrepreneur and possible innovator. This research will study which motives form the basis for sustainable innovation. When the motives are known, it is possible to look at which incentives stimulate/influence these motives of entrepreneurs. In order to have better insight in which entrepreneurs are real innovators, two types of entrepreneurs will be distinguished: leaders and followers. It is expected that these two types have different motives for sustainable innovations and give more specific data concerning the incentives which might have influenced them to innovate. The motives of an entrepreneur can be intrinsic or extrinsic for a sustainable innovation. But it might also be that both influence or even play a major role in the decision making process of an entrepreneur for investing in a sustainable innovation. Figure 1 presents an illustration of the literature framework which will be used. Starting from the left, the motives which can be intrinsic or extrinsic for a sustainable innovation. Both 'routes' lead to a sustainable innovation. During the realization process, a barrier might influence the implementation. These barriers can even end the realization/implementation. But the motives can be affected by an incentive, encouraging the entrepreneur to overcome the barrier. The incentive can also reduce the barrier and thereby making it possible to realize the sustainable innovation. The entrepreneur can be a leader or a follower, in both cases, the same framework is used. This framework shows a causal relation between the motives and a sustainable innovation. The consideration or implementation of a sustainable innovations depends on the motives which might be different between both entrepreneur groups. With this research, ZLTO will have a better insight in the motives of different types of entrepreneurs and how to stimulate them with incentives.

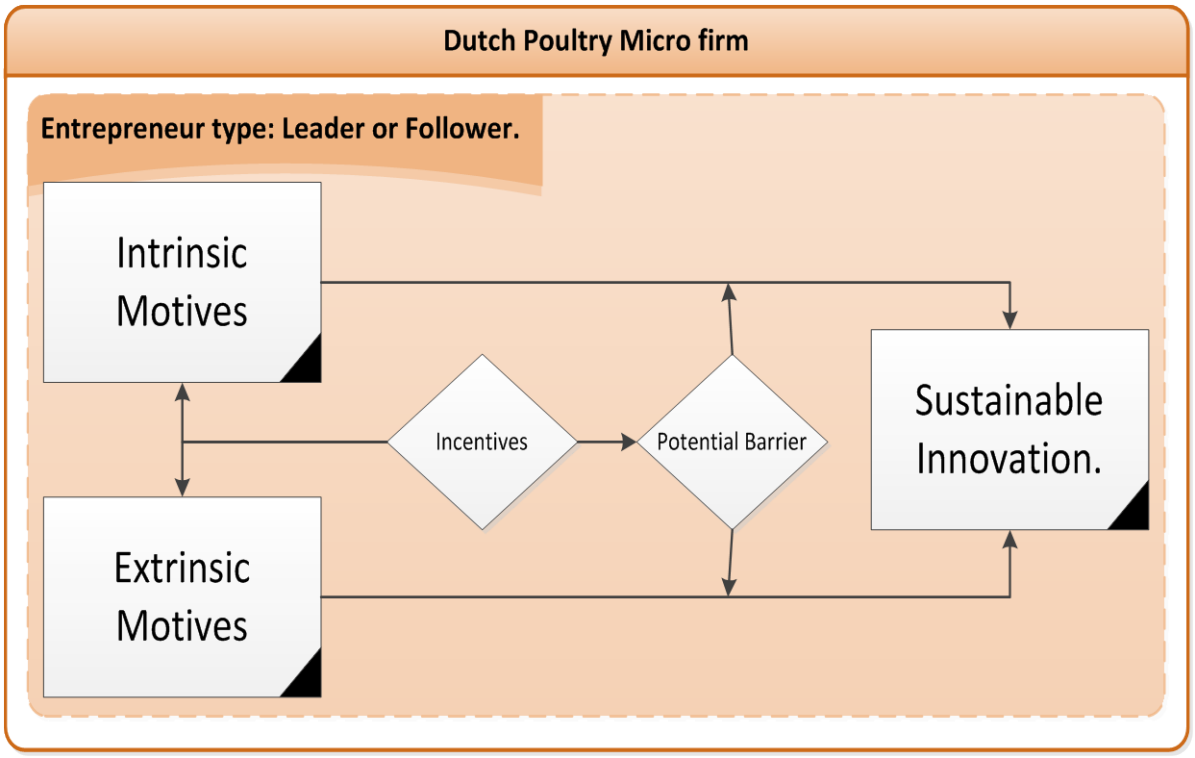

Figure 1 Literature Framework.

3. Methodology

In this chapter the methodology is explained. It contains elaboration of the population, the procedure and how the questionnaires used in this research are developed. Furthermore it will mention the assumption which are made for the research and gives a scope of the design and analysis.

3.1 Population & Sampling

In order to have a representative sample of Dutch poultry entrepreneurs, the members of LLTB and LTO Noord were added to the poultry members of ZLTO. Both associations are similar advocacy organizations as ZLTO but for a different part of the Netherlands. These members live and work in the Netherlands. The poultry sector was chosen because research has shown that this agricultural sector has been one of the most innovative in the Netherlands the past 5 years (LEI, 2012). All contact information of the population, was available at LLTB, LTO Noord and ZLTO. Respondents must meet the requirements: an entrepreneur of a micro firm who is considered to be the owner/manager working in the poultry sector. The firm can have 10 or less employees, is located in the Netherlands and the owner has a minimum of 10.000 animals on his/her firm. These requirements can be checked at the members list of LLTB, LTO Noord and ZLTO. According to these requirements, LLTB has 92 members, LTO Noord has 453 members and ZLTO has 273 members working in the poultry sector. Giving a total sample of 718. It is expected that about 20% (144 respondents) will answer the questionnaire (ZLTO, 2012). In order to increase the response rate, participation by the members was rewarded with a chance to win one of 5 gift certificates of €20.

3.2 Procedure

From the literature framework, a questionnaire has been constructed. All the topics which are discussed in the framework are developed into questions. There were two stages. In the first stage, the aspects of the literature framework were interviewed with help of a qualitative questionnaire. This first questionnaire had open questions with regard to which innovation an entrepreneur had considered, implemented or was currently considering. With every innovation mentioned by the respondents, he/she was asked what the motives, incentives and motives were for this sustainable innovation. This interview had a time limit of 60 till 75 minutes. In appendix I, the formulated questions are presented (in Dutch). Stage 1 was conducted on a small part of the total sample. This selection included several entrepreneurs who are perceived to be innovative (ZLTO, 2012), thereby ensuring that frontrunners and followers were also represented in stage 1, the qualitative round. This selection of innovative entrepreneurs was made by colleagues of ZLTO who work in the poultry department and know the members. The interviews have taken place at a location chosen by these respondent. These respondents were contacted and interviewed personally by the researcher. This first stage has given an insight in the motives for sustainable innovations and the incentives and barriers which have affected the decision making process. It was expected that after the completion of a few interviews, the data from the interviews might become similar. Once an interview gave no more new insights/data, the first stage would be completed. After having completed 11 interviews, the date had become similar to the first 10 interviews. From this point, the second stage started.

In stage 2 the qualitative interviews from stage 1 were used as an input for the quantitative questionnaire. The respondents could choose from a set of innovation which were mentioned by the respondents in stage 1 and are considered to be innovative. This second questionnaire was digital and sent by email to the remaining sample (707). The invitation letter (email) elaborated to the respondents what the goal is of this research (appendix VI). From these answers, the analysis can be made resulting in the conclusions and recommendation.

3.3 Questionnaire development

The questionnaires used for this research are an operationalization of the literature framework. For the first stage, the qualitative interview, questions were developed which asked the respondent which sustainable innovations he/she had considered, implemented or was currently under consideration. Per answer, the respondent was asked what his/her motives, incentives and barriers were for this particular sustainable innovation. In appendix I the qualitative questionnaire is attached, in Dutch. Results from this first stage were lists of: 'sustainable innovations, the motivation for the related innovations, a list of incentives why the innovation were considered at that moment and a list of barriers which may have prolonged or ended the implementation process'. A small grasp (2 results per motive, incentive, barrier) of results are added in appendix II. In all cases, the motives, incentives and barriers were all asked until there were no additional answers. From these results, the questionnaire for stage 2 has been developed.

To explain stage 2, the quantitative questionnaire (appendix IV), we first look at the sustainable innovations mentioned by the respondents in stage 1. In appendix III a list of innovations is given. With help of the definition presented in the literature (chapter 2), three ZLTO colleagues have classified which innovations are considered to be sustainable. The selection is done by three ZLTO colleagues in order to exclude any bias influence by the researcher in favor of the internal validity (de Vaus, 2001). These 11 innovations were categorized based on 'people, planet or profit' and 'product or process' aspects. Table 1 gives an overview of this categorization. In this first question of stage 2 (quantitative questionnaire, appendix IV), the respondent were asked to start answering if the specific sustainable innovation was:

- not considered,
- considered and in which year is was considered,
- implemented and in which year it was implemented,
- considering it at the moment and when it is expected to be implemented

In the second question, the respondent were presented with an overview of their choices from question one, categorized in 3 items (people, planet and profit) with 2 sub-levels (product and process)(table 1). The innovations who were not considered were left out in this overview. The respondent had to choose from each category item (people, planet and profit), one sustainable innovation. Leaving him/her with maximal 3 innovations for further analyses. With this categorization was ensured that different sustainable innovations could be measured. Thereby creating a wider spread in possible answers related why an innovation is considered or implemented. The respondents were not aware of this categorization.

Table 1 Categorization innovations

Category	Innovation NL	Innovation EN
People	Product: Verkoop eigen producten	Sales of own made products
	Process: Overstap huisvestingsysteem	Housing
	Kuikenvangmachine	Chicken catch machine
	Luchtwasser	Air scrubber
Planet	Product: Windturbine	Wind turbine
	Zonnepanelen	Solar panels
	Landschappelijke inpassing	Landscaping
	Process: Patiosysteem	Patio system
	Vergistingsinstallatie	Fermentation system
Profit	Process: Warmtewisselaar	Heat exchanger
	Verlichtingstoepassing	Light systems

In question 3 of the quantitative questionnaire, the respondent were asked to score in turn the motives, incentives and barriers on a 5 point Likert-scale (*1= Absolute not important. 2= not important 3= important nor, not important. 4= important. 5= very important*) for all 3 innovations which they had chosen in question 2 (Lee, 2011; Verhees et al., 2011). For each sustainable innovation, the same set of motives, incentives and barriers were used for the analysis. The respondent had the possibility to add additional motives, incentives and barriers if the designed set of motives, incentives and barriers did not completely covered the sustainable innovation.

The motives used in the quantitative questionnaire (stage 2) were gathered from the answered in stage 1. The list of motives is shortened because many answers were comparable. This was checked by both supervisors. This resulted in a list of 14 motives (appendix IV). Three students were asked to divide the motives in intrinsic and extrinsic motives. This distinction is based on the definitions of intrinsic and extrinsic motives presented in chapter 2. The results gave 9 extrinsic and 5 intrinsic motives attached in appendix V.

The incentives used in the quantitative questionnaire (stage 2) were gathered from the answered in stage 1. The list of incentives is shortened because many answers were comparable. This was checked by both supervisors. This resulted in a list of 16 incentives (appendix IV).

The barriers used in the quantitative questionnaire (stage 2) were gathered from the answered in stage 1. The list of barriers is shortened because many answers were comparable. This was checked by both supervisors. This resulted in a list of 10 barriers (appendix IV).

3.4 Assumptions

The results drawn from this research (members of LLTB, LTO Noord and ZLTO), are the same for all the poultry entrepreneurs in the Netherlands. Sample for this research consisted of 718 poultry entrepreneurs. The total population of poultry entrepreneurs in the Netherlands is 2400 with in total more than 100 million animals (LEI, 2012). Meaning this research has nearly 30% of the total poultry entrepreneur in the Netherlands.

3.5 Design

A 'Cross-sectional design' is used for this research. The data was gathered at one point in time and there were no interventions. The literature framework (figure 1) gives a causal analysis based on a priori reasoning from the literature study (de Vaus, 2001). The causal relation has been explained in chapter 2.7. To avoid problems with the internal validity, the selection of entrepreneurs for stage 1 of the procedure (quantitative interviews), the distinction between intrinsic versus extrinsic motives and the selection of sustainable innovations are done by a small test group. Thereby avoiding a bias role of the researcher (de Vaus, 2001). Also, both entrepreneur groups (leaders and followers) might have additional reasons why they differ from each other. The sample had to have certain requirements, as mentioned in paragraph 3.1, to make them more comparable. In the analysis stage, respondents who did not meet these requirements were dropped out.

3.6 Analysis

The analysis was done with help of SPSS[2]. Before starting the test in SPSS, the labels were added and the data-set had to be reorganized. Any variables which were not used during the analysis were excluded. All open questions in which the respondents could add answer, were collected and will be discussed in the results before excluding them. First the *frequency analy*sis will be done to look at the data and see if there are any unusual results. The second analysis is a f*actor analysis*. The results will give an insight in whether the set; of motives, incentives and barriers, might have relations within each set as given in the quantitative questionnaire (appendix IV). Results might indicate that some variables can be combined into a similar component. With an overview of the means, it is possible to see which sustainable innovation is analyzed most often and which motives, incentives and barriers are scores as most important. The implementation date of the sustainable innovations, give the possibility to classify the respondents into two groups (the leader and follower) for sustainable innovations. This can be analyzed with an *independent sample T-test* in which the entrepreneur groups, leaders and followers, can be compared with each other with the following hypotheses: H0 = $\mu 1 = \mu 2$ and Ha = $\mu 1 \neq \mu 2$. $\mu 1$ = leaders of sustainable innovation and $\mu 2$ are the following entrepreneurs of sustainable innovation.

[2]SPSS Statistics is a software package used for statistical analysis. It is now officially named "IBM SPSS Statistics"

4. Results

In this chapter the results from the interviews will be analyzed and discussed. Starting with a short elaboration of the response and setup, the means and descriptive variables are addressed followed by the anova test, independent sample T-test and the correlation test. Attached in appendixes VII, VIII, IX and X are the complete tables of all tests.

The online questionnaire has been sent to 707 members. A total of 155 responded in time (22%). These are all taken into account for the analysis. All sustainable innovations have been analyzed (unless mentioned otherwise), but innovations 8 (patio system) and 9 (fermentation system) have been left out of the results because they were each analyzed only once by a respondent. Therefore no statistical analyses could be done.

4.1 Elaborating the sustainable innovation, motives, incentives and barriers

For the online questionnaire, 11 sustainable innovations were used. Table 2 gives an overview of the selected sustainable innovations. '*Solar panels*' was most often considered and is currently most often considered while '*change of lights systems*' (bolts to LED) has been most often realized. Remarkable is that '*solar panels*' is only 2 times realized thereby being one of the least implemented sustainable innovations. Column 6 in table 2 gives the order of most often chosen by respondents based on all three aspects (considered, realized or momentarily under consideration).

Table 2 Sustainable innovations used in the online questionnaire

Innovations per category	Considered by respondent	Realized by respondent	Momentarily under consideration	Total	Most often chosen
People					
(1) Sales of own produced products	13	35	2	=50	6
(2) Change of animal housing system	16	53	5	=74	5
(3) Chicken catching machine	4	5	1	=10	11
(4) Air scrubber	17	6	5	=28	8
Planet					
(5) Wind turbine	28	3	4	=35	7
(6) Solar panels	61	2	28	=113	**1**
(7) Local landscaping	15	52	11	=78	4
(8) Patio system	12	1	1	=14	9
(9) Fermentation system	10	-	1	=11	10
Profit					
(10) Heat exchanger	26	51	10	=87	3
(11) Change of light bolts to LED light	22	72	13	=103	2

Looking at category *people*, '*change of housing system*' has been most often chosen. It has been realized 53 times. As categorized in table 1, this is a process innovation.

Looking at category *planet*, '*solar panels*' has been most often chosen. But it has been realized only 2 times. As categorized in table 1, this is a product innovation.

Looking at category *profit*, '*change of light bolts to LED light*' has been most often chosen. It has been realized 72 times. As categorized in table 1, this is a process innovation.

4.1.1 Motives

In table 3 the means of the motives are presented for sustainable innovations: '*sales of own products', 'change of animal housing system'* (housing) and *'chicken catch machine*'. Column 1 of table 3 gives the motives categorized in 'extrinsic' and 'intrinsic' motives. Columns 2, 3 and 4 give the sustainable innovation with each 2 sub-columns: "the mean (average score based on the 5-point likert-scale) and the number of results (how often this sustainable innovation has been analyzed, chosen for further answering by the respondents) indicated by '*N*'".

Sustainable innovation '*sales of own products'* has on average *'financial favorable'* as highest scoring extrinsic motive. 'Ensure continuity' is on average the highest scored intrinsic motive for sustainable innovation '*sales of own products'*. From the 155 respondents, 18 respondents have scored their motives for this sustainable innovation. Sustainable innovation '*change of animal housing system'* has on average *'ensure continuity'* as highest scored intrinsic motive. '*Financial favorable'* is on average the highest scoring extrinsic motive for this sustainable innovation. From the 155 respondents, 57 respondents have scored their motives for this sustainable innovation. Sustainable innovation '*chicken catch machine'* has on average *'improvement of quality'* as highest scoring extrinsic motive. '*Ensure continuity*' is on average the highest scored intrinsic motive for this sustainable innovation. From the 155 respondents, only 10 respondents have scored their motives for this particular sustainable innovation.

Table 3 Means of the motives per innovation 1, 2 and 3

Sustainable innovation category	**People**		**People**		**People**	
	Sales of own products		**Housing**		**Chicken catch machine**	
Motives	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Extrinsic						
Animal welfare	3.06	18	3.82	57	3.80	10
Working conditions	3.44	18	3.72	57	4.30	10
Financial favorable	**4.39**	18	**4.23**	57	4.20	10
Improvement of technical results	3.89	18	4.11	57	4.20	10
Improvement of quality	3.61	18	4.21	57	**4.40**	10
To meet legislation	3.06	18	3.96	57	3.40	10
Favor surrounding aspect like nature & environment	3.11	18	3.44	57	2.80	10
In favor of the image of the poultry industry	3.89	18	3.88	57	3.90	10
Sustainability: people planet profit	3.17	18	3.68	57	3.90	10
Intrinsic						
Ensure continuity	**3.72**	18	**4.35**	57	**3.90**	10
Realizing scale enlargement	2.78	18	3.42	57	2.90	10
In order to sell or reuse own products	3.61	18	2.88	57	2.20	10
Demand from the poultry chain and or consumer	3.56	18	3.96	57	2.80	10
Personal style of entrepreneurship	3.50	18	3.70	57	3.60	10

In table 4 the means of the motives are presented for sustainable innovations: '*air scrubber', 'wind turbine'* and *'solar panels*'. Column 1 of Table 4 gives the motives categorized in 'extrinsic' and 'intrinsic' motives. Columns 2, 3 and 4 gives the sustainable innovation with each 2 sub-columns: "the mean (average score based on the 5-point likert-scale) and the number of results (how often this sustainable innovation has been analyzed, chosen for further answering by the respondents) indicated by '*N*'".

Sustainable innovation '*air scrubber'* has on average *'to meet legislation'* as highest scoring extrinsic motive. '*Ensure continuity*' is on average the highest scored intrinsic motive concerning sustainable innovation '*air scrubber*'. From the 155 respondents, 15 respondents have scored their motives for this sustainable innovation. Sustainable innovation '*wind turbine'* has on average *'financial favorable'* as highest scoring extrinsic motive. '*Personal style of entrepreneurship'* and *'ensure continuity'* have on average the highest scoring intrinsic motives for '*wind turbine'*. From the 155 respondents, only 6 respondents have scored their motives for this sustainable innovation. Sustainable innovation '*solar panels'* has on average *'financial favorable'* as highest scoring extrinsic motive and '*Personal style of entrepreneurship*' as (on average) highest scoring intrinsic motive. From the 155 respondents, 84 respondents have scored their motives for this particular sustainable innovation.

Table 4 Means of the motives per innovation 4, 5 and 6

Sustainable innovation category	**People**		**Planet**		**Planet**	
	Air scrubber		**Wind turbine**		**Solar panels**	
Motives	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Extrinsic						
Animal welfare	3.47	15	2.33	6	1.82	84
Working conditions	3.80	15	2.00	6	1.90	84
Financial favorable	3.67	15	**4.50**	6	**4.11**	84
Improvement of technical results	3.93	15	2.67	6	2.25	84
Improvement of quality	4.13	15	3.00	6	2.36	84
To meet legislation	**4.27**	15	3.50	6	2.18	84
Favor surrounding aspect like nature & environment	3.80	15	3.00	6	3.40	84
In favor of the image of the poultry industry	3.73	15	4.00	6	3.68	84
Sustainability: people planet profit	3.47	15	3.50	6	3.62	84
Intrinsic						
Ensure continuity	**4.07**	15	**4.17**	6	3.14	84
Realizing scale enlargement	4.00	15	3.50	6	2.44	84
In order to sell or reuse own products	2.67	15	2.83	6	2.24	84
Demand from the poultry chain and or consumer	2.93	15	3.83	6	2.43	84
Personal style of entrepreneurship	3.20	15	**4.17**	6	**3.45**	84

In table 5 the means of the motives are presented for sustainable innovations: '*landscaping', 'heat exchanger'* and *'change of light bolts to LED light* (light systems)'. Column 1 of table 5 gives the motives categorized in 'extrinsic' and 'intrinsic' motives. Columns 2, 3 and 4 give the sustainable innovation with each 2 sub-columns: "the mean (average score based on the 5-point likert-scale) and the number of results (how often this sustainable innovation has been analyzed, chosen for further answering by the respondents) indicated by '*N*'". Sustainable innovation '*landscaping'* has on average *'in favor of the image of the poultry industry'* as highest scoring extrinsic motive and '*Personal style of entrepreneurship*' as (on average) highest scored intrinsic motive. From the 155 respondents, 42 respondents have scored their motives for this sustainable innovation. Sustainable innovation '*heat exchanger'* has on average *'improvement of technical results'* and *'to meet legislation'* as highest scoring extrinsic motives. '*Ensure continuity'* is on average the highest scored intrinsic motive for a '*heat exchanger'*. From the 155 respondents, 64 respondents have scored their motives for this sustainable innovation. Sustainable innovation '*light systems'* has on average *'improvement of technical results'* as highest scoring extrinsic motive. '*Ensure continuity*' is on average the highest scored intrinsic motive with concerns to this sustainable innovation. From the

155 respondents, 63 respondents have scored their motives for this particular sustainable innovation.

The sustainable innovations categorized as 'people' have on average '*financial favorable'* as highest scoring (extrinsic) motive ((4.39 + 4.23 + 4.20 + 3.67 / 4)= 4.12). This calculation is made by adding per motive, all mean scores and divide by the number of sustainable innovations in this category. The sustainable innovations categorized as 'planet' have on average '*in favor of the image of the poultry industry*' as highest scoring (extrinsic) motive ((4.00 + 3.68 + 4.07 / 3)= 3.92). The sustainable innovations categorized as 'profit' have on average '*improvement of technical results*' as highest scoring (extrinsic) motive ((4.20 + 4.17 / 2)= 4.19).

Table 5 Means of the motives per innovation 7, 10 and 11

Sustainable innovation category	**Planet**		**Profit**		**Profit**	
	Landscaping		**Heat Exch.**		**Light system**	
Motives	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Extrinsic						
Animal welfare	2.90	42	4.00	64	3.90	63
Working conditions	2.83	42	3.59	64	3.62	63
Financial favorable	2.98	42	3.98	64	4.08	63
Improvement of technical results	2.86	42	**4.20**	64	**4.17**	63
Improvement of quality	2.90	42	4.09	64	4.08	63
To meet legislation	3.79	42	**4.20**	64	2.79	63
Favor surrounding aspect like nature & environment	3.79	42	3.58	64	2.92	63
In favor of the image of the poultry industry	**4.07**	42	3.44	64	3.00	63
Sustainability: people planet profit	3.67	42	3.44	64	3.22	63
Intrinsic						
Ensure continuity	3.43	42	**3.84**	64	**3.32**	63
Realizing scale enlargement	3.31	42	3.20	64	2.51	63
In order to sell or reuse own products	2.29	42	2.20	64	2.03	63
Demand from the poultry chain and or consumer	2.81	42	2.22	64	2.24	63
Personal style of entrepreneurship	**3.62**	42	3.19	64	3.22	63

Appendix VII (tables A) gives an insight in the highest scoring motives overall. Motive '*financial favorable'* scored the highest with an average of 3.98 on a 5 point likert-scale while '*in order to sell or reuse own products'* has the lowest average score with 2.40 (Appendix VII, tables A, column 2). In table A is also the difference between intrinsic and extrinsic motives added based on the distinction made in appendix V by 3 students (column 3). Out of the first 6 motives, only 1 is intrinsic versus 5 extrinsic motives. This indicates that overall, the extrinsic motives are valued higher in the consideration process of implementing a sustainable innovation.

The 'Anova test' must indicate whether there is variance between or within the motives and the sustainable innovations. The index variable represents all sustainable innovations used in this research. The motives are the dependent variables and the index variable is the independent variable. Results indicated that 12 out of 14 motives, have a 'F-result' which is significant, meaning that these motives have no equal variance assumption. In appendix VIII (table A), the 2 motives (personal style of entrepreneurship and sustainability: people planet profit) are presented which were not significant meaning that equal variance must be assumed. These results have consequences for the interpretation of the 'independent-sample T-tests'.

4.1.2 Added motives by the respondents

The respondents could add additional motives during the online (quantitative) questionnaire. Most often they elaborated one or two motives which were important. Most common were financial or governmental related. Only the aspects: 'private matter, necessary investment, facilities too old and transfer to biological poultry farming', can be seen as additional motives. But these were mentioned all only once, therefore are not included in this research. Further additional motives were already accounted for in the given set of 14 motives (see appendix IV).

4.1.3 Incentives

In table 6 the means of the incentives are presented for sustainable innovations: '*sales of own products', 'change of animal housing system'* (housing) and *'chicken catch machine*'. Column 1 of table 6 gives the incentives while columns 2, 3 and 4 represent the sustainable innovation which each have 2 sub-columns: "the mean (average score based on the 5-point likert-scale) and the number of results (how often this sustainable innovation has been analyzed, chosen for further answering by the respondents) indicated by '*N*'".

Sustainable innovation '*sales of own products'* has on average *'due to demand from the poultry chain / consumer'* as highest scoring incentive. From the 155 respondents, 18 respondents have scored their incentives for this sustainable innovation. Sustainable innovation '*change of animal housing system'* has on average *'due to legislative changes'* as highest scored incentive. From the 155 respondents, 57 respondents have scored their incentives for this sustainable innovation. Sustainable innovation '*chicken catch machine'* has on average *'reading media: industry journals, newspapers'* as highest scoring incentive. From the 155 respondents, only 10 respondents have scored their incentives for this particular sustainable innovation.

Table 6 Means of the incentives per innovation 1, 2 and 3

Sustainable innovation category	**People**		**People**		**People**	
	Sales of own products		**Housing**		**Chicken catch machine**	
Incentives	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
1 Extreme weather conditions	1.28	18	1.63	57	1.20	10
2 Due to an accident on the work floor	1.28	18	1.51	57	1.40	10
3 Due to private circumstanced	1.61	18	2.02	57	1.30	10
4 Due to local pressure from the community	1.50	18	1.86	57	1.20	10
5 Due to outbreak of animal diseases	1.22	18	1.65	57	2.00	10
6 Due to disappointing results	1.67	18	1.96	57	1.50	10
7 Due to legislative changes	1.72	18	**3.63**	57	1.30	10
8 Due to demand from the poultry chain / consumer	**3.22**	18	3.54	57	1.30	10
9 On advice from company advisor (bank, feed etc.)	1.94	18	2.70	57	1.50	10
10 Because of favorable accounting gains	2.17	18	3.04	57	2.00	10
11 On advice from ZLTO / LTO Noord / LLTB	1.61	18	1.84	57	1.40	10
12 By attending an open day / field trip	2.00	18	2.25	57	2.40	10
13 Reading media: industry journals, newspapers	2.17	18	2.75	57	**2.90**	10
14 On advice from a study association, research	1.61	18	2.32	57	2.00	10
15 On advice from other poultry entrepreneurs	1.94	18	2.56	57	2.50	10
16 On advice from family or friends	2.28	18	2.04	57	1.80	10

In table 7 the means of the incentives are presented for sustainable innovations: '*air scrubber', 'wind turbine'* and *'solar panels*'. Sustainable innovation '*air scrubber'* has on average *'due to legislative changes'* as highest scoring incentive. From the 155 respondents, 15 respondents have scored their incentives for this sustainable innovation. Sustainable innovation '*wind turbine'* has on average *'because of favorable accounting gains'* as highest scored incentive. From the 155 respondents, only 6 respondents have scored their incentives for this sustainable innovation. Sustainable innovation '*solar panels'* has on average *'because of favorable accounting gains*' as highest scoring incentive. From the 155 respondents, 84 respondents have scored their incentives for this particular sustainable innovation.

Table 7 Means of the incentives per innovation 4, 5 and 6

Sustainable innovation category	**People**		**Planet**		**Planet**	
	Air scrubber		**Wind turbine**		**Solar panels**	
Incentives	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
1 Extreme weather conditions	2.13	15	1.67	6	1.70	84
2 Due to an accident on the work floor	1.67	15	1.50	6	1.57	84
3 Due to private circumstanced	1.67	15	1.00	6	1.65	84
4 Due to local pressure from the community	2.07	15	1.67	6	1.65	84
5 Due to outbreak of animal diseases	1.73	15	1.17	6	1.56	84
6 Due to disappointing results	1.73	15	1.17	6	1.75	84
7 Due to legislative changes	**3.80**	15	1.33	6	1.89	84
8 Due to demand from the poultry chain / consumer	1.87	15	2.33	6	1.85	84
9 On advice from company advisor (bank, feed etc.)	2.20	15	2.33	6	2.23	84
10 Because of favorable accounting gains	2.60	15	**3.00**	6	**3.60**	84
11 On advice from ZLTO / LTO Noord / LLTB	1.60	15	1.67	6	2.08	84
12 By attending an open day / field trip	2.00	15	1.83	6	2.31	84
13 Reading media: industry journals, newspapers	2.13	15	2.50	6	2.95	84
14 On advice from a study association, research	2.20	15	2.00	6	2.17	84
15 On advice from other poultry entrepreneurs	2.13	15	2.00	6	2.17	84
16 On advice from family or friends	1.80	15	2.00	6	1.90	84

In table 8 the means of the incentives are presented for sustainable innovations: '*landscaping', 'heat exchanger'* and *'change of light bolts to LED light* (light systems)'. Sustainable innovation '*landscaping'* has on average *'due to legislative changes'* as highest scoring incentive. From the 155 respondents, 42 respondents have scored their incentives for this sustainable innovation. Sustainable innovation '*heat exchanger'* has on average *'due to legislative changes'* as highest scored incentive. From the 155 respondents, 64 respondents have scored their incentives for this sustainable innovation. Sustainable innovation '*change of light bolts to LED light'* has on average *'reading media: industry journals, newspapers*' as highest scoring incentive. From the 155 respondents, 63 respondents have scored their incentives for this particular sustainable innovation.

The sustainable innovations categorized as 'people' have on average '*due to legislative changes*' as highest scoring incentive ((1.72 + 3.63 + 1.30 + 3.80 / 4)= 2.61). This calculation is made by adding per incentive, all mean scores and divide by the number of sustainable innovations in this category. The sustainable innovations categorized as 'planet' have on average '*because of favorable accounting gains*' as highest scoring incentive ((3.00 + 3.60 + 2.12 / 3)= 2.91). The sustainable innovations categorized as 'profit' have on average '*reading media: industry journals, newspapers*' as highest scoring incentive ((2.89 + 2.98 / 2)= 2.94).

Table 8 Means of the incentives per innovation 7, 10 and 11

Sustainable innovation category	Planet Landscaping		Profit Heat Exch.		Profit Light system	
Incentives	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
1 Extreme weather conditions	1.71	42	2.59	64	1.62	63
2 Due to an accident on the work floor	1.38	42	1.48	64	1.51	63
3 Due to private circumstanced	1.50	42	1.52	64	1.60	63
4 Due to local pressure from the community	2.40	42	1.92	64	1.60	63
5 Due to outbreak of animal diseases	1.64	42	1.83	64	1.62	63
6 Due to disappointing results	1.64	42	2.03	64	1.94	63
7 Due to legislative changes	**3.33**	42	**3.50**	64	2.00	63
8 Due to demand from the poultry chain / consumer	2.12	42	1.75	64	1.76	63
9 On advice from company advisor (bank, feed etc.)	2.05	42	2.70	64	2.60	63
10 Because of favorable accounting gains	2.12	42	3.02	64	2.95	63
11 On advice from ZLTO / LTO Noord / LLTB	1.71	42	1.75	64	1.84	63
12 By attending an open day / field trip	1.93	42	2.63	64	2.41	63
13 Reading media: industry journals, newspapers	2.48	42	2.89	64	**2.98**	63
14 On advice from a study association, research	1.86	42	2.38	64	2.38	63
15 On advice from other poultry entrepreneurs	2.07	42	2.77	64	2.71	63
16 On advice from family or friends	1.98	42	1.83	64	1.95	63

Appendix VII (tables B) gives an insight in the highest scoring incentives overall. Measured over all incentives scores, '*because of favorable accounting gains'* is scored the highest with an average of 2.95 on a 5-point likert-scale while '*due to an accident on the work floor'* has the lowest average score with 1.50. These mean scores of the incentives are lower than those of the motives (appendix VII, tables A). This indicate that the motives are valued as more important than the incentives.

The 'Anova test' must indicate whether there is variance between or within the incentives and the sustainable innovations. The index variable represents all sustainable innovations. The incentives are the dependent variables and the index variable is the independent variable. Results indicated that 12 out of 16 incentives, have a 'F-result' which is significant, meaning that these incentives have no equal variance assumption. In appendix VIII (table B), the 4 incentives (*due to an accident on the work floor, on advice from ZLTO / LTO Noord / LLTB, by attending an open day / field trip and on advice from family or friends*) are presented which were not significant meaning that equal variance must be assumed. These results have consequences for the interpretation of the 'independent-sample T-tests'.

4.1.4 Added incentives by the respondents

The respondents could add additional motives during the online (quantitative) questionnaire. Most common were financial gains or opportunities or governmental issues who forced them to invest. The aspects: 'personal interest, image of the poultry sector, animal welfare and continuity were mentioned a few times as additional incentives. Most were seen as motives but could indeed also be interpreted as an incentive. Also these additional answers were mentioned each only a few times, therefore are further not included in this research. Other additional incentives were already accounted for in the given set of 16 incentives (see appendix IV)

4.1.5 Barriers

In table 9 the means of the barriers are presented for sustainable innovations: '*sales of own products', 'change of animal housing system'* (housing) and *'chicken catch machine*'. Column 1 of Table 9 gives the barriers while columns 2, 3 and 4 represent the sustainable innovation which each have 2 sub-columns: "the mean (average score based on the 5-point likert-scale) and the number of results (how often this sustainable innovation has been analyzed, chosen for further answering by the respondents) indicated by '*N*'".

Sustainable innovation '*sales of own products'* has on average '*legislative restrictions'* as highest scoring barrier. From the 155 respondents, 17 respondents have scored their barriers for this sustainable innovation. Sustainable innovation '*change of animal housing system'* has on average *'legislative restrictions'* as highest scored barrier. From the 155 respondents, 57 respondents have scored their barriers for this sustainable innovation. Sustainable innovation '*chicken catch machine'* has on average *'project scope, feasibility and support'* as highest scoring barrier. From the 155 respondents, only 10 respondents have scored their barrier for this particular sustainable innovation

Table 9 Means of the barriers per innovation 1, 2 and 3

Sustainable innovation category	**People**		**People**		**People**	
	Sales of own products		**Housing**		**Chicken catch machine**	
Barriers	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
1 Legislative restrictions	**2.53**	17	**3.30**	57	1.30	10
2 Financial not feasible	2.29	17	3.00	57	2.40	10
3 Restrictions due to outbreak of animal diseases	1.76	17	2.04	57	1.80	10
4 Project scope, feasibility and support	2.18	17	2.63	57	**2.60**	10
5 Technological not feasible	1.76	17	2.12	57	1.60	10
6 Lack of equipment and or facilities	1.82	17	2.33	57	1.90	10
7 Mitigating environmental / surrounding factors	1.88	17	2.09	57	1.30	10
8 No continuity	1.41	17	2.16	57	1.30	10
9 No demand from poultry chain or consumer	1.88	17	2.05	57	1.30	10
10 Private circumstances	1.65	17	2.00	57	1.30	10

In table 10 the means of the barriers are presented for sustainable innovations: '*air scrubber', 'wind turbine'* and *'solar panels*'. Sustainable innovation '*air scrubber'* has on average *'financial not feasible'* as highest scoring barrier. From the 155 respondents, 15 respondents have scored their barriers for this sustainable innovation. Sustainable innovation '*wind turbine'* has on average *legislative restrictions'* as highest scored barrier. From the 155 respondents, only 6 respondents have scored their barriers for this sustainable innovation. Sustainable innovation *'solar panels'* has on average *'financial not feasible'* as highest scoring barrier. From the 155 respondents, 84 respondents have scored their barriers for this particular sustainable innovation.

Table 10 Means of the barriers per innovation 4, 5 and 6

Sustainable innovation category	People		Planet		Planet	
	Air scrubber		Wind turbine		Solar panels	
Barriers	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
1 Legislative restrictions	3.47	15	**4.67**	6	2.30	84
2 Financial not feasible	**3.67**	15	3.33	6	**3.64**	84
3 Restrictions due to outbreak of animal diseases	2.20	15	1.50	6	1.57	84
4 Project scope, feasibility and support	2.80	15	3.00	6	2.56	84
5 Technological not feasible	2.73	15	1.67	6	2.06	84
6 Lack of equipment and or facilities	2.60	15	1.83	6	1.81	84
7 Mitigating environmental / surrounding factors	2.47	15	3.00	6	1.76	84
8 No continuity	2.07	15	1.33	6	1.88	84
9 No demand from poultry chain or consumer	1.80	15	1.33	6	1.85	84
10 Private circumstances	1.93	15	1.33	6	1.88	84

In table 11 the means of the barriers are presented for sustainable innovations: '*landscaping', 'heat exchanger'* and *'change of light bolts to LED light* (light systems)'. Sustainable innovation '*landscaping'* has on average *'legislative restrictions'* as highest scoring barrier. From the 155 respondents, 42 respondents have scored their barriers for this sustainable innovation. Sustainable innovation '*heat exchanger'* has on average *'financial not feasible'* as highest scored barrier. From the 155 respondents, 64 respondents have scored their barriers for this sustainable innovation. Sustainable innovation '*change of light bolts to LED light'* has on average *'financial not feasible*' as highest scoring barrier. From the 155 respondents, 63 respondents have scored their barriers for this particular sustainable innovation.

The sustainable innovations categorized as 'people' have on average '*financial not feasible'* as highest scoring barrier (2.29 + 3.00 + 2.40 + 3.67 / 4)= 2.84). This calculation is made by adding per barrier, all mean scores and divide by the number of sustainable innovations in this category. The sustainable innovations categorized as 'planet' have on average '*legislative restrictions*' as highest scoring barrier ((4.67 + 2.30 + 2.36 / 3)= 3.11). The sustainable innovations categorized as 'profit' have on average '*financial not feasible'* as highest scoring barrier ((2.72 + 2.57 / 2)= 2.65).

Table 11 Means of the barriers per innovation 7, 10 and 11

Sustainable innovation category	Planet		Profit		Profit	
	Landscaping		Heat Exch.		Light system	
Barriers	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
1 Legislative restrictions	**2.36**	42	2.66	64	1.89	63
2 Financial not feasible	2.07	42	**2.72**	64	**2.57**	63
3 Restrictions due to outbreak of animal diseases	1.64	42	1.72	64	1.62	63
4 Project scope, feasibility and support	1.98	42	2.08	64	2.03	63
5 Technological not feasible	1.71	42	1.78	64	1.89	63
6 Lack of equipment and or facilities	1.93	42	1.89	64	1.84	63
7 Mitigating environmental / surrounding factors	1.93	42	1.92	64	1.62	63
8 No continuity	1.71	42	1.84	64	1.71	63
9 No demand from poultry chain or consumer	1.62	42	1.70	64	1.65	63
10 Private circumstances	1.60	42	1.67	64	1.63	63

Appendix VII (tables C) gives an insight in the highest scoring barriers overall. Measured over all barriers scores, financial not feasible is scored the highest with an average of 2.90 on a 5 point likert-scale while restrictions due to outbreak of animal diseases has the lowest average score with 1.74.

The 'Anova test' must indicate whether there is variance between or within the barriers and the sustainable innovations. The index variable represents all sustainable innovations. The barriers are the dependent variables and the index variable is the independent variable. Results indicated that barrier *no demand from poultry chain or consumer* was the only barriers which has a 'F-result' which is not significant, meaning that equal variance must be assumed. In appendix VIII (table C), the are presented of this barrier which was not significant meaning that equal variance must be assumed. These results have consequences for the interpretation of the 'independent-sample T-tests'.

4.1.6 Added barriers by the respondents

The respondents could add additional barriers during the online (quantitative) questionnaire. Most common added answer was that results were not satisfying. The aspects: 'finances, problems with the local community and government were often elaborated. The added answer 'results' has been mentioned only a few times which was not enough to be included for further research. Other additional barriers were already accounted for in the given set of 10 barriers (see appendix IV).

4.2 Comparing leaders and followers

As found in the literature, Avermaete et al. (2004) indicated that only 18% of the entrepreneurs where leading in innovating and that 44% of the group were followers. 16% were non-innovators leaving 22% as traditional innovators (Avermaete et al., 2004). In this analysis, the 'following' group is combined with the 'non-innovators' and 'traditional innovators'. Thereby creating two groups: leaders of innovation with 18% versus followers of innovation with 82%. The entrepreneur groups were also analyzed based on a 50% division of both entrepreneur groups. The 50% division creates a bigger group of leading innovators which might give more significant results. sample T-test'. The distinction can be made based on the dates (years) in which the sustainable innovations were realized or are planned. Table 12 will give an overview of the sustainable innovations and the average years in which they were implemented or currently under consideration (expected year of realization). The entrepreneur groups are compared based on these years which serves as line for demarcation between the leading (lower than the indicated year) versus the following (higher than the indicated year) entrepreneur group.

Table 12 Year of implementation or expected realization

Sustainable Innovation	Year	18% versus 82%	50% versus 50%
People			
(1) Sales of own produced products		1981	1998
(2) Change of animal housing system		2000	2008
(4) Air scrubber		2005	2012
Planet			
(5) Wind turbine		1995	2013
(6) Solar panels		2011	2013
(7) Local landscaping		1994	2007
Profit			
(11) Change of light bolts to LED light		2002	2010

Group 1 (μ1) are the leading entrepreneurs and group 2 (μ2) the following entrepreneurs. Both entrepreneur groups will be compared per sustainable innovation with help of the 'independent All analysis who only considered a sustainable innovation were left out. The significance of the test will proof if both entrepreneur groups have different motives, incentives or barriers for a sustainable innovation. This test is repeated for all 8 innovations (sustainable innovation air scrubber, patio system and fermentation system were left out due to that there were not enough data). In appendix IX, tables A till F, are the complete 'independent-sample T-tests' per sustainable innovation attached. Only the results which were significant are addressed and taken into account.

Table 13 discussed the significant results for sustainable innovation: 'sales of own made product'. The results from the 'independent-sample T-tests' (column 2) are positive in 2 cases, but negative for all other cases. This has no effect on the results and conclusions. Looking at the motives compared on the 18% versus 82% division for this sustainable innovation (column 1), motives '*financial favorable'* and '*favor surrounding aspects like nature & environment'* have a significance level < α 0.05 (column 3) meaning that both motives are differently scored between both entrepreneurs groups. Group 1 scored '*financial favorable'* as more important in their motives for implementing 'sales of own made products' as a sustainable innovation compared to the followers. Motive '*favor surrounding aspects like nature & environment'* is scores lower by group 1 concluding that both entrepreneurs groups also differ significantly based on this motive for implementing the 'sales of own made products' as sustainable innovation.

Table 13 Independent sample T-test Innovation (1) 'Sales of own made products'

Group comparison based 18% and 50% difference.	t	Sign. (2-tailed)
Motives 18%		
Financial favorable	4.583	0.001
Favor surrounding aspect like nature & environment	-2.449	0.037
Incentives 18%		
Extreme weather conditions	-6.000	0.000
Due to an accident on the work floor	-2.582	0.027
Due to private circumstanced	-6.000	0.000
Due to local pressure from the community	-6.000	0.000
Due to outbreak of animal diseases	-6.000	0.000
Barriers 18%		
Legislative restrictions	-5.071	0.001
Financial not feasible	-10.854	0.000
Restrictions due to outbreak of animal diseases	-17.676	0.000
Project scope, feasibility and support	-10.854	0.000
Technological not feasible	-15.922	0.000
Lack of equipment and or facilities	-15.000	0.000
No continuity	-11.129	0.000
No demand from poultry chain or consumer	-3.428	0.006
Motives 50%		
Favor surrounding aspect like nature & environment	-2.828	0.030
Incentives 50%		
On advice from family or friends	2.416	0.036

Also in Table 13 (column 1), the 50% division of both entrepreneurs groups is presented which has only 1 motive, 1 incentives and no barriers. This means that if the entrepreneur groups are split / divided by half, the amount of significant results change drastically from 15 variables to 2 variables

(motives, incentives and barriers). Meaning that the leaders who implemented 'sales of own made products' as one of the first entrepreneurs, had different motives, incentives and barriers than those who followed. But if both entrepreneur groups are divided by half (50% division), the number of different motives, incentives and barriers which are significant seem to become less.

Looking at the incentives based an 18% division (column 1) in table 13, incentives: "*extreme weather conditions, due to an accident on the work floor, due to private circumstances, due to local pressure from the community, due to outbreak of animal diseases"*, all have a p-value which is < α 0.05. Group 1 scored these incentives lower than group 2 (all 't-values' for these incentives are negative). This indicates that with concerns to sustainable innovation 'sales of own made products', that leaders of sustainable innovation differ from the following entrepreneurs on these incentives. The 50% division has only one incentive which is not only different from the incentives mentioned in the 18% versus 82% entrepreneur group division, but also equal variance must be assumed for this incentive. Again this results confirms that with the 50% versus 50% division of both entrepreneur groups, the number of different motives, incentives and barriers which are significant seem to become less. Meaning that the real group of leading entrepreneurs is smaller in the case of sustainable innovation 'sales of own made products'.

From the 10 barriers mentioned in the qualitative questionnaire (appendix IV), 8 barriers in table 13 show a significance level < α 0.05. Meaning that followers of sustainable innovations score almost all these barriers different than the leaders of sustainable innovation. All the 't-values' are negative meaning that these barriers were less experienced during consideration or implementation by group 1 with concerns to 'sales of own made products'. It can be concluded that the following entrepreneur group experience more barriers than the leading entrepreneur group. Appendix VIII (table C) showed that equal variance may be assumed for barrier *no demand from poultry chain or consumer*. Therefore equal variance must be assumed with this barrier.

Table 14 presents the results of sustainable innovation 'housing system' in which the leaders and followers of sustainable innovation are also compared with an 18% versus 82% and 50% versus 50% division. Looking in column 1 of table 14, there are no motives or incentives with any significant results if group 1 and 2 are compared based on an 18% versus 82% division. Only 1 barriers (*project scope, feasibility and support*) has a p-value which is < α 0.05 and therefore proofs that group 1 scores this barrier lower than group 2 ('t-values' are negative). However for this sustainable innovation, the most significant results are found in the incentives based on the 50% versus 50% division. Incentives: "*due to legislative changes, due to demand from the poultry chain / consumer, on advice from company advisor (bank, feed etc.), because of favorable accounting gains, on advice from ZLTO / LTO Noord / LLTB, by attending an open day / field trip , reading media: industry journals, newspapers* and *on advice from a study association, research",* have all a p-value which is < α 0.05. Therefore the results are significant. In these cases, group 1 scored all these incentives lower (less important) than group 2 ('t-values' are negative). Concluding that 8 out of 16 incentives are different for the leading entrepreneur group compared with the following entrepreneur groups based on a 50% versus 50% division.

Table 14 Independent sample T-test Innovation (2) 'Housing'

Group comparison based 18% and 50% difference.	t	Sign. (2-tailed)
Barriers 18%		
Project scope, feasibility and support	-2.308	0.037
Motives 50%		
To meet legislation	-2.030	0.049
Incentives 50%		
Due to legislative changes	-2.131	0.040
Due to demand from the poultry - chain / consumer	-2.171	0.035
On advice from company advisor	-2.510	0.016
Because of favorable accounting gains	-2.926	0.005
On advice from ZLTO/LTO Noord/LLTB	-2.191	0.034
By attending an open day / field trip	-3.439	0.001
Reading media: journals, newspapers	-2.818	0.007
On advice from a study association	-2.128	0.040

Table 15 gives the results of sustainable innovation 'chicken catch machine'. Only motives '*favor surrounding aspect like nature & environment'* and *'sustainability: people planet profit* have a p-value which are < α 0.05. Both motives are scored as more important by group 1 than group 2. This result proves that group 1 has significant differences between group 1 and group 2 for sustainable innovation 'chicken catch machine' based on a 50% versus 50% division. Table 15 also gives the results of sustainable innovation 'solar panels' in which, based on an 18% versus 82% division, barriers '*legislative restrictions'* and '*financial not feasible'* are significant with positive 't-values'. This means that group 1 scores these barriers higher than group 2 and experienced these barriers more during consideration or implementation of 'solar panels'. Compared on a 50% versus 50% division, only barrier '*financial not feasible'* is still significant meaning that this barriers is experienced by a large group of entrepreneurs (group 1) when implementing a 'solar panel' as a sustainable innovation.

Table 15 Independent sample T-tests innovations (3 & 6) 'Chicken catch machine & Solar panels'

Chicken catch machine			***Solar panels***		
Group comparison based 18% and 50% difference.	**t**	**Sign. (2-tailed)**	**Group comparison based 18% and 50% difference.**	T	**Sign. (2-tailed)**
Motives 50%			**Barriers 18%**		
Favor surrounding aspect like - nature & environment	5.196	0.035	Legislative restrictions	2.257	0.051
Sustainability: people planet profit	2.828	0.047	Financial not feasible	2.636	0.046
			Barriers 50%		
			Financial not feasible	3.619	0.001

Table 16 gives the results of sustainable innovation 'landscaping'. Compared with an 18% versus 82% division, incentive '*due to local pressure from the community*' and barrier '*financial not feasible'*, have results which indicate that group 1 scores these two cases differently than group 2. Compared on a 50% versus 50% division, only incentive '*due to local pressure from the community'* is still significant meaning that this incentive is experienced by a large group of entrepreneurs (group 1). Looking at the sustainable innovation, one might think this is logical because 'landscaping' is a sustainable innovation for the local community. Therefore, with these results, it can be concluded that the local community is a positive incentive for entrepreneurs in order to implement this sustainable innovation. Also in table 16 are the results for sustainable innovation 'heat exchanger'.

Looking at the motives, incentives and barriers with the 18% versus 82% division, motive *to 'meet legislation*', incentives '*due to demand from the poultry chain / consumer', 'because of favorable accounting gains'*, and barrier '*private circumstances'* have all a p-value which is < α 0.05. Group 1 scored these motives, incentives and barriers concerning the consideration or implementing of a 'heat exchanger' differently from group 2. With the 50% versus 50% division, there were no motives, incentives or barriers which showed any significant results.

Table 16 Independent sample T-tests innovations (7 & 10) 'Landscaping & Heat exchanger'

Landscaping			***Heat exchanger***		
Group comparison based 18% and 50% difference.	**t**	**Sign. (2-tailed)**	**Group comparison based 18% and 50% difference.**	**T**	**Sign. (2-tailed)**
Incentives 18%			**Motives 18%**		
Due to local pressure from			To meet legislation	3.078	0.004
- the community	2.945	0.016	**Incentives 18%**		
Barriers 18%			Due to demand from the poultry		
Financial not feasible	2.649	0.040	- chain / consumer	-2.629	0.012
Incentives 50%			Because of favorable accounting		
Due to local pressure from			- gains	3.445	0.004
- the community	3.099	0.004	**Barriers 18%**		
			Private circumstances	-5.627	0.000

In appendix IX, tables A till F give the complete overview for sustainable innovations: "sales of own made products, housing system, chicken catch machine, solar panels, landscaping and heat exchanger". In total this add up to 6 sustainable innovation. There were no significant results for the sustainable innovations 'wind turbine and light systems' (2 sustainable innovations were left out as explained in introduction of chapter 4). This indicates that that is no difference between leaders and followers of sustainable innovation concerning these 'wind turbine' and 'light systems'.

4.3 Checking for correlations

Appendix X contains the complete correlation tests between the motives, incentives, barriers and the sustainable innovations . A variable is constructed which contains the answers of the implementation date and currently under consideration per sustainable innovation. Meaning that with help of the correlation analysis, it is possible to indicate whether a motive, incentive or barrier is related to a specific year (in which the sustainable innovation was implemented or under consideration). The correlation analysis is used to see if there is a positive (+) or negative (-) relation. When the relation is 0, it means that there is no relation. From 0 - 0.2 is a barely a relation, from 0.2 - 0.4 a weak relation, from 0.4 - 0.6 a reasonable relation exists, from 0.6 – 0.8 a strong relation exits and above 0.8 is very strong (positive or negative) relation (Ott & Longnecker, 2010).

Results indicate that when a motive, incentive or barrier is positively correlated to the adoption time, that specific motive, incentive or barrier is more important for the group 2 (the following entrepreneurs). If the correlation is negative, the results indicate that the specific motive, incentive or barrier is more important for the group 1 (the leading entrepreneurs).

Only sustainable innovations: 'sales of own made products, air scrubber, solar panels, landscaping and light systems' showed significant results regarding the motives and are therefore discussed. The full correlation tables are presented in appendix X (table A). Sustainable innovations: "change of animal housing system, air scrubber, solar panels and landscaping", have shown significant results concerning the incentives and are therefore presented fully in appendix X (table B). With regards to

the barriers, only sustainable innovations: “air scrubber and wind turbine”, showed significant results. The results are discussed and presented in appendix X (table C). The other sustainable innovations had no significant results and are therefore not further elaborated. The correlation test is performed only on those sustainable innovations which were implemented or currently under consideration.

4.5.1 Motives

Table 17 gives an overview of sustainable innovations: ‘sales of own made products’, ‘air scrubber’ and ‘solar panels’. Motives: “*working conditions*(2), *improvement of quality*(5), *to meet legislation*(6), *ensure continuity*(7), *realizing scale enlargement*(9), *in order to sell or reuse own products*(10)”, have shown no significant results in relation to these sustainable innovations and are therefore not mentioned in table 17 or table A from appendix X. Table 17 has 5 columns. Column 1 are the motives, column 2 indicated whether a motive is intrinsic (Intr.) or extrinsic (Extr.), column 3 till 5 are the sustainable innovations. Columns 3, 4 and 5 have each 3 sub-columns. Sub 1 is the Pearson outcome, sub 2 is the p-value and sub 3 is the numbers of respondents.

With regard to sustainable innovation ‘sales of own made products’(column 3), only motive ‘*financial favorable’* has a p-value (column 3, sub 2) < α 0.05 and is therefore significant. The ‘Pearson’ outcome (column 3, sub 1) 0.476 is positive but the relation, the correlation between motive *‘financial favorable’* and the adoption time of sustainable innovation ‘sales of own made products’, is weak. This result means that ‘*financial favorable’* was more important for the entrepreneurs in group 2. Column 2 indicated whether a motive is intrinsic of extrinsic. Motive ‘*financial favorable’* is been distinct as extrinsic (appendix V). From the 8 motives who have shown significant correlation results with regards to 1 of 5 sustainable innovations (appendix X table A), 6 are extrinsic. This indicates that mainly extrinsic motives show a correlation with the date of implementation or (currently under) consideration with regards to a sustainable innovation. Total number of respondents who implemented or currently consider the sustainable innovation ‘sales of own made products’ is 37. Column 5 in table 17 presents the numbers of respondents (22) who analyzed this sustainable innovation in the qualitative questionnaire.

For sustainable innovations ‘air scrubber’, also in table 17 (and table A, appendix X), only motive ‘*personal style of entrepreneurship’* has a p-value (column 4, sub 2) < α 0.05 and is therefore correlated with the adoption time for this sustainable innovation. This motive has been distinct as intrinsic (appendix V). The relation (Pearson value) is strong with a value of 0.756. This strong correlation indicates that the adoption time of an ‘air scrubber’ is strongly related with the personal style of an entrepreneur in group 2. In total 11 respondents implemented or are currently considering this sustainable innovation. Only 8 respondents actually filled in their motives concerning this sustainable innovation. In appendix X (table A) all the results are presented concerning the motives which are significant to this sustainable innovation.

Concerning the consideration or implementation of ‘solar panels’ (also in Table 17) is correlated with 2 motives. The motives ‘*animal welfare’* and ‘*improvement of technical results’* have a p-value which is < α 0.05. Both motives are extrinsic according to the distinction made in appendix V. Both ‘Pearson’ values are between 0.400 and 0.500 and therefore the relation is positive, weak and more of importance for group 2. For motive ‘*animal welfare’* seems no logical explanation why this motive is related to the adoption time of ‘solar panels’. It is possible to expect a type I error for this motive,

meaning that there is no logical explanation to expect a correlation while the results indicate otherwise (Ott & Longnecker, 2010). Motive '*improvement of technical results'* however seems to be very logical. This indicated '*improvement of technical results'* is positively related to the adoption time and more important for group 2 with regards to sustainable innovation 'solar panels'. Both motives are extrinsic (appendix V). In total 52 respondents implemented or are currently considering this sustainable innovation. Only 29 respondents actually filled in their motives concerning this sustainable innovation. In appendix X (table A) all the results are presented concerning the motives which are significant to this sustainable innovation.

Table 17 Correlation test between the innovations 1, 4 & 6 and motives

Innovations		*Own sales(1) N=37*			*Air scrubber(4) N=11*			*Solar panels(6)N=52*		
Motives	**Intr. vs. Extr.**	**Pearson**	**Sign 2tailed**	**N**	**Pearson**	**Sign 2tailed**	**N**	**Pearson**	**Sign 2tailed**	**N**
1 Animal welfare	E	-0.285	0.195	22	0.239	0.568	8	0.465	**0.011**	29
3 Financial favorable	E	0.476	**0.025**	22	-0.247	0.159	8	0.127	0.765	29
4 Improvement of - technical results	E	0.005	0.981	22	0.127	0.765	8	0.493	**0.007**	29
8 Favor surrounding aspect - like nature & environment	E	0.066	0.769	22	0.271	0.516	8	0.193	0.317	29
11 Demand from the poultry - chain and or consumer	I	-0.176	0.434	22	0.623	0.099	8	0.074	0.704	29
12 Personal style - of entrepreneurship	I	-0.173	0.442	22	0.756	**0.034**	8	0.278	0.144	29
13 In favor of the image of - the poultry industry	E	-0.175	0.436	22	0.388	0.343	8	0.255	0.182	29
14 Sustainability: people - planet profit	E	-0.138	0.541	22	0.380	0.353	8	0.237	0.216	29

Table 18 indicates that sustainable innovation 'landscaping' has 2 motives which are significantly < α 0.05. Motives '*in favor of the image of the poultry sector'* and '*sustainability: people planet profit'*, which are both extrinsic (appendix V), have negative 'Pearson' values in the range of -0.410 and -0.440. Both motives have a weak relation to the adoption time considering 'landscaping' and are therefore these motives are more important for group 1. However, motive '*favor surrounding aspects like nature & environment'* has a 'Pearson' value of -0.348 with a p-value of 0.051. Strictly taken, this motive is > α 0.05. But the results are so close to the limit of α 0.05, is might become vital when adopting sustainable innovation 'landscaping'. Also when looking at the content of this motives (*favor surrounding aspects like nature & environment*), it seems to have a logical connection with 'landscaping' and might therefore be important. In total 63 respondents implemented or are currently considering this sustainable innovation. Only 32 respondents actually filled in their motives concerning this sustainable innovation. In appendix X (table A) all the results are presented concerning the motives which are significant to this sustainable innovation.

For sustainable innovation 'light systems', only 1 motive has a 'Pearson' value (0.300) which is significant < α 0.05. Motive '*demand from the poultry chain and or consumers'* (which is intrinsic), has a weak positive relation to 'light systems'. This indicates that this motive is correlated to the adoption time with regard to 'light systems' and more important for group 2. Column 4 of Table 18, gives the number of respondents who implemented or are currently considering this sustainable innovation (85). From the total 85, only 51 respondents actually filled in their motives concerning this sustainable innovation.

Table 18 Correlation test between the innovations 7 & 11 and motives

Innovations		*Landscaping(7) N=63*			*Light systems (11) N=85*		
Motives	**Intr. vs. Extr.**	**Pearson**	**Sign 2tailed**	**N**	**Pearson**	**Sign 2tailed**	**N**
1 Animal welfare	E	-0.287	0.111	32	-0.088	0.541	51
3 Financial favorable	E	0.479	0.521	32			
4 Improvement of - technical results	E	0.007	0.969	32	-0.157	0.273	51
8 Favor surrounding aspect - like nature & environment	E	-0.348	0.051	32	0.036	0.804	51
11 Demand from the poultry - chain and or consumer	I	-0.063	0.732	32	0.300	**0.033**	51
12 Personal style - of entrepreneurship	I	-0.294	0.102	32	0.073	0.611	51
13 In favor of the image of - the poultry industry	E	-0.440	**0.012**	32	0.198	1.65	51
14 Sustainability: people - planet profit	E	-0.417	**0.017**	32	0.101	0.482	51

4.3.2 Incentives

The incentives: "*due to an accident on the work floor*(2), *due to private circumstanced*(3), *due to complaints from the local community*(4), *due to outbreak of animal diseases*(5), *due to legislative changes*(7), *due to demand from the poultry chain / consumer*(8), *on advice from a study association, research*(14)", have shown no significant correlation results for any sustainable innovation accounted in this research. These incentives are therefore not taken into the presentation of the results in table 19 and table B in appendix X. Table 19 gives an overview of the incentives for sustainable innovation 'housing'. In total 58 respondents implemented or are currently considering this sustainable innovation. 34 respondents actually filled in their incentives concerning this sustainable innovation. Concerning sustainable innovation 'housing', only incentives '*due to disappointing results'* is significant. The 'Pearson' value (-0.339) is weak and negative. Meaning that incentive '*due to disappointing results'* is related to the adoption time of this sustainable innovation for entrepreneurs of group 1.

Table 19 Correlation test between the innovations 2 & 4 and incentives.

Innovations	*Housing(2) N=58*			*Air scrubber(4) N=11*		
Incentives	**Pearson**	**Sign 2tailed**	**N**	**Pearson**	**Sign 2tailed**	**N**
1 Extreme weather conditions	-0.155	0.328	34	0.562	0.147	8
6 Due to disappointing results	-0.339	**0.019**	34	0.667	0.071	8
9 On advice from company advisor	-0.223	0.204	34	0.736	**0.038**	8
10 Because of favorable accounting gains	-0.068	0.703	34	0.701	**0.053**	8
11 On advice from ZLTO / LTO Noord / LLTB	-0.156	0.378	34	0.715	**0.046**	8
12 By attending an open day / field trip	-0.202	0.252	34	-0.064	0.880	8
13 Reading media: journals, newspapers	-0.191	0.279	34	0.198	0.639	8
15 On advice from other poultry entrepreneurs	-0.069	0.699	34	-0.008	0.986	8
16 On advice from family or friend	0.014	0.939	34	0.562	0.147	8

Also presented in table 19 is sustainable innovations 'air scrubber'. Incentives: "*on advice from company advisor, because of favorable accounting gains* and *on advice from ZLTO / LTO Noord / LLTB",* have both a positive strong relation (Pearson values are between >0.700 and < 0.750) concerning sustainable innovation 'air scrubber'. This means that these 3 incentives have a strong relation with the adoption time of an 'air scrubber' for entrepreneurs in group 2.

In total 11 respondents implemented or are currently considering this sustainable innovation. Only 8 respondents actually filled in their incentives concerning the sustainable innovation 'air scrubber'.

Looking at table 20, sustainable innovation 'solar panels' has 3 incentives with show significant results. Incentives; "*by attending an open day / field trip, reading media: journals, newspapers* and *on advice from other poultry entrepreneurs*", show all a weak positive relation (Pearson values are between >0.410 and < 0.490). This means that with concerns to the adoption time of 'solar panels', entrepreneurs of group 2 found these incentives more important than entrepreneurs of group 1.

With concerns to sustainable innovation 'landscaping', incentive '*reading media: journals, newspapers* has a weak negative relation (Pearson is -0.376). This means that with concerns to the adoption time of 'landscaping', entrepreneur of group 1 found these incentives more important than entrepreneurs of group 2. But incentive '*on advice from family or friends'* has a weak positive relation (Pearson is 0.037). This means that with concerns to the adoption time of 'landscaping', entrepreneurs of group 2 found this incentives more important than entrepreneurs of group 1. In total 63 respondents implemented or are currently considering this sustainable innovation. 32 respondents actually filled in their barriers concerning the sustainable innovation 'landscaping'.

Table 20 Correlation test between the innovations 6 & 7 and incentives.

Innovations / Incentives	*Solar panels(6)N=52*			*Landscaping(7) N=63*		
	Pearson	**Sign 2tailed**	**N**	**Pearson**	**Sign 2tailed**	**N**
1 Extreme weather conditions	-0.30	0.879	29	0.102	0.579	32
6 Due to disappointing results	-0.148	0.445	29	0.334	0.062	32
9 On advice from company advisor	0.305	0.108	29	0.146	0.424	32
10 Because of favorable accounting gains	0.159	0.409	29	-0.035	0.848	32
11 On advice from ZLTO / LTO Noord / LLTB	0.253	0.185	29	-0.184	0.314	32
12 By attending an open day / field trip	0.411	**0.027**	29	0.111	0.546	32
13 Reading media: journals, newspapers	0.481	**0.008**	29	-0.376	**0.034**	32
15 On advice from other poultry entrepreneurs	0.430	**0.020**	29	0.073	0.692	32
16 On advice from family or friend	0.086	0.659	29	0.370	**0.037**	32

4.5.3 Barriers

Table 21 gives the correlation test of sustainable innovations 'air scrubber' and 'wind turbine'. The barriers: "*legislative restrictions*(1), *financial not feasible*(2), *technological not feasible*(5), *lack of equipment and or facilities*(6), *no continuity*(8), *private circumstances*(10)", have shown no significant results and are therefore not taken into the result presented in table 21 and appendix X (table C).

In total 11 respondents implemented or are currently considering an 'air scrubber'. Only 8 respondents filled in the barriers concerning this sustainable innovation. Barrier '*restrictions due to outbreak of animal diseases'*, has a very strong positive relation (Pearson value is 0.859). This means that with concerns to the adoption time of an 'air scrubber', entrepreneurs of group 2 found this incentives very important compared to entrepreneurs of group 1. With concerns to barriers '*project scope, feasibility and support'* and '*no demand from poultry chain or consumer'*, both have a positive strong relation with the adoption time with regard to an 'air scrubber'. Meaning that both incentives are more important for the following entrepreneurs (group 2).

Table 21 Correlation test between the innovations 4 & 5 and barriers.

Innovations	*Air scrubber(4) N=11*			*Wind turbine(5)N=7*		
Barriers	**Pearson**	**Sign 2tailed**	**N**	**Pearson**	**Sign 2tailed**	**N**
3 Restrictions due to outbreak of						
- animal diseases	0.859	**0.006**	8	-	**0.000**	4
4 Project scope, feasibility						
- and support	0.771	**0.025**	8	0.057	0.943	4
7 Mitigating environmental /						
- surrounding factors	0.324	0.434	8	-	**0.000**	4
9 No demand from poultry						
- chain or consumer	0.708	**0.049**	8	-	**0.000**	4

Sustainable innovation 'wind turbine' seem not to be correct. The Pearson values are missing, but the p-values for barriers '*restrictions due to outbreak of animal diseases*', '*mitigating environmental / surrounding factors*' and '*no demand from poultry chain or consumer*' are significant (< α0.05). But there is no information about the correlation. Therefore we must assume that the amount of data concerning this sustainable innovations was not sufficient.

Sustainable innovation 'air scrubber' has the most related variables. In total, 1 motive, 3 incentives and 3 barriers (6 in total) whereas 'solar panels' and 'landscaping' have each in total 5 variables (motives, incentives and or barriers) which have a relation to that sustainable innovation. This means that 'air scrubber' is the most influenced by the motives, incentives and or barriers of an entrepreneur with concerns to the adoption time of an 'air scrubber'.

5. Conclusion

This chapter will answer the research questions as set in chapter 1. By looking back at the results, the answers will be elaborated.

5.1 The sustainable innovations

As presented in table 2, sustainable innovation 'solar panels' has been most often considered. Sustainable innovation 'change of light bolts to LED light' has been most often implemented (realized) and sustainable innovation 'solar panels' is currently most under consideration. Overall 'solar panels' is most often chosen. Looking at category people, 'change of housing system' (which is a process innovation) has been most often chosen. With concerns to category planet, 'solar panels' (which is a product innovation) has been most often chosen. With regards to category profit, 'change of light bolts to LED light' (which is a process innovation) has been most often chosen. The sustainable innovations categorized as people have on average '*financial favorable'* as highest scoring (extrinsic) motive. The sustainable innovations categorized as planet have on average '*in favor of the image of the poultry industry*' as highest scoring (extrinsic) motive. The sustainable innovations categorized as profit have on average '*improvement of technical results*' as highest scoring (extrinsic) motive.

5.2 The motives

In order to answer sub research question 1: '*Which motives do leading entrepreneurs have for a sustainable innovations?*', we look at the high scoring extrinsic and intrinsic motives per sustainable innovation. For sustainable innovations: "sales of own products, change of animal housing system, wind turbine, solar panels", '*financial favorable*' is scored on average as highest scoring extrinsic motive. Sustainable innovation 'chicken catch machine', has on average '*improvement of quality*' as highest scoring extrinsic motive while: "heat exchanger and light systems", have on average '*improvement of technical results*' as highest scoring extrinsic motive. 'Air scrubber' has on average '*to meet legislation*' as highest scoring extrinsic motive while 'landscaping' scores on average '*in favor of the image of the poultry industry'* as highest extrinsic motive. For the intrinsic motives, sustainable innovations: "wind turbine, solar panels and landscaping", scored on average '*personal style of entrepreneurship*' as highest motive. But for the sustainable innovations: "sales of own products, change of animal housing system, chicken catch machine, air scrubber, wind turbine, heat exchanger and light systems", '*ensure continuity*' scored as highest intrinsic motive.

Results indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 18% versus 82% division, only motives: "*financial favorable , favor surrounding aspect like nature & environment* and *to meet legislation*", have shown significant differences between group 1 and group 2. In total 3 extrinsic motives measured over 8 sustainable innovations from a set of 14 motives given in the quantitative questionnaire.

Extrinsic motives: "*animal welfare, financial favorable, improvement of technical results, favor surrounding aspect like nature & environment, sustainability: people planet profit* ", have shown a correlation with the adoption time of the following sustainable innovations: "sales of own made products, solar panels and landscaping". Intrinsic motives: "demand from the poultry chain and or consumer, personal style of entrepreneurship", have shown a correlation with the adoption time of the following sustainable innovations: "air scrubber, light systems". The correlated adoption time of

a specific sustainable innovation indicated whether a motive is been found more important by the entrepreneurs before this time of adoption or afterwards. From all correlation, 5 out of 7 Pearson values were positive indicated that the motives are often found more important after point of adoption, meaning more important for group 2 (the following entrepreneurs) than group 1 (the leading entrepreneurs). From the 7 correlating motives, 5 were extrinsic concluding that the extrinsic motives have more correlations with the adoption time of a sustainable innovation.

In order to answer sub research question 2: '*Which motives do following entrepreneurs have for a sustainable innovations?* ', we look at the results from the comparison between the leading entrepreneur group (1) and the following entrepreneur group (2) based on a 50% versus 50% division. Only the motives; "*favor surrounding aspect like nature & environment, to meet legislation* and *sustainability: people planet profit*", have shown significant results. In total 3 extrinsic motives measured over 8 sustainable innovations from a set of 14 motives given in the quantitative questionnaire.

If all motives which showed a significant result based on the 18% versus 82% division and the 50% versus 50% division are combined, only 6 motives have a significant result indicating a differences between both entrepreneur groups. From these 6 motives, only 4 (*financial favorable, favor surrounding aspect like nature & environment, to meet legislation* and *sustainability: people planet profit)* differ from each other (from a set of 14 motives given in the quantitative questionnaire). We can conclude that there are almost no significant differences between both the leading and following entrepreneur group based on their motives for sustainable innovation with exception of the 4 extrinsic motives mentioned.

5.3 The incentives

In order to answer sub research question 3: *Which incentives stimulate the motives of an entrepreneur for sustainable innovations?*', we look at the barriers which scored on average the highest per sustainable innovation. For the sustainable innovations: "change of animal housing system, air scrubber, landscaping, heat exchanger", incentive *'due to legislative changes'* has been scored on average the highest. For 'chicken catch machine' and 'change of light bolts to LED light', on average *'reading media: industry journals, newspapers'* is scored as highest incentive. For the sustainable innovation 'wind turbine' and 'solar panels', is on average *'because of favorable accounting gains'* scored as highest incentive. And for the 'sales of own products', incentive *'due to demand from the poultry chain / consumer'* is scored on average the highest. All these incentives are highly scored by the respondents and therefore can be concluded to have influence on the motives of an entrepreneur for the consideration and realization of a sustainable innovation.

Results indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 18% versus 82% division, incentives: "e*xtreme weather conditions, due to an accident on the work floor, due to private circumstanced, due to local pressure from the community, due to outbreak of animal diseases, due to demand from the poultry chain / consumer, because of favorable accounting gains*", have shown in total 8 times a significant differences between group 1 and group 2. These 7 different incentives presented are (measured over 8 sustainable innovations) part from a set of 16 incentives given in the quantitative questionnaire. Almost half of the given incentives indicate a significant difference between group 1 and 2.

Results indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 50% versus 50% division, incentives: "*on advice from family or friends, due to legislative changes, due to demand from the poultry chain/consumer, on advice from company advisor, because of favorable accounting gains, on advice from ZLTO/LTO Noord/LLTB, by attending an open day/field trip, reading media: journals, newspapers, on advice from a study association*", have shown in total 10 times a significant differences between group 1 and group 2. These 9 different incentives presented are (measured over 8 sustainable innovations) part from a set of 16 incentives given in the quantitative questionnaire. More than half the given incentives indicate a significant difference between group 1 and 2.

Incentives: "*extreme weather conditions, due to disappointing results, on advice from company advisor, because of favorable accounting gains, on advice from ZLTO/LTO Noord /LLTB, by attending an open day/field trip, reading media: journals, newspapers, on advice from other poultry entrepreneurs, on advice from family or friend*", have shown a correlation with the adoption time of the following sustainable innovations: "housing, air scrubber, solar panels and landscaping". The correlated adoption time of a specific sustainable innovation indicated whether an incentive is been found more important before this time of adoption or afterwards. From all correlation, 7 out of 9 Pearson values were positive indicated that the incentives are often found more important by the entrepreneurs after point of adoption, meaning more important for group 2 (the following entrepreneurs) than group 1 (the leading entrepreneurs).

5.4 The barriers

In order to answer sub research question 4: *Which barriers have a possible effect on the realization of a sustainable innovation?*', we look at the barriers which scored on average the highest per sustainable innovation. For the sustainable innovations: "sales of own products, change of animal housing system, wind turbine, landscaping", barrier '*legislative restrictions'* is scored on average the highest. For sustainable innovations: "air scrubber, solar panels, heat exchanger, change of light bolts to LED light", barrier *'financial not feasible'* is scored on average the highest. 'Chicken catch machine' has on average *'project scope, feasibility and support'* as highest scoring barrier. All these barriers are highly scored by the respondents and therefore can be concluded to have influence on the realization of a sustainable innovation.

Results indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 18% versus 82% division, barriers: "*legislative restrictions, financial not feasible, restrictions due to outbreak of animal diseases, project scope feasibility and support, technological not feasible, lack of equipment and or facilities, no continuity, no demand from poultry chain or consumer, private circumstances*", have shown in total 13 times a significant differences between group 1 and group 2. These 9 different barriers presented are (measured over 8 sustainable innovations) part from a set of 10 barriers given in the quantitative questionnaire. Almost all the given barriers indicate a significant difference between group 1 and 2.

Results indicated than when the leading entrepreneur group (1) is compared with the following entrepreneur group (2) based on an 50% versus 50% division, barrier: "*financial not feasible*" has shown only once a significant results indicating a difference between group 1 and group 2. This indicates that when the division is made bigger (50% instead of 18%), the differences between both entrepreneur groups seem to disappear.

Barriers: "*restrictions due to outbreak of animal diseases, project scope feasibility and support, mitigating environmental/ surrounding factors, no demand from poultry chain or consumer*", have shown a correlation with the adoption time of sustainable innovations: 'air scrubber'. The correlated adoption time of a specific sustainable innovation indicated whether an barrier is been more experienced before this time of adoption or afterwards. The Pearson values from the 3 out of 4 barriers with a correlation were positive and strong. Indicated that the barriers are experienced by the group entrepreneur after the average point of adoption, meaning more experienced by group 2 (the following entrepreneurs) than group 1 (the leading entrepreneurs)

5.5 Answer to the main research question

With the conclusion mentioned, we can answer the main research question: ***Which incentives have an effect on the motives of Dutch poultry farmers to invest in sustainable innovations and is there a difference between leading and following entrepreneurs?*** There are differences between leading and following entrepreneur groups when we look at the motives, incentives and barriers for sustainable innovation. But as mentioned, the number of significantly different motives between both entrepreneur groups is rather small. For the main research question we are more concerned about the incentives. From sub research question 3, we found that incentives: "*extreme weather conditions, due to an accident on the work floor, due to private circumstanced, due to local pressure from the community, due to outbreak of animal diseases, due to demand from the poultry chain / consumer, because of favorable accounting gains*", differ between leaders and the followers of sustainable innovations based on a 18% versus 82 division. In total 7 different incentives.

Similar differences can be found based on a 50% versus 50% division but in this case, 9 different incentives (*on advice from family or friends, due to legislative changes, due to demand from the poultry chain/consumer, on advice from company advisor, because of favorable accounting gains, on advice from ZLTO/LTO Noord/LLTB, by attending an open day/field trip, reading media: journals, newspapers, on advice from a study association*) proof that there is an significant difference between both entrepreneur groups.

6. Discussion

This chapter will finalize this research by looking at the limitations, the managerial implication for ZLTO, the scientific contribution and recommendations for further research.

6.1 Limitations

Looking at the results of the 'independent sample T-tests' in which the motives, incentives and barriers were compared based on a leading entrepreneur group and a following entrepreneur group, one might discuss the differences of the motives between leading and following entrepreneurs. Seeing that in this research, 8 from the 11 sustainable innovations have been analyzed based on a set of 14 motives. This resulted in 112 (8 times 14) scores motives and only 6 motives were significantly different (3 with 18% versus 82% division and 3 with 50% division).

In the quantitative questionnaire, respondents had to choose 3 sustainable innovations which they would answer further (score the motives, incentives and barriers). During this research, there has been no check whether the respondents have analyzed more implemented than considered sustainable innovations. This might give more insight in the barriers in case that the considered sustainable innovations are compared with the barriers of the implemented and currently under consideration.

In one case, a motive had significant results but a type 1 error is assumed because there was no logical relation between the motive (animal welfare) and the sustainable innovation (solar panels). This type of error has not been assumed with other cases because the results seemed logical. It could have been that due to the line of questioning in the quantitative questionnaire, respondents might have misinterpreted the given motives, incentives and barriers.

6.2 Managerial implication

The means of the motives, incentives and barriers per sustainable innovations as presented in tables 3 till 12 indicating which motives, incentives and barriers are valued (scored by entrepreneurs) as most important for that particular sustainable innovations. Therefore ZLTO needs to focus on these high scoring means. It is concluded that there are almost no differences in the motives between leading and following entrepreneurs. But there are differences in the incentives and barriers.

Looking at table 2, we see which sustainable innovations are currently most under consideration. These are: "solar panels (28 times), change of light systems (13 times), local landscaping (11 times) and heat exchanger (10 times)". By focusing on the high scoring means as presented in tables 3 till 12 for these sustainable innovations, the entrepreneurs can be influences. The results from the 'T-test' have indicated several differences for these sustainable innovations which indicated that certain motives, incentives and barriers might be different between leading and following entrepreneurs. ZLTO can emphasize more on the motives of these sustainable innovation in their communication towards their members and give information with help of the incentives related to the high scoring barriers. This can trigger a response from the members to seek more information and support from ZLTO.

6.3 Scientific contribution

With this research, a contribution is made to science due to the possibility of comparing different entrepreneur groups on their motives, incentives and barriers. Instead of the division Avermaete et al. (2004) and Rogers (1995) made by percentages, the entrepreneurs can be recognized based on different scores for motives, incentives and barriers for a sustainable innovation. Also in this research, the division of both entrepreneur groups (leaders and followers) has analyzed based on the adoption date and expected realization date of a sustainable innovation. Results indicated that with regards to different sustainable innovations, motives: "*financial favorable, to meet legislation* and *favor surrounding aspect like nature & environment"*, are scored as less or more important by leading entrepreneurs compared to following entrepreneurs. With regards to the incentives: "*extreme weather conditions, due to an accident on the work floor, due to private circumstances, due to local pressure from the community, due to outbreak of animal diseases"*, are scored differently by leading entrepreneurs compared to following entrepreneurs.

6.4 Suggestions for further research

In order to get a better overview of the motives, incentives and barriers of entrepreneurs for sustainable innovation, more research is needed in all sectors of the Dutch agricultural industry. The poultry sector has given a lot of information about the entrepreneurs, but other sector will have different sustainable innovation for which other motives, incentives and barriers might play a role in the decision making process. By doing more research in the other sectors of the agriculture industry, an overall study can afterwards give better insight in the most common motives, incentives and barriers for an entrepreneur. A last suggestion is the division of the entrepreneur groups. In this research only 2 entrepreneur groups were divided were literature has given 4 (Avermaete et al., 2004) or even 5 (Rogers, 1995) groups. In further research, the result from this research can also be based on more entrepreneur groups.

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Appendixes

I. Qualitative questionnaire (stage1)

Vragenlijst kwalitatief onderzoek

1. Welke innovaties heeft u in de afgelopen 5 jaar overwogen op uw pluimveebedrijf?
    a. Welke nog meer?
2. Welke innovaties heeft u daadwerkelijk toegepast op uw pluimveebedrijf?
    a. Welke nog meer?
3. In welk jaar heeft u deze innovaties toegepast op uw pluimveebedrijf?

Over de eerste Innovatie

1. Waarom heeft u deze innovatie overwogen
    a. Waren er nog andere redenen om deze innovatie te overwegen
2. Wat was de aanleiding om over deze innovatie na te denken
3. Waren er problemen die het toepassen van deze innovatie belemmerden (of waarom heeft u deze innovatie uiteindelijk niet toegepast/)
    a. Waren er nog andere problemen (redenen om deze innovatie niet toe te passen?)
4. Hoe heeft u uiteindelijk deze problemen opgelost?

Over de tweede Innovatie

1. Waarom heeft u deze innovatie overwogen
    a. Waren er nog andere redenen om deze innovatie te overwegen
2. Wat was de aanleiding om over deze innovatie na te denken
3. Waren er problemen die het toepassen van deze innovatie belemmerden (of waarom heeft u deze innovatie uiteindelijk niet toegepast/)
    a. Waren er nog andere problemen (redenen om deze innovatie niet toe te passen?)
4. Hoe heeft u uiteindelijk deze problemen opgelost?

Etc.

II. Part of the results; qualitative questionnaire results.

Sustainable Innovation	Datum	Motive 1	Motive 2	Incentive 1	Incentive 2	Barrier 1	Barrier 2
locatie uitbreiding met nieuwe stal	2007	kwantiteit verhogen	financieel haalbaar	continuiteit	zelf nog 10-15 jaar	geen	
staluitbreiding	2010	ruimte voor dieren vergroten		wetgeving. Dieren per m²			
locatie uitbreiding met nieuwe stal	2013	thuis locatie 'op slot'	opschaling	andere locatie bedrijf te koop	kwantiteit verhogen, kostprijs lager	gemeentelijke bepaling	
vleeskuikens omgezet in Volwaard	2007	consument gericht. Niche markt	schaalvergroting geen oplossing voor de sector	zlto oproep voor tussen segment gangbaar en biologische vleesk.		meer werk. Minder kippen, meer ruimte, langer op stal	risico dat na 1jaar project stopte
stal systeem	2012	spring gedrag bevorderen		dierenwelzijn		geen	
nieuwe legnesten	2007	percentage grondeieren verminderen	Kwaliteits-verbetering	teveel grond eieren	teveel vieze eieren	geen	
inpak machine vernieuwd	2008	afgeschreven en veroudert	betere techniek op de markt	afgeschreven	meer capaciteit	geen	
centrale verwarming	2011	Arbeidsomstandig-heden verbeteren	bewaarplaats verwarmen	Koud op de werkvloer		geen	
stal met extra licht inval en asfalt rondom	2005	Arbeidsomstandig-heden verbeteren.	kosten besparen	fijner, gezonder werken. Meer rust.	groot verbruiker	geen	

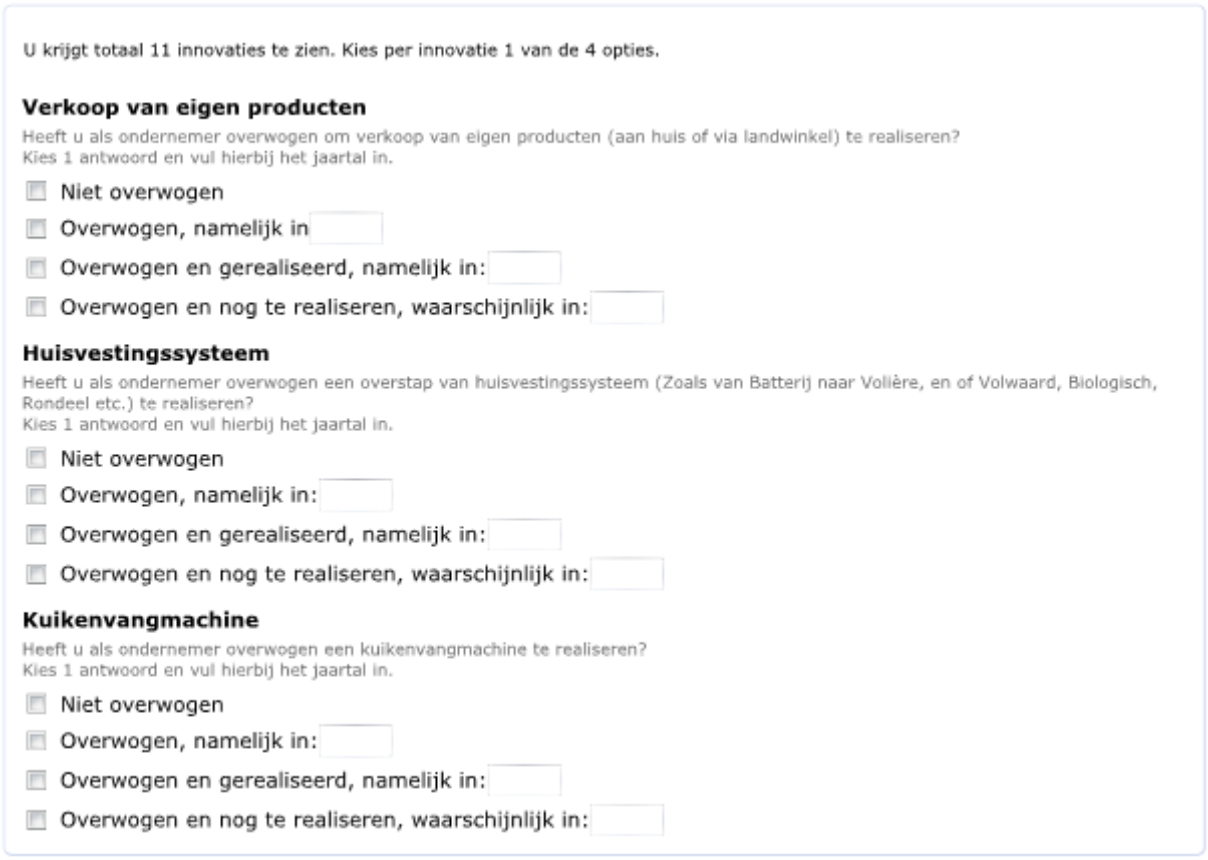
led verlichting	2010	energie besparen		kosten reduceren		geen	
windturbine	Niet	eigen energie voorziening	duurzaam ondernemen	veel wind in de polder (woonplaats)	idealistisch	gemeente / provincie.	landelijke inrichting
zonne-energie	2012	energie besparen	continuïteit	groot dak oppervlakte	subsidie	geen	
warmte wisselaars in stallen	2007	kosten besparing		hoge energie rekening		meer stroom kosten	
Eigen voer (mais) mengen en vergisten	Niet	kosten drukken (transport en droging)	duurzamer zijn	hoge voerprijzen	continuïteit, bestaansrecht	financieel	materiaal
windscherm	2011	klimaat beheersing		windkracht in de omgeving		geen	
rechtsvorm Eenmanszaak BV rechtsvorm Beheer: BV pluimvee, BV techniek	2007 2010	risico en verantwoordelijkheid aanpassing		groei omvang bedrijf		geen	
zichtstal	2012	imago sector	inzichtelijker			geen	
hanenvlees	Niet	goed stuk vlees	is nu afval	Diervriendelijkheid		smaak	bereiding
wildplantage	2012	ganzen buiten bedrijf/grond houden	overdracht infecties	vogelpest	2sterren creëren	geen	
mestopslag (loods/schuur) en uitwisseling	2010	droge mest opslaan	mest afzet verbeteren	opslag te kort	afzet bij externen en op eigen bio grond	akkerbouw grond is nog gangbaar	

III. Selection of sustainable innovations for the quantitative questionnaire.

The definition of sustainable innovation for this research is; 'the development or implementation of a new product, process or managerial improvement, which meets the needs of the present without compromising (unbalance the triple bottom line [people, planet and profit]) the ability of future generations to meet their own needs'. ***New for the firm or sector.***	**Mark Y (yes) or N (no)**	**Mark Y (yes) or N (no)**	**Mark Y (yes) or N (no)**
~~Nieuwbouw stal (minimaal 500m²)~~	N	Y	?
~~Aan- of verbouw bestaande stal~~	N	N	?
~~Aankoop pluimvee bedrijf (stallen) op externe locatie van het thuis bedrijf. (minimaal 500m²)~~	N	Y	N
Overstap van huisvesting systeem. Vb: Batterij naar Volière, Volwaard, Biologische etc	N	Y	Y
~~Systeem aanpassingen in stal. Vb: verlaging afstand hok en grond (sprongafstand)~~	N	N	?
~~Nieuwe legnesten /hokken~~	N	N	?
~~Nieuwe eier inpakmachine~~	N	N	N
~~Vloer- en of centrale verwarming in stal of werkplaats~~	N	Y	?
~~Daglicht in stal creëren,~~	N	N	N
Verlichting: Led verlichting, TL high frequentie etc.	N	Y	Y
Windturbine	Y	Y	Y
Zonnepanelen	Y	Y	Y
Warmtewisselaar	N	Y	Y
Vergisting installatie	Y	Y	?
~~Nieuw voersysteem~~	N	N	N
~~Windscherm~~	N	N	N
Luchtwasser	N	Y	Y
~~Pluimvee ras wisseling~~	N	N	?
~~Rechtsvorm bedrijf. Vb: Maatschap naar VOF, Holding, BV etc..~~	N	Y	N
~~Zichtlocatie (in stal)~~	N	Y	?
Verkoop eigen producten	Y	Y	?
~~Hergebruik afval~~	N	N	Y
~~Mestafzet~~	N	Y	N
~~Extra Arbeidskracht~~	N	N	N
~~Overdekte uitloop~~	N	N	Y
~~Invulling uitloop~~	N	N	?
~~Stapelrobot~~	N	Y	N
~~Containervuller (bij ouderdieren)~~	N	Y	N
Kuikenvangmachines	Y	Y	?
~~Strooiselverwijderingssystemen~~	N	Y	N
~~Strooiseldroogsystemen~~	N	N	Y
~~Mestdroogsystemen~~	N	N	Y
Patiosysteem	Y	Y	Y
~~Entingen (nieuwe entstoffen, andere schema's)~~	N	N	?
Landschappelijke inpassing	Y	Y	N
Results: 11 innovations marked Yes. **20 innovations marked No.** **4 innovation marked incomplete (black)** **Total number of innovations = 35**			

IV. Quantitative questionnaire (stage 2)

This is a small selection of the complete questionnaire.



U krijgt totaal 11 innovaties te zien. Kies per innovatie 1 van de 4 opties.

Verkoop van eigen producten

Heeft u als ondernemer overwogen om verkoop van eigen producten (aan huis of via landwinkel) te realiseren?
Kies 1 antwoord en vul hierbij het jaartal in.

- ☐ Niet overwogen
- ☐ Overwogen, namelijk in
- ☐ Overwogen en gerealiseerd, namelijk in:
- ☐ Overwogen en nog te realiseren, waarschijnlijk in:

Huisvestingssysteem

Heeft u als ondernemer overwogen een overstap van huisvestingssysteem (Zoals van Batterij naar Volière, en of Volwaard, Biologisch, Rondeel etc.) te realiseren?
Kies 1 antwoord en vul hierbij het jaartal in.

- ☐ Niet overwogen
- ☐ Overwogen, namelijk in:
- ☐ Overwogen en gerealiseerd, namelijk in:
- ☐ Overwogen en nog te realiseren, waarschijnlijk in:

Kuikenvangmachine

Heeft u als ondernemer overwogen een kuikenvangmachine te realiseren?
Kies 1 antwoord en vul hierbij het jaartal in.

- ☐ Niet overwogen
- ☐ Overwogen, namelijk in:
- ☐ Overwogen en gerealiseerd, namelijk in:
- ☐ Overwogen en nog te realiseren, waarschijnlijk in:

Luchtwasser

Heeft u als ondernemer overwogen een luchtwasser te realiseren?
Kies 1 antwoord en vul hierbij het jaartal in.

- ☐ Niet overwogen
- ☐ Overwogen, namelijk in:
- ☐ Overwogen en gerealiseerd, namelijk in:
- ☐ Overwogen en nog te realiseren, waarschijnlijk in:

Windturbine

Heeft u als ondernemer overwogen een windturbine te realiseren?
Kies 1 antwoord en vul hierbij het jaartal in.

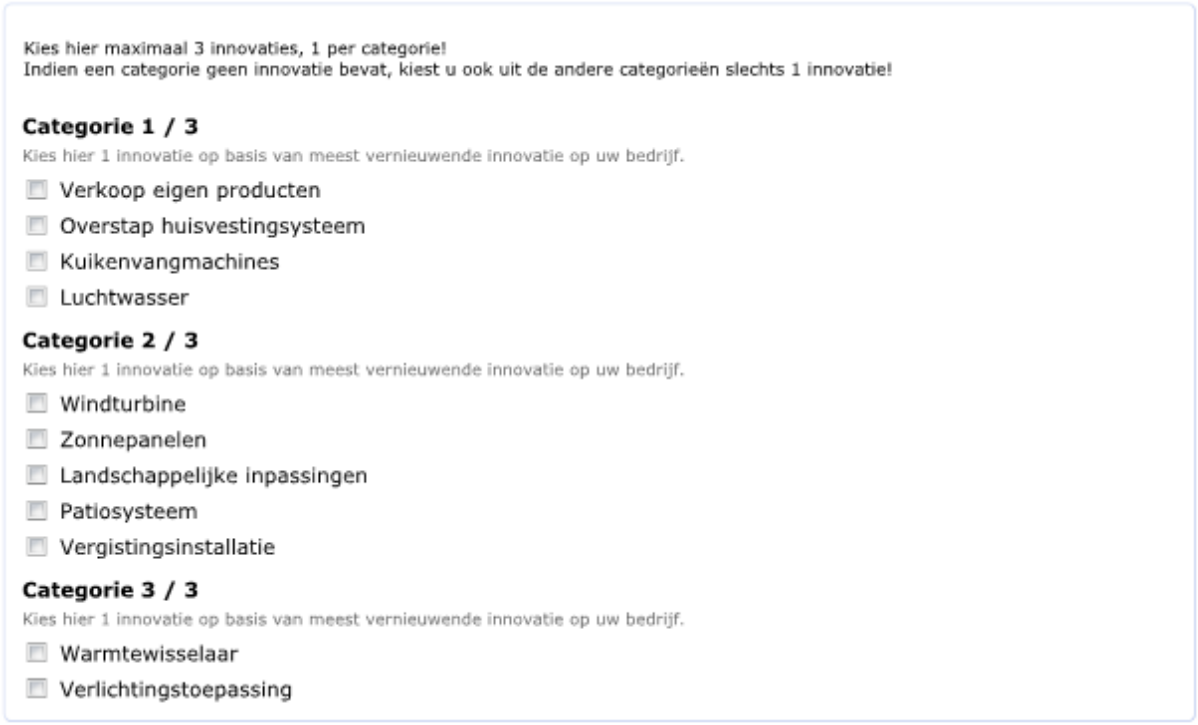
- ☐ Niet overwogen
- ☐ Overwogen, namelijk in:
- ☐ Overwogen en gerealiseerd, namelijk in:
- ☐ Overwogen en nog te realiseren, waarschijnlijk in:

Zonnepanelen

Heeft u als ondernemer overwogen een zonnepaneel te realiseren?
Kies 1 antwoord en vul hierbij het jaartal in.

- ☐ Niet overwogen
- ☐ Overwogen, namelijk in:
- ☐ Overwogen en gerealiseerd, namelijk in:
- ☐ Overwogen en nog te realiseren, waarschijnlijk in:

Selection of three sustainable innovations



Kies hier maximaal 3 innovaties, 1 per categorie!
Indien een categorie geen innovatie bevat, kiest u ook uit de andere categorieën slechts 1 innovatie!

Categorie 1 / 3

Kies hier 1 innovatie op basis van meest vernieuwende innovatie op uw bedrijf.

- ☐ Verkoop eigen producten
- ☐ Overstap huisvestingsysteem
- ☐ Kuikenvangmachines
- ☐ Luchtwasser

Categorie 2 / 3

Kies hier 1 innovatie op basis van meest vernieuwende innovatie op uw bedrijf.

- ☐ Windturbine
- ☐ Zonnepanelen
- ☐ Landschappelijke inpassingen
- ☐ Patiosysteem
- ☐ Vergistingsinstallatie

Categorie 3 / 3

Kies hier 1 innovatie op basis van meest vernieuwende innovatie op uw bedrijf.

- ☐ Warmtewisselaar
- ☐ Verlichtingstoepassing

Motives

Verkoop eigen producten

Kunt u op een schaal van 1 op 5, het belang aangeven van de onderstaande redenen om deze innovatie wel of niet te overwegen.
1 = Absoluut niet belangrijk, 2 = Niet belangrijk, 3 = Belangrijk nog onbelangrijk, 4 = Belangrijk, 5 = Zeer belangrijk.

	Absoluut niet belangrijk	Niet belangrijk	Belangrijk nog onbelangrijk	Belangrijk	Zeer belangrijk
Ten gunste van het dierenwelzijn	○	○	○	○	○
Arbeidsomstandigheden verbeteren	○	○	○	○	○
Financieel gunstiger	○	○	○	○	○
Technische bedrijfsresultaten verbeteren	○	○	○	○	○
Kwaliteit verbeteren	○	○	○	○	○
Aan wetgeving voldoen	○	○	○	○	○
Continuïteit waarborgen	○	○	○	○	○
Ten gunste van de omgeving: natuur & milieu	○	○	○	○	○
Realiseren van schaalvergroting / uitbreiding.	○	○	○	○	○
Om eigen product af te zetten en of te (her-) gebruiken	○	○	○	○	○
Vraag vanuit de markt en of keten	○	○	○	○	○
Persoonlijke manier van ondernemen: ideologie / visie & strategie.	○	○	○	○	○
Ten gunste van het imago v/d sector of bedrijf	○	○	○	○	○
Duurzaamheidaspect: ten gunste van People, Planet & Profit.	○	○	○	○	○

Incentives

Verkoop eigen producten

Wat was de directe aanleiding om deze innovatie te overwegen? Oftewel: kunt u nagaan op welk moment u het initiatief heeft genomen om met deze innovatie aan de slag te gaan en waarom u dat juist in die periode deed?
Het initiatief voor deze innovatie werd genomen naar aanleiding van:
1 = Absoluut niet, 2 = Niet, 3 = Misschien, 4 = Enigszins, 5 = Zeer zeker.

	Absoluut niet	Niet	Misschien	Enigszins	Zeer zeker
Vanwege (extreme) weersomstandigheden	○	○	○	○	○
Vanwege een bedrijfsongeval	○	○	○	○	○
Vanwege privé omstandigheden	○	○	○	○	○
Door (onder druk van) de lokale gemeenschap	○	○	○	○	○
Door uitbraak van ziekten- / bacteriën / infecties	○	○	○	○	○
Vanwege tegenvallende resultaten	○	○	○	○	○
Vanwege wettelijke bepaling door de (lokale) overheid	○	○	○	○	○
Door vraag van de afnemer en/ of consument	○	○	○	○	○
Op advies van een bedrijfsadviseur, bijv. voerleverancier, boekhouder, etc.	○	○	○	○	○
Vanwege boekhoudkundige voordelen, bijv. financieel afgeschreven / gunstiger	○	○	○	○	○
Op advies van ZLTO / LTO-Noord / LLTB	○	○	○	○	○
Bijwonen van een open dag en of congres	○	○	○	○	○
Door het lezen van media: vakbladen-/ kranten- / social media, etc.	○	○	○	○	○
Op advies van een studieclub- / onderzoek	○	○	○	○	○
Op advies van collega-pluimveehouders	○	○	○	○	○
Op advies van familieleden, vriendenkring	○	○	○	○	○

Barriers

Verkoop eigen producten

Welke problemen hebben zich tijdens het overwegingproces voorgedaan?
Kunt u aangeven op een schaal van 1 op 5 welke problemen eventueel van invloed waren of zelfs hebben geleid tot het niet realiseren van de innovatie?

	Absoluut niet	Niet	Misschien	Enigszins	Zeer zeker
Wettelijke beperkingen: Overheid	○	○	○	○	○
Financieel / economisch niet haalbaar	○	○	○	○	○
Beperkingen door uitbraak ziekte, bacterie, infectie.	○	○	○	○	○
Projectomvang / haalbaarheid / procestijd en draagvlak	○	○	○	○	○
Technisch niet mogelijk	○	○	○	○	○
Gebrek aan bedrijfsmiddelen en of voorzieningen. Vb: arbeid, grond, materiaal, gebouwen etc.	○	○	○	○	○
Beperkende omgevingsfactoren, bijv. de lokale gemeenschap	○	○	○	○	○
Geen opvolging (continuïteit)	○	○	○	○	○
Geen vraag vanuit de markt en of keten	○	○	○	○	○
Privé omstandigheden	○	○	○	○	○

V. Distinction of intrinsic and extrinsic motives.

Intrinsic motives	Extrinsic motives
Continuïteit waarborgen Ensure continuity	*Ten gunste van het dierenwelzijn* Animal welfare
Realiseren van schaalvergroting / uitbreiding. Realizing scale enlargement	*Arbeidsomstandigheden verbeteren* Working conditions
Om eigen product af te zetten en of te (her-) gebruiken In order to sell or reuse own products	*Financieel gunstiger* Financial favorable
Kansen en of vraag /aanbod uit de markt / keten Demand from the poultry chain and or consumer	*Technische bedrijfsresultaten verbeteren* Improvement of technical results
Persoonlijke manier van ondernemen: ideologie / visie & strategie. Personal style of entrepreneurship	*Kwaliteit verbeteren* Improvement of quality
	Aan wetgeving voldoen To meet legislation
	Ten gunste van de omgeving: natuur & milieu Favor surrounding aspect like nature & environment
	Ten gunste van het imago v/d sector of bedrijf In favor of the image of the poultry industry
	Duurzaamheidaspect: ten gunste van People, Planet & Profit. Sustainability: people planet profit

VI. Invitation email.

WUR – ZLTO Enquête: Duurzame innovaties Pluimveehouderij

Onderzoek pluimveehouderij WUR

Geachte heer/ mevrouw,

U ontvangt deze mail als ondernemer in de pluimveehouderij en als lid van LLTB, LTO Noord of ZLTO. Mijn naam is Jochem Tolkamp, student aan de Universiteit van Wageningen. Voor mijn afstudeeronderzoek breng ik, in opdracht van ZLTO, de motivatie van pluimveehouders om te innoveren in kaart. Met behulp van een enquête, die maximaal 15 minuten duurt om in te vullen, wil ik u vragen deel te nemen aan dit onderzoek. Uw reactie geeft LLTB, LTO Noord, ZLTO en mijzelf inzicht in hetgeen een ondernemer echt drijft. Zo kunnen LLTB, LTO Noord en ZLTO leden beter begeleiden, stimuleren en ondersteunen bij innovaties. U als lid heeft hier baat bij omdat de organisatie beter kan inspelen op de behoeftes van haar leden

Innovaties zijn veranderingen op uw bedrijf in bijvoorbeeld productietechnologie, afzet van (nieuwe) producten of management. Deze innovaties behoeven niet noodzakelijkerwijs vernieuwend te zijn voor de sector. Ook innovaties die u serieus overwogen heeft maar die door omstandigheden niet zijn uitgevoerd, worden in het onderzoek meegenomen.

Voor het onderzoek dient de enquête ingevuld te worden door diegene binnen het bedrijf die uiteindelijk de beslissing neemt om te innoveren. Hoewel meerdere personen invloed hebben op de beslissing (eigenaren, bedrijfsleiders, partners, kinderen, opvolgers, etc.), gaat dit onderzoek ervan uit dat uiteindelijk één van bovengenoemde belanghebbenden de knoop doorhakt.

Ik verzoek u vriendelijk om bij te dragen aan het onderzoek en mij in de gelegenheid te stellen af te studeren. Het onderzoek is anoniem en wordt als zodanig verwerkt.
Ter beloning worden er totaal 5 VVV bonnen verloot onder de deelnemers van € 20.
De onderstaande link begeleidt u automatisch naar de online enquête.

Bij voorbaat dank voor uw medewerking en bijdrage.

Met vriendelijke groet,
Jochem Tolkamp, student Wageningen UR
Stage15@zlto.nl

[klik hier]

VII. Means motives, incentives and barriers per sustainable innovation

In this appendix, the tables who were mentioned in the chapters are presented.

Table A: Means per motive overall

Motive	I or E	Mean	St.Dev
Financial favorable	Extrinsic	3.98	0.99
Ensure continuity	Intrinsic	3.63	1.13
In favor of the image of the poultry industry	Extrinsic	3.62	3.62
Improvement of quality	Extrinsic	3.54	1.28
Improvement of technical results	Extrinsic	3.52	3.52
Sustainability: people planet profit	Extrinsic	3.51	3.51
Personal style of entrepreneurship	Intrinsic	3.43	3.43
Favor surrounding aspect like nature & environment	Extrinsic	3.38	3.38
To meet legislation	Extrinsic	3.31	3.31
Animal welfare	Extrinsic	3.22	3.22
Working conditions	Extrinsic	3.13	3.13
Realizing scale enlargement	Intrinsic	2.96	2.96
Demand from the poultry chain and or consumer	Intrinsic	2.76	2.76
In order to sell or reuse own products	Intrinsic	2.40	2.40

Table B Descriptive analysis Incentives

Incentive	Mean	St.Dev
Because of favorable accounting gains	2.95	1.34
Reading media: industry journals, newspapers	2.78	2.78
Due to legislative changes	2.69	1.47
On advice from other poultry entrepreneurs	2.42	1.15
On advice from company advisor (bank, feed etc.)	2.40	1.17
By attending an open day / field trip	2.30	1.10
On advice from a study association, research	2.20	1.02
Due to demand from the poultry chain / consumer	2.18	1.19
On advice from family or friends	1.94	0.89
Due to disappointing results	1.84	0.90
On advice from ZLTO / LTO Noord / LLTB	1.83	0.86
Extreme weather conditions	1.82	1.00
Due to local pressure from the community	1.81	0.95
Due to outbreak of animal diseases	1.65	0.79
Due to private circumstanced	1.64	0.85
Due to an accident on the work floor	1.50	0.62

Table C Descriptive analysis Barriers

Incentive	Mean	St.Dev
Financial not feasible	2.90	1.32
Legislative restrictions	2.54	1.35
Project scope, feasibility and support	2.33	1.16
Lack of equipment and or facilities	1.97	0.94
Technological not feasible	1.95	0.93
Mitigating environmental / surrounding factors	1.88	0.90
No continuity	1.83	0.93
No demand from poultry chain or consumer	1.77	0.80
Private circumstances	1.76	0.82
Restrictions due to outbreak of animal diseases	1.74	0.78

VIII. Anova tests.

Table A: Anova analysis motives

Category		Sum of Squares	DF	Mean Square	F	Sign
Personal style of entrepreneurship						
	Between Groups	17.304	10	1.730	1.639	0.094
	Within Groups	369.416	350	1.055		
	Total	386.720	360			
Sustainability: people planet profit						
	Between Groups	13.463	10	1.346	1.257	0.253
	Within Groups	374.731	350	1.055		
	Total	388.194	360			

Table B Anova analysis incentives

Category		Sum of Squares	DF	Mean Square	F	Sign
Due to an accident on the work floor						
	Between Groups	2.953	10	0.295	0.753	0.674
	Within Groups	137.297	350	0.392		
	Total	140.249	360			
On advice from ZLTO / LTO Noord / LLTB						
	Between Groups	11.437	10	1.144	1.572	0.113
	Within Groups	254.591	350	0.727		
	Total	266.028	360			
By attending an open day / field trip						
	Between Groups	20.887	10	2.089	1.754	0.068
	Within Groups	416.803	350	1.191		
	Total	437.690	360			
On advice from family or friends						
	Between Groups	4.057	10	0.406	0.511	0.882
	Within Groups	277.722	350	0.793		
	Total	281.778	360			

Table C Anova barriers

Category		Sum of Squares	DF	Mean Square	F	Sign
No demand from poultry chain or consumer						
	Between Groups	10.854	10	1.085	1.699	0.080
	Within Groups	223.010	349	0.639		
	Total	233.864	359			

IX. T-Test per sustainable innovation: leaders versus followers.

Table A: Independent sample T-test Innovation (*Verkoop eigen producten*) 'sales of own made products'.

Group comparison based 18% and 50% difference.	Equal variance assumption	t	df	Sign. (2-tailed)	Mean Difference	Std. Error	95% CI of the Difference Lower	Upper
Motives 18%								
Financial favorable	Not assumed	4.583	9	0.001	0.700	0.153	0.354	1.046
Favor surrounding aspect - like nature & environment	Not assumed	-2.449	9	0.037	-0.800	0.327	-1.539	-0.061
Incentives 18%								
Extreme weather conditions	Not assumed	-6.000	9	0.000	-0.800	0.133	-1.102	-0.498
Due to an accident on the work floor	*Assumed*	-2.582	10	0.027	-0.800	0.310	-1.490	-0.110
Due to private circumstanced	Not assumed	-6.000	9	0.000	-0.800	0.133	-1.102	-0.498
Due to local pressure from - the community	Not assumed	-6.000	9	0.000	-0.800	0.133	-1.102	-0.498
Due to outbreak of animal diseases	Not assumed	-6.000	9	0.000	-0.800	0.133	-1.102	-0.498
Barriers 18%								
Legislative restrictions	Not assumed	-5.071	9	0.001	-2.000	0.394	-2.892	-1.108
Financial not feasible	Not assumed	-10.854	9	0.000	-2.400	0.221	-2.900	-1.900
Restrictions due to outbreak - of animal diseases	Not assumed	-17.676	9	0.000	-2.700	0.153	-3.046	-2.354
Project scope, feasibility and support	Not assumed	-10.854	9	0.000	-2.400	0.221	-2.900	-1.900
Technological not feasible	Not assumed	-15.922	9	0.000	-2.600	0.163	-2.969	-2.231
Lack of equipment and or facilities	Not assumed	-15.000	9	0.000	-2.500	0.167	-2.877	-2.123
No continuity	Not assumed	-11.129	9	0.000	-1.700	0.153	-2.046	-1.354
No demand from poultry chain - or consumer	*Assumed*	-3.428	9	0.006	-1.700	0.496	-2.805	-0.595
Motives 50%								
Favor surrounding aspect - like nature & environment	Not assumed	-2.828	6	0.030	-1.143	0.404	-2.132	-0.154
Incentives 50%								
On advice from family or friends	*Assumed*	2.416	10	0.036	1.314	0.544	0.102	2.526

Table B. Independent sample T-test Innovation (Overstap huisvestingssysteem) 'housing system'.

Group comparison based	Equal variance			Sign.	Mean		95% CI of the Difference	
18% and 50% difference.	assumption	t	df	(2-tailed)	Difference	Std. Error	Lower	Upper
Barriers 18%								
Project scope, feasibility and support	Not assumed	-2.308	13	0.037	-0.639	0.277	-1.235	-0.043
Motives 50%								
To meet legislation	Not assumed	-2.030	40	0.049	-0.446	0.220	-0.889	-0.002
Incentives 50%								
Due to legislative changes	Not assumed	-2.131	38	0.040	-0.758	0.356	-1.478	-0.038
Due to demand from the poultry								
- chain / consumer	Not assumed	-2.171	43	0.035	-0.728	0.335	-1.403	-0.052
On advice from company advisor	Not assumed	-2.510	42	0.016	-0.838	0.334	-1.512	-0.165
Because of favorable accounting gains	Not assumed	-2.926	43	0.005	-1.034	0.354	-1.747	-0.332
On advice from ZLTO/LTO Noord/LLTB	*Assumed*	-2.191	44	0.034	-0.448	0.204	-0.859	-0.036
By attending an open day / field trip	*Assumed*	-3.439	44	0.001	-1.017	0.296	-1.613	-0.421
Reading media: journals, newspapers	Not assumed	-2.818	42	0.007	-0.783	0.278	-1.344	-0.222
On advice from a study association	Not assumed	-2.128	38	0.040	-0.619	0.291	-1.208	-0.030

Table C. Independent sample T-test Innovation (Kuikenvangmachine) 'chicken catch machine'.

Group comparison based	Equal variance			Sign.	Mean		95% CI of the Difference	
18% and 50% difference.	assumption	t	df	(2-tailed)	Difference	Std. Error	Lower	Upper
Motives 50%								
Favor surrounding aspect like								
- nature & environment	Not assumed	5.196	2	0.035	3.000	0.577	0.516	5.484
Sustainability: people planet profit	*Assumed*	2.828	4	0.047	1.333	0.471	0.025	2.642

Table D. Independent sample T-test Innovation (Zonnepanelen) 'solar panels'.

Group comparison based	Equal variance			Sign.	Mean		95% CI of the Difference	
18% and 50% difference.	assumption	t	df	(2-tailed)	Difference	Std. Error	Lower	Upper
Barriers 18%								
Legislative restrictions	Not assumed	2.257	9	0.051	0.675	0.229	-0.005	1.355
Financial not feasible	Not assumed	2.636	5	0.046	1.525	0.578	0.035	3.015
Barriers 50%								
Financial not feasible	Not assumed	3.619	36	0.001	1.241	0.343	0.545	1.936

Table E. Independent sample T-test Innovation (Landschappelijke inpassing) 'landscaping'.

Group comparison based	Equal variance			Sign.	Mean		95% CI of the Difference	
18% and 50% difference.	assumption	t	df	(2-tailed)	Difference	Std. Error	Lower	Upper
Incentives 18%								
Due to local pressure from								
- the community	Not assumed	2.945	9	0.016	1.145	0.389	0.269	2.021
Barriers 18%								
Financial not feasible	Not assumed	2.649	6	0.040	0.782	0.295	0.052	1.513
Incentives 50%								
Due to local pressure from								
- the community	Not assumed	3.099	30	0.004	1.293	0.417	0.441	2.145

Table F. Independent sample T-test Innovation (Warmtewisselaar) 'heat exchanger'.

Group comparison based	Equal variance			Sign.	Mean		95% CI of the Difference	
18% and 50% difference.	assumption	t	df	(2-tailed)	Difference	Std. Error	Lower	Upper
Motives 18%								
To meet legislation	Not assumed	3.078	45	0.004	0.348	0.113	0.120	0.575
Incentives 18%								
Due to demand from the poultry								
- chain / consumer	Not assumed	-2.629	45	0.012	-0.304	0.116	-0.538	-0.071
Because of favorable accounting								
- gains	Not assumed	3.445	15	0.004	0.974	0.283	0.370	1.578
Barriers 18%								
Private circumstances	Not assumed	-5.627	45	0.000	-0.413	0.073	-0.561	-0.265

X. Correlation tests motives, incentives and barriers per sustainable innovation

Table A. Correlation test between the innovations and motives.

Innovations	*Own sales(1) N=37*			*Air scrubber(4) N=11*			*Solar panels(6)N=52*			*Landscaping(7) N=63*			*Light systems (11) N=85*		
Motives	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N
1 Animal welfare	-0.285	0.195	22	0.239	0.568	8	0.465	**0.011**	29	-0.287	0.111	32	-0.088	0.541	51
3 Financial favorable	0.476	**0.025**	22	-0.247	0.159	8	0.127	0.765	29	0.479	0.521	32			
4 Improvement of															
- technical results	0.005	0.981	22	0.127	0.765	8	0.493	**0.007**	29	0.007	0.969	32	-0.157	0.273	51
8 Favor surrounding aspect															
- like nature & environment	0.066	0.769	22	0.271	0.516	8	0.193	0.317	29	-0.348	0.051	32	0.036	0.804	51
11 Demand from the poultry															
- chain and or consumer	-0.176	0.434	22	0.623	0.099	8	0.074	0.704	29	-0.063	0.732	32	0.300	**0.033**	51
12 Personal style															
- of entrepreneurship	-0.173	0.442	22	0.756	**0.034**	8	0.278	0.144	29	-0.294	0.102	32	0.073	0.611	51
13 In favor of the image of															
- the poultry industry	-0.175	0.436	22	0.388	0.343	8	0.255	0.182	29	-0.440	**0.012**	32	0.198	1.65	51
14 Sustainability: people															
- planet profit	-0.138	0.541	22	0.380	0.353	8	0.237	0.216	29	-0.417	**0.017**	32	0.101	0.482	51

Table B: Correlation test between the innovations and incentives.

Innovations	*Housing(2) N=58*			*Air scrubber(4) N=11*			*Solar panels(6)N=52*			*Landscaping(7) N=63*		
Incentives	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N
1 Extreme weather conditions	-0.155	0.328	34	0.562	0.147	8	0.30	0.879	29	0.102	0.579	32
6 Due to disappointing results	-0.339	**0.019**	34	0.667	0.071	8	-0.148	0.445	29	0.334	0.062	32
9 On advice from company advisor	-0.223	0.204	34	0.736	**0.038**	8	0.305	0.108	29	0.146	0.424	32
10 Because of favorable accounting gains	-0.068	0.703	34	0.701	**0.053**	8	0.159	0.409	29	-0.035	0.848	32
11 On advice from ZLTO / LTO Noord / LLTB	-0.156	0.378	34	0.715	**0.046**	8	0.253	0.185	29	-0.184	0.314	32
12 By attending an open day / field trip	-0.202	0.252	34	-0.064	0.880	8	0.411	**0.027**	29	0.111	0.546	32
13 Reading media: journals, newspapers	-0.191	0.279	34	0.198	0.639	8	0.481	**0.008**	29	-0.376	**0.034**	32
15 On advice from other poultry entrepreneurs	-0.069	0.699	34	-0.008	0.986	8	0.430	**0.020**	29	0.073	0.692	32
16 On advice from family or friend	0.014	0.939	34	0.562	0.147	8	0.086	0.659	29	0.370	**0.037**	32

Table C: Correlation test between the innovations and barriers.

Innovations	*Air scrubber(4) N=11*			*Wind turbine(5)N=7*		
Barriers	Pearson	Sign 2tailed	N	Pearson	Sign 2tailed	N
3 Restrictions due to outbreak of animal diseases	0.859	**0.006**	8	-	**0.000**	4
4 Project scope, feasibility and support	0.771	**0.025**	8	0.057	0.943	4
7 Mitigating environmental / surrounding factors	0.324	0.434	8	-	**0.000**	4
9 No demand from poultry chain or consumer	0.708	**0.049**	8	-	**0.000**	4