rijksuniversiteit groningen

July 1, 2020

Farmers' ability to adapt to drought

A case study of Noord-Holland, the Netherlands

Leliveld, P

S3381811

GEBAPROJN

Supervisor: Prof. Dr. L.G. (Ina) Horlings

15 ECTS

Rijksuniversiteit Groningen

Summary

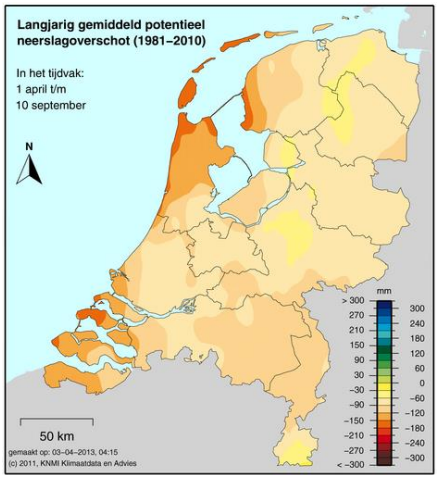
This report looks at the estimates, expectations, and experiences of farmers in Noord-Holland with regard to the increasing drought in the Netherlands. It does that by first introducing the topic of drought and resilience, the meaning of resilience followed up by both a qualitative as quantitative analysis. The qualitative part of the research consists of five interviews with experts and a farmer from Texel. The quantitative part is a large questionnaire with 29 respondents throughout the province of Noord-Holland. This province was chosen because of its large rain shortage, which is due to its high demand. The central research question is; to what extent are there differences between the expectation of farmers in Noord-Holland on changing precipitation patterns and the actual estimation of experts? Besides, this report looks at the resilience of farmers, since this will be important for the future health of their farm. The data showed that farmers take the drought very serious and take measures to prevent drought. The difficulty is that these measures are expensive and therefore, it is hard to adapt to drought. Secondly, farmers likely agree with experts on the scenarios for the future of our climate. The question was difficult to answer since the climate experts themselves still debate about how the future will play out. The report will help to better understand the needs of farmers and could contribute to better policy making and communication.

Table of content

Introduction 3
Theoretical framework 4
Conceptual model 6
Methodology 6
Results 8
Estimation of drought and future climate 8
Impact of drought 9
The expectations of farmers 12
Texel 12
Discussion 13
Conclusion 14
Bibliography 15
Appendices 17
Appendix 1 17
Appendix 2 17
Appendix 3 17
Appendix 4 18
Appendix 5 18
Appendix 6 KNMI'14 scenario's 18
Appendix 7 Questionnaire 19
Appendix 8 Letter of consent 26
Appendix 9 Interview questions 28

Introduction

Climate change is one of the most urgent debates nowadays in spatial planning. Spatial measures against urban heat and increasing precipitation are most known. However, climate change, and its changing precipitation pattern, is not only affecting the urban environment. Both the increasing severity of showers as the increasing drought form a problem in the upcoming years. This might form serious problems for agricultural land and protection. Damage through drought comes from not only freshwater shortages but is also due to salination (Van Duinen et al., 2015). The years 2018 and 2019 have also shown extreme droughts (KNMI, 2019), and show how urgent the theme is in the Netherlands. Because droughts can affect crop protection, this might lead to less income for farmers. Also, Esfahanian et al. (2017) mention the extreme costs of droughts. They even express it as "…one of the costliest natural disasters…"(p.31). Therefore, it can be expected that farmers would take drought risks very serious. As figure 1 shows, the precipitation surplus is negative in the entire Netherlands. The lack of precipitation is visible in the north-west of the country. The data (KNMI, 2013) shows that the province of Noord-Holland experiences the worst drought, which is due to its high demand for water. As we know, the agricultural sector is very much dependent on water. This water either comes from the ground- and surface water (76 million m^3) or from tap water (43 million m^3) (Ecorys, 2019). There are, according to the Ecorys report, five factors that can influence the effect of drought on agricultural land, namely, "The frequency and timing of the drought, the region and type of soil, type of crop, the available amount of water in the water system and the possibility for irrigation" (p. 12). This research will also take these variables into account. The report mentions, contributing to the statement made earlier about economic loss, that the loss in income for agricultural farmers is expected to be 8% due to increasing heat and drought. The central research question is; to what extent are there differences between the expectation of farmers in Noord-Holland on changing precipitation patterns and the actual estimation of experts? These differences will be researched with the use of the climate scenarios from the KNMI, the Dutch meteorological institute (2015). The KNMI'14 climate scenarios consist of moderate (1°C rise) and warm (2°C rise) scenarios for 2050 and 2085. Both the moderate and the warm scenario consists of one low and one higher value. Both higher values (G_h and W_h) are expected to have dryer summers in the future (KNMI, n.d.).



1: Multi-year average potential precipitation surplus (KNMI, 2013)

Apart from the central research question, it will also give an insight on the expected economic loss. This research focusses only on the negative sides of changing precipitation patterns but acknowledges that farmers can have positive effects from climate change, such as longer growing seasons and higher CO_2 concentrations as mentioned by the KNMI (2014). The literature further suggests research on how farmers and experts estimate drought (Van Duinen et al., 2015). Besides increasing droughts, also the precipitation

extremes are changing as well (Lenderink & Van Meijgaard, 2008). The increasing severity of showers might cause damage to the crop. Resilience can become very important for farmers to adjust to the increasing drought and changing precipitation patterns as shown above. If farmers have a good overview of what they can expect in the future, they can become more resilient. Resilience will not just occur after a better understanding of the weather; it needs actions from farmers to adjust to the drought. This requires a good understanding of the seriousness of droughts. Therefore, underestimation of the problem might be harmful for not only the future crop production but also consequently the farmers' income. Furthermore, a better insight into the experiences and perception of farmers can help to make better policies or to help farmers to adapt to drought. The willingness and ability to adapt will be the overarching theme that makes this paper societally relevant. The societal relevance is what could help policy makers to get a better understanding of the needs of farmers. The scientific relevance is that there has not yet been extensive research on how farmers estimate the effects of drought compared to experts. The concept of resilience will be discussed in the next chapter. Efficiently dealing with water and changing crop and harvest intensities are mentioned as possible solutions to increasing drought (KNMI, 2013).

The assumption is that farmers have well-educated knowledge about the future climate, which will result in a good estimation of the expected drought. This research will, therefore, answer or address the question; to what extent are there differences between the expectation of farmers in Noord-Holland on changing precipitation patterns and the actual estimation of experts? Besides, this research will also elaborate on the experiences of farmers and the measures they already take. It does not only discuss the droughts, but also the increasing severity of showers and therefore talks about changing precipitation patterns. This research intends to make statements about the resilience of the farmers in Noord-Holland, their experiences, and to address the differences between farmers estimations and those of and experts. Insight in these possible differences can help policymakers in improving their policies. Moreover, new policies or policy measures might have to be developed if the hypothesis is found to be true. To further elaborate on this research question, it is important to first discuss the main concepts as will be done in the next section. The next section will introduce and explain the concept of resilience and adaptation. It will explain the research gap and the types of methods that have been used to gain a better understanding of resilience. After the theoretical framework, this research will explain the methodology that have been used.

Theoretical framework

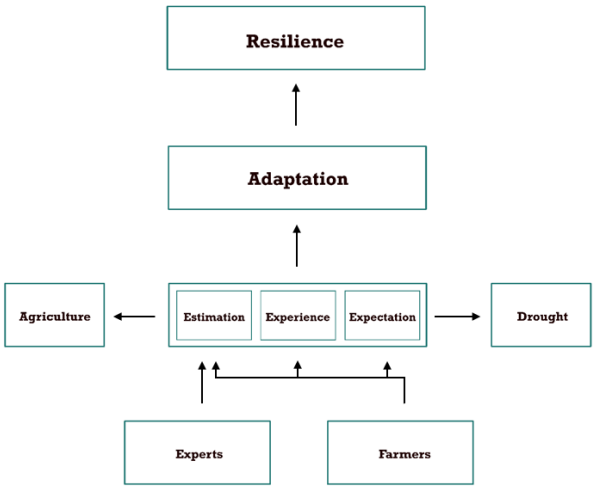
The concept of resilience has been increasingly discussed in the scientific literature. Lately, this concept has been used in combination with climate change. The concept of resilience has been applied in various disciplines; from biochemistry to computer science and spatial planning. This thesis will only discuss the concept in relation to climate change. In 1973 the concept of resilience was described as "… a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (Holling, p.14). Holling already describes the concept but does not link resilience and climate change, as his interpretation focussed on a biological perspective.

Also, Davoudi et al. (2012) mention that the link between urban planning and climate is something recent since they mentioned that "in recent years, the concept of resilience has gained currency in a number of policy domains (Davoudi this issue), and dealing with the impacts of climate change is a case in point. Reference to resilience is made in adaptation planning, policy development, and implementation, at different administrative scales. The resilience concept appears to be particularly pertinent for framing urban planning and development policies and programmes" (p.325).

Three types of resilience can be identified (Dhar & Khirfan, 2017); engineering, ecological, and evolutionary resilience. All are concerned with touching upon "… both the time and the process of absorbing shocks" (Dhar & Khirfan, 2017, p.74). Literature relating to climate change defines resilience as "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change" (IPCC, 2007, p.880). The concept has, nevertheless, barely been linked to domains as adaptation and vulnerability (Dhar & Khirfan, 2017). Besides, the concept of resilience has also been critiqued. For example, the "conservative" ecological and spatial scale has been critiqued (Mackinnon & Derickson, 2012). The concept of "resourcefulness" is also introduced here. This research will also discuss the link between adaptation and resilience, as discussed in Dhar & Khirfan (2017). As a method, existing literature has been used by both papers to come to their conclusions. Nevertheless, quantitative methods can be used to assess resilience as well (Sterk et al, 2013; Van Duinen et al, 2014). The central question in this research, as mentioned earlier, relates to ecological resilience, as discussed above. This type of resilience has the purpose to maintain the "…existence of function" and the focus to "persistence, change and unpredictability" (Dhar & Khirfan, 2017, p75). Especially the unpredictability of precipitation will play an important role in this research. The concept ecological resilience can also be described as "…external disturbances and shocks that result in a system becoming transformed through the emergence of new structures and behaviours" (Mackinnon & Derickson, 2012, p.256). The external disturbances in this paper, relate to the changes in precipitation patterns. This definition of ecological resilience is also the definition that will be used in this paper since it fits neatly into the theme. This paper also acknowledges the critique made by Mackinnon & Derickson (2012), who argued that resilience is a concept that is defined by experts. Therefore, this research sees the urgency to test whether this importance of resilience is also seen by a non-expert group. Another critique on the concept of resilience is that "it vaccinates citizens and environments so that they can take larger doses of inequality and degradation in the future; it mediates the effects of global socio-environmental inequality but does little towards alleviating it" (Kaika, 2017, p. 89). This research acknowledges that climate change is something that should be solved on a macro scale, but it does also see the importance of taking measures at meso- and/or micro-scale. Becoming resilient as an farmer is one of those measures.

Conceptual Model

So far, the concept of resilience has been explained. As can be seen in the theoretical framework, this research will analyse whether the knowledge gap between the farmers and experts results in different estimations of drought and it will elaborate on the experience farmers have with drought and the measures taken against drought. With knowledge is meant; knowledge about weather patterns, the understanding of climate change, and knowledge about agriculture, for example how climate change could affect crops. The knowledge of farmers leads to estimations about future drought, which hopefully leads to adaptation of their practices. This is dependent on the ability of the farmer to adapt, which eventually could lead to resilience. The hypothesis in this research is; farmers in Noord-Holland will estimate the risk of changing precipitations similar to climate/ agricultural experts. Besides, to get a deeper understanding, it will also focus on the experience and expectation of farmers. This can be seen in the middle of the model (figure 2). The base of the model shows the actors, namely experts and farmers. To make a small nuance, this research does acknowledge that farmers have much knowledge about these topics. Therefore, this research is hopefully not seen as an underestimation of farmers. This needs to be said after the constant distinction between 'farmers' and 'experts.” With experts, this research implies people who have carefully studied related topics for years and have a good overview of what is happening in certain regions. So, there is no black and white distinction between expert and farmer. A farmer could be an expert and an expert could be or could have been, a farmer. When looking at figure 2, the line moving from the experts is only pointing towards the estimation, which will be compared with the estimations of farmers. This distinction is made in the model since experts will only be tested on their estimation, while farmers will be questioned on all three concepts. All concepts; estimation, experience and expectation, are linked to both agriculture and drought.



2: Conceptual model

Methodology

In this paper, both a qualitative and quantitative method will be used. Those methods are necessary to establish whether or not there is a difference between the farmers' perspective and the experts' estimates. It could be the case, as also mentioned in the discussion, that the respondents of the quantitative research might have more affinity with drought than farmers who did not respond and therefore do not represent the average situation. With the use of two methods, the research hopes to prevent this bias. This paper will first interview experts on drought to determine their point of view on drought. These interviews will help to construct and apply a quantitative analysis of farmers. Farmers’ knowledge and estimation about drought

will be tested by providing them with four climate scenarios for the future. These scenarios have been made by the KNMI (2015) and have been explained in the introduction. They can be found in appendix 6. Besides, the estimation of farmers is also tested with ordinal (if the last two summers were incidents) and interval questions regarding how often we will have this type of drought in the upcoming 30 years. This thesis will thus not only test the estimates on drought with scenarios. Besides, this method offered the opportunity to elaborate on their thoughts and opinions in open questions. The estimation of farmers is one part of the survey, the other part included questions about the experiences and expectations of farmers. There have been questions regarding these topics. Likewise, this questionnaire contained questions relating to other variables such as age, gender, crop type, size of the area, years of having the farm, and their capacity to adapt to drought and take measure. The interviews with the experts raised new questions that helped to set up the questionnaire. After gathering the results of the questionnaire, a farmer from Texel was asked about his thoughts on the questionnaire. This helped to take out any possible misleading questions, if there were any. Most importantly, the interview helped to gain a deeper understanding of farmers' experiences on the island. The questionnaire has been distributed by LTO Noord, The Royal General Bulb Growers' Association (KAVB) and a Facebook group called "Boeren in actie Noord-Holland." After collection of the data, statistical tests have been used to analyse how farmers estimate the drought measures and what variables might explain this. Due to the low amount of cases, non-parametric tests have been used. Ordinal data has been analysed using the Somers'd test. A Kolmogorov-Smirnov test has been used to test normality and a Wilcoxon Signed-rank test has been used to compare a test statistic with a population mean. Ordinal question consist of a score that goes from 1-strongly disagree to 5-strongly agree, whereas a score of 3 means neutral. A quantitative research requires a sufficient number of respondents. This research was therefore dependent on external parties. This research took into account ethical issues such as the privacy of farmers, concerning sharing personal information. The sampled population will be reached via farmers' organisations, which could have formed a problem with the representability of the research group. This paper hopes to have prevented this by sending the questionnaire to different farmer's organisations. Experts from different institutions (LTO Noord, de Watercommissie Noordelijk Zandgebied, Wageningen University & Research) have been interviewed so that political ideologies can be minimised in the results. All experts have knowledge about either climate change or agriculture and/or have extensive local knowledge. The data has been processed using ArcMap, AtlasTI and, SPSS Statistics.

Before elaborating on the results, it must be clear that this research has been held during the corona-crisis period in the spring of 2020, which could have influenced the results. The next section will elaborate further on the results, guided by different subtopics, which will provide a clearer structure. Four experts and one farmer from Texel had been interviewed and 29 farmers responded to the online questionnaire. This is quite a low response rate taking into account that the questionnaire reached around 1000 to 2000 farmers in the province of Noord-Holland. The coronavirus caused many problems for farmers, which could have led to a decreasing interest to fill in a questionnaire. Even though the topic was very relevant at the time the

questionnaire was held. Because of the low response rate, this research will be very careful in drawing hard conclusions. The discussion will elaborate further on this. Before discussing the results, it is important to show the diversity of the respondents. The white areas show the zip code area's that the respondents have their farm in (figure 3). This research captured farmers from different regions, different soil types, and different types of agriculture.

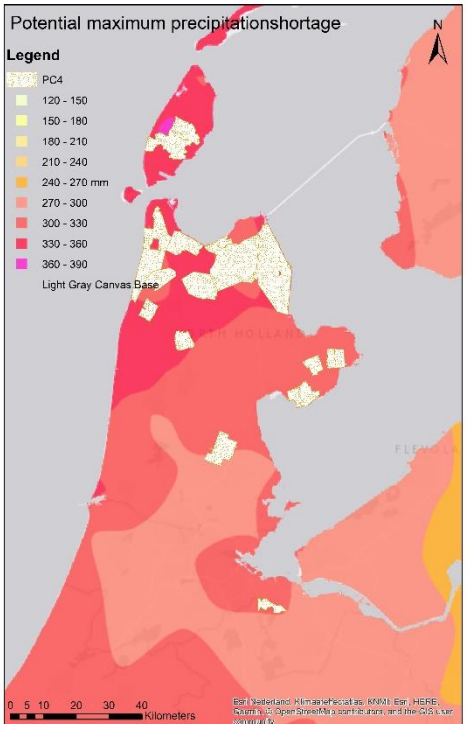


Figure 3: Location of the respondents in Noord-Holland

Results

As mentioned in the methodology, the result section is divided into subheadings to structure the information.

Estimation of drought and future climate

The KNMI (2015) came up with four scenarios that would suggest what the future climate would look like. These estimates go from a 1°C increase in temperature to a 2°C increase, and from no other changes to more drought in the summers and more precipitation in the winter. Climate experts themselves like to stick to these scenario's since they are very dependent on the direction of the wind and other factors. What became most clear from the expert interviews was that the Netherlands that approximately enough water every year, however; we are not able to store enough water for dry periods in certain provinces. In Noord-Holland, the drought is seen as a problem but farmers and experts both see that so far, they have been able to manage the problem. Texel, an island that is part of the province of Noord-Holland, is a different case that will be discussed later on. This paper focussed on Noord-Holland since the demand for water was very high, which resulted in a very large precipitation shortage. The province so far managed to have enough water for irrigation since it has a very large water source, namely the IJsselmeer. According to the expectation of experts, drought itself is, and will not be, the biggest water problem in Noord-Holland in the coming years, but there will probably be more severe impacts on the quality of the ground- and surface water.

"Drought in itself was not the biggest problem, but at a certain moment the surface water gets saltier and then it is a consideration of the farmer to either start irrigation with saltier water (which leads to plants getting damaged through salt) or to go for damage through drought." – A policy advisor in Noord-Holland

The policy advisor mentioned that farmers became more aware of the problem after it was nearly forbidden to irrigate your land after a long period of drought. Only 13,8% of the farmers disagreed with the question that the drought of the last two summers were not accidents. Whereas, the rest either responded neutral or agreed. This is supported by data that shows that farmers expect a dry period, such as 2018 and 2019, to

happen around 11 times in the upcoming 30 years. There is not enough data to elaborate on the differences between different agricultural sectors, but arable farmers (akkerbouw in Dutch) do seem to estimate the number of years this will happen a bit higher (around 15 times in the upcoming 30 years), but there is no statistical evidence for this difference.

On average around a fourth of the farmers seem to agree or strongly agree with the statement; ”I am worried about the climate”, whereas on average around a third of the farmers (strongly) disagrees with this statement. The data shows that farmers who scored higher on the statement; “The drought was a burden in the summer also score higher on the statement; I am worried about the climate.” This seems to strengthen the comment earlier that experiences with dry periods make farmers more aware (see appendix 1).

Age does not seem to influence farmers' concern about the climate. One of the expectations was that the younger the farmers are, the more worried they are about the climate. The data in this study does not show any relationship between these two variables.

Coming back on the scenario's as discussed at the beginning of this chapter, experts do see that we are getting more precipitation in the winters and less precipitation during the spring and summer. This difference in the amount of precipitation is also what causes troubles for farmers and water boards. Farmers have been asked to choose between either the KNMI’14 climate scenario’s, ‘no idea’ or ‘different, namely;.’ It is very difficult to predict this since it is highly dependent on many variables that are hard to determine, which is also mentioned by an expert on climate and agriculture. Around 20% of the farmers has not a clear idea about what the most likely scenario will be. 55% of the farmers expect that we will get more precipitation in the winters and dryer summers. Only 7% mentioned that it will be something different. This shows that 73% does agree with a scenario from the KNMI. Since experts are still in doubt about what the most likely scenario will be, this research only tests whether the farmers agree with the scenario’s that are made by the KNMI (2015). It could be the case, for example, that farmers think there will not be any increase in temperature, or maybe even more than the KNMI’14 climate scenario’s suggested.

Impact of drought

The drought can result in loss of harvest and other impacts in multiple ways, but the biggest problem seems to be salination. The subtle balance between damage through drought or damage through salination is mentioned by the experts. On the one hand, farmers would love to keep irrigating, but on the other hand, if you do this with water that is too salty, it might even result in more damage. It is therefore not only important that there is enough water, but it should be of good quality too. The introduction mentioned that around 8% of the damage was expected for the agricultural sector as a consequence of drought. The result of the survey shows that farmers themselves expect to have around 15% damage due to the drought (15,41% to be accurate). This value is statistically different from the 8% (see appendix 2) mentioned in the introduction. It is necessary to statistically test if the two values are different from each other, since the high value could also be an error due to the low number of respondents. Farmers responded to the question: "what could be

done better to help farmers in times of drought?," that more freshwater is needed. Some come up with concrete ideas, while others mention they just need more freshwater. This might show a difference in thinking between farmers and experts. The differences between farmers and experts on this theme seem to be that farmers focus more on water quantity while experts focus on both the quantity and the quality of the water. One expert mentioned that the drought itself is not the problem, but the fact that due to drought the surface water gets saltier. This differs per crop, and therefore the climate calendar (Schaap et al., 2009) is a useful tool to gain more knowledge about the damage per crop. The calendar shows the complexity of the problem of drought and salination. Every crop is in its way sensitive for damage through drought, and as one expert also mentioned that different crops can cope with different values of Chloride/L. Whereas potatoes could cope with 900mg of Chloride/L, this is only 150 Chloride/L for a tulip. Therefore, it makes sense that bulb growers were one of the first to be aware of the problem.

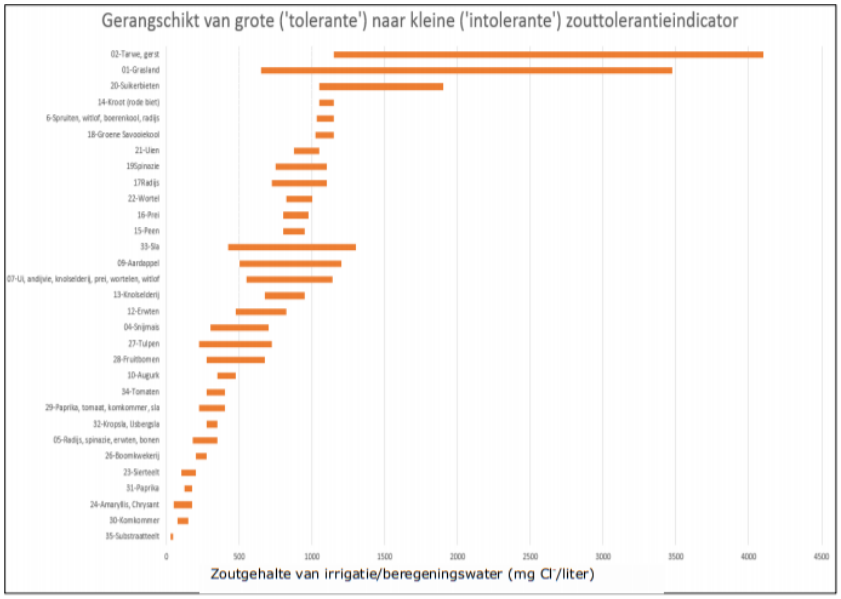


Figure 4: The salt tolerance level of crops in mg Cl/liter (Stuyt et al, 2016)

Nevertheless, bulb growers do not seem to have more burden in the summer and do not seem to estimate the drought worse than other types of agriculture. This could be due to the type of damage farmers experience since potatoes seem to be less vulnerable to chloride. The saltiness of the water is measured as the EC-value. There is an increasing awareness with regard to the importance of water quality. A project was set up in the north of Noord-Holland to better measure the quality of the water. This project is called 'Inlaat op Maat' and is within the programme 'Boeren Meter Water' (translated: Farmers Measure Water) (LTO Noord, 2019). On Texel, a local collaboration came up with an easy solution to discharge salty water and to store freshwater (HHNK/ Texel Water, 2018). As several experts mention, the problem in the Netherlands is not that we do not have enough water, but that we discharge all the freshwater in the sea during times of heavy rain. This frustration was also mentioned by a farmer from Texel. During the winter they pump all the freshwater out, and in the summer they experience large problems since they have a lack of irrigation water. Besides, they experience trouble due to infiltration of saltwater from the sea. This is not the only battle with nature. Experts would love to see that more freshwater could be stored in the Ijsselmeer, which is a freshwater lake on the east of North Holland. More freshwater stored in the lake would mean that there is more freshwater available in the summer for irrigation and salt ventilation. The problem mentioned is that the IJsselmeer/Markermeer is a protected and developing nature area and that therefore

the water level is not allowed to go above a maximum., according to one of the experts. Nevertheless, in Noord-Holland, the experts seem to be proud of what they have achieved so far. The water boards have been praised several times. By having good salt ventilation, the water quality within the canals could improve.

Taking measures against the drought seems to help. Around 90% of the respondents have taken measures to decrease the effect of drought. Farmers who scored higher on the ordinal question (same ranking as mentioned earlier) "I take enough measures to make the effect of drought as small as possible" seem to give a lower score on "I experience a lot of damage because of drought" (see appendix 3). Furthermore, farmers that took "enough" measures according to their own assessment, expect on average a smaller percentual damage in yield because of drought (see figure 5 and appendix 4). Experts mentioned that if farmers produce a lower yield, possibly due to drought, the price of the products goes up since the supply goes down.

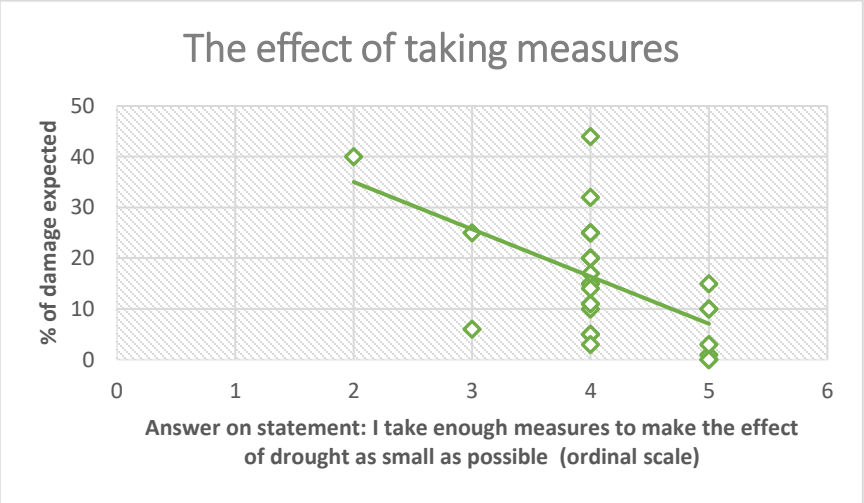


Figure 5: The effect of taking measures against drought

"…until present day we have had enough water. In 2018 it has been tense, but a very large part of Noord-Holland was compensated by the price. So that was eventually more an advantage than a disadvantage." – An expert on water quality

Nevertheless, as farmers start to better cope with the effects of drought, and therefore have less damage, they will produce more crops in the end, resulting in more damage for farmers that did not take measures. One farmer mentioned in an open question that subsidies need to stop to get the sector healthy again. This comment shows the struggle that farmers are dealing with. One expert mentioned that during a workshop practically only progressive farmers showed up. This shows the difficulty for institutions and organisations to also reach the more conservative farmers. The investment costs are high which results in a difficult decision for farmers. In the introduction, this report stated that there are also positive sides to climate change. The introduction mentioned longer growing seasons and higher CO_2 concentrations (KNMI, 2014). Nevertheless, the farmer on Texel could not think of anything positive rather than saying that he liked that it was a bit warmer now. This does not say that there is not anything positive on climate change, but it does highlight that the farmer is at least not aware of it (if there are any positives). The report did also mention in the introduction that the increased precipitation could also be a problem. This has been asked during

interviews, and indeed farmers do experience damage due to a large amount of precipitation in a short period as well.

The expectations of farmers

Both the quantitative as the qualitative methods provided data what farmers expect from organisations and their trust in institutes/ organisations. Around 60% of the farmers would like to get support. This support varies from lowering taxes and getting financial support, to getting more water for irrigation. On the question "From which parties do you expect to get support?" 9 (out of 29) expect support from the province, 15 of water boards, 8 from the Ministry, 11 from agricultural organisations, and 9 don't need any support from organisations (see figure 6). Note that respondents can fill in multiple organisations, and therefore numbers are not cumulative. The communication between farmers and water boards is very important in times where there is less water available, which was also mentioned in an interview with a farmer. Agricultural organisations can help here as a connection between farmers and water boards.

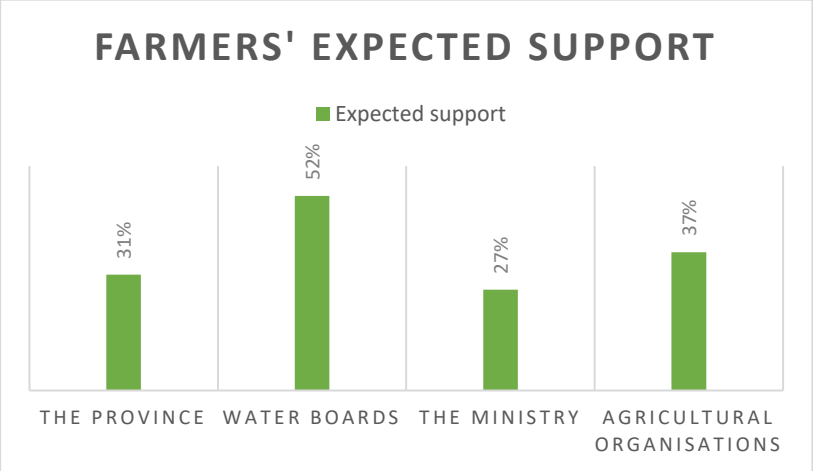


Figure 6: Farmers' expected support to help with damage due to drought

Farmers, according to the questionnaire, do not feel supported by the government. The amount of support by the government scored an average of 2,28 on the statement "I feel supported the government." The ordinal scale goes from 1- strongly disagree to 3 – neutral and 5 strongly agree. Neutral (a score of 3) can be seen as the boundary between a positive or a negative response. The perceived lack of support by the government might be explained based on the constant change of rules and regulations, as mentioned by one of the experts. The score on support by agricultural organisations can be seen as neutral (score of 2,97). The lack of support on governments and agricultural organisations cannot be seen as two separate scores, since on average people who felt a lack of support of government also felt a lack of support by agricultural organisations (see appendix 5). The feeling of a lack of support cannot be explained by variables from the dataset such as; age, gender, percentage of damage expected, worried about the climate etc.

Texel

The case of Texel, an island in the north of the province of Noord-Holland, deserves specific attention. It was often mentioned during interviews that Texel was a specific case. Due to the lack of irrigation water, farmers cannot irrigate during a long period of drought. They have to wait for the rain. It is therefore not strange that the two farmers from Texel that filled in this questionnaire expect 40% and 44% damage

(whereas the average damage expected was around 15%). Due to the low number of respondents, there is logically no statistical evidence that farmers on Texel expect a higher percentage of damage in the context of the whole survey. Nevertheless, a larger dataset would likely have made this difference significant. Therefore, a farmer from the region has been interviewed to get more in depth information. In the interview, the farmer from Texel mentioned that this was a combination of damage through drought and damage through excess precipitation in the winter. The interviewee said not to have any damage due to salination. The groundwater table was too low to have any effect. Nevertheless, he said that other farmers do have much damage due to infiltration from the sea. He mentioned that his farm is located just before the dyke (at the side of the Waddenzee) and that the water was more brackish there than further inland. An innovation called the "Zoete Stuw" (freshwater weir) could be a way to keep the effect of salty irrigation water reasonable. It has already been tested and proven successful. Both respondents completely disagree with the statement "I feel supported by the government" and agree and completely agree with the statement "I experience a lot of damage from drought." Resilience is hard to achieve when you are so dependent on rain. Excess water is discharged in the winter into the sea. Nevertheless, you now see local initiatives to become more resilient against large periods of drought. These projects are still relatively small according to one of the farmers from Texel in an interview. There is a larger project going on, but, according to the farmer, this will cost millions and is therefore not available for everyone. The farmer will wait until others have done the initiative, and then he will maybe consider it. There are possibilities to store water, but this requires a lot of surface, and the surface is scarce. The farmer from Texel said that it is a very difficult consideration between losing income or having extra expenses every year.

Discussion

This paper made statements regarding the estimation and experiences of farmers and experts and can be placed as a contribution to the scientific debate about working towards resilience. It has been very careful in making statements due to the number of respondents. It therefore mainly used descriptive statistics. The lack of data made it harder to find the right relations, but it has proven that the 8% expected damage as a result of drought (Ecorys, 2019) is incorrect in Noord-Holland. Furthermore, the coronavirus made the topic of drought of relatively less importance, which could have led to less amount of cases and maybe a different estimation. Even though it was still possible to conclude with less data, future research might go more in-depth in statistics that have now been labelled as percentages or 'likely.' Besides, it might be possible that the respondents do not completely reflect the entire agriculture of Noord-Holland. It could be, for example, that only farmers that are affected by drought respond to the questionnaire. This paper was aware of this problem and tried with the use of mixed methods to make this influence very small. Future research might also go into detail about the fine line between large investment cost and accepting the damage. This research noted that this was a dilemma for farmers. The statements made in this paper only go for the region of Noord-Holland, since other provinces/regions might have very different outcomes due to the type of agriculture, relative height, location, or soil type. This paper can therefore not be used to make

statements about the Netherlands as a whole. Implications of this research could be a better understanding of farmers expectations, and therefore giving better advice. A better insight into the expectations, experiences, and estimates of farmers could help in making better policies.

Conclusion

This paper started with discussing the introduction, theoretical background, and methodology. The introduction mentioned the relevance of the paper. During the gathering of the results, many news media mentioned the increasing problem of drought in the Netherlands (NOS, 2020; RTL Nieuws, 2020; KNMI, 2020). The results dealt with topics as; estimation of drought and future climate, impact of drought, the expectation of farmers, and Texel. In the first part of the results, estimation of drought and future climate gave an insight into how both farmers and experts estimate drought. One of the expectations was that age will influence the estimation of future drought and climate. Nevertheless, there appears to be no significant relation at all. What can be seen from the qualitative and quantitative methods is that farmers take drought very seriously and most expect the future to be dryer in the summer and wetter in the winter. Besides, by choosing one of the climate scenario's instead of choosing something different, 73% estimated the future somehow the same as experts do. It is therefore very likely that farmers agree with experts that the temperature in the future will rise. Farmers do seem to estimate the percentage of damage higher than estimated in the introduction (15% in comparison to the 8% expected). In terms of resilience, it is difficult to draw one clear conclusion. On the one hand, many farmers seem to adapt to climate change and 90% of the farmers are taking, according to them, enough measures. But on the other hand, farmers still estimate to have damage due to the drought. They can take measures on their own but are also very dependent on the functioning of the water board. It is not just the farmers themselves that should adapt to a new climate, it is the entire agricultural system that needs to work towards resilience. Texel is even harder to become resilient, due to the lack of irrigation water. They are maybe the most rain-dependent area of the Netherlands. This is far from resilience, but there are good initiatives to adapt to the new situation. To work towards resilience, the country needs to shift from transporting water to storing water in rainy periods. Furthermore, the gained knowledge about farmers' experience, estimations, and expectations should be used to help them in a more efficient way. Finally, a sectoral climate adaptation guide, with ways to become more adaptive, could help to increase resilience.

I would like to thank:

- LTO Noord
- The Royal General Bulb Growers' Association (KAVB)
- Watercommissie Noordelijk Zandgebied
- Wageningen University & Research

Bibliography

Davoudi, S., Shaw, K., Haider, L.J., et al. (2012). Resilience: a bridging concept or a dead end? "reframing" resilience: challenges for planning theory and practice interacting traps: resilience assessment of a pasture management system in northern Afghanistan urban resilience: what does it mean in planning practice? Resilience as a useful concept for climate change adaptation? The politics of resilience for planning: a cautionary note. *Plan. Theory Practice*. 13 (2), 299–333.

Dhar, T.K. & Khirfan, L. 2017, "A multi-scale and multi-dimensional framework for enhancing the resilience of urban form to climate change", Urban Climate, vol. 19, pp. 72-91.

Duinen, R. van, Filatova, T., Geurts, P. & Veen, A. van der (2015). "Coping with drought risk: empirical analysis of farmers' drought adaptation in the south-west Netherlands", *Regional Environmental Change*, vol. 15, no. 6, pp. 1081-1093.

Ecorys (2019). *Economische schade door droogte in 2018*. Rotterdam: Ministerie van Infrastructuur en Waterstaat

Esfahanian, E., Nejadhashemi, A.P., Abouali, M., Adhikari, U., Zhang, Z., Daneshvar, F. and Herman, M.R. (2017). Development and evaluation of a comprehensive drought index. Journal of environmental management, 185, pp. 31-43.

HHNK / Texel Water (2018). Projectplan Zoete Stuw. s.l.: Hoogheemraadschap Hollands Noorderkwartier.

Holling, C. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics, 4*, 1-23.

IPCC (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK..

Kaika, M. (2017). 'Don't call me resilient again!': the New Urban Agenda as immunology … or … what happens when communities refuse to be vaccinated with 'smart cities' and indicators.

KNMI (2013). *Archief doorlopend potentieel neerslagoverschot (gevalideerde data).* Retrieved on 27 February 27, 2020 from: https://www.knmi.nl/nederland-nu/klimatologie/geografische-overzichten/archief-neerslagoverschot

KNMI (2015). KNMI'14 Climate scenario's for the Netherlands. De Bilt: Royal Netherlands Meteorological Institute.

KNMI (2019). *Droogtemonitor*. Retrieved on February 21, 2020 from https://www.knmi.nl/nederland-nu/klimatologie/droogtemonitor

KNMI (2020). Toename neerslagtekort en verdamping in voorjaar. Retrieved on June 5, 2020 from https://www.knmi.nl/over-het-knmi/nieuws/toename-neerslagtekort-en-verdamping-in-voorjaar

KNMI (n.d.). Pictures of the future Climate scenario's. Retrieved on June 28, 2020 from http://www.climatescenarios.nl/scenarios_summary/index.html

Lenderink, G. & Meijgaard, E. Van. (2008). "Increase in hourly precipitation extremes beyond expectations from temperature changes", Nature Geoscience, vol. 1, no. 8, pp. 511-514.Environment and Urbanization, 29(1), pp. 89-102.

LTO Noord (2019). Metingen waterkwaliteit kop Noord-Holland bekijken op NZGMEET.nl. Retrieved on June 19, 2020 from https://www.ltonoord.nl/provincie/regio-west/noord-holland/nieuws/2019/07/09/metingen-waterkwaliteit-kop-noord-holland-bekijken-op-nzgmeet#:~:text=09%20juli%202019%20De%20afgelopen,waren%20zichtbaar%20via%20nzgmeet.nl.

Mackinnon, D. & Derickson, K. (2012). From resilience to resourcefulness: a critique of resilience policy and activism. *Progress in Human Geography*, 37(2): 253–270,

NOS (2020). Haspels en pompen voor boeren niet aan te slepen vanwege droogte. Retrieved on June 5, 2020 from https://nos.nl/artikel/2335038-haspels-en-pompen-voor-boeren-niet-aan-te-slepen-vanwege-droogte.html

RTL (2020). Het regent, maar het is droger dan ooit. Retrieved on June 5, 2020 from https://www.rtlnieuws.nl/nieuws/nederland/artikel/5131551/buienradar-weer-regen-droogte

Schaap, B., Blom-Zandstra, G., Geijzendorffer, I., Hermans, T., Smidt, R., Verhagen, J. (2009). Klimaat en Landbouw Noord-Nederland Rapportage van fase 2. Wageningen University: Plant Research International B.V.

Sterk, M., Gort, G., Klimkowska, A., Ruijven, J. van, Teeffelen, A. J. A. van, & Wamelink, G. W. W. (2013). Assess ecosystem resilience: Linking response and effect traits to environmental variability. *Ecological Indicators*, 30, 21-27.

Stuyt, L.C.P.M., Blom-Zandstra, M., Kselik, R.A.L. (2016). Inventarisatie en analyse zouttolerantie van landbouwgewassen op basis van bestaande gegevens. ISSN 1566-7197. Wageningen: Wageningen Environmentral Research.

Appendices

Appendix 1

Directional Measures

			Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Ordinal by Ordinal	Somers' d	Symmetric	,320	,148	2,148	,032
		Q12 Worried about the climate Dependent	,322	,151	2,148	,032
		Q11 The drought was a burden in the summer Dependent	,318	,145	2,148	,032

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Appendix 2

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		Q26_1 % of damage expected
N		29
Normal Parameters[a,b]	Mean	15,41
	Std. Deviation	11,303
Most Extreme Differences	Absolute	,101
	Positive	,101
	Negative	-,086
Test Statistic		,101
Asymp. Sig. (2-tailed)		,200[c,d]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

```
*Nonparametric Tests: One Sample.
NPTESTS
  /ONESAMPLE TEST (Q26 lofdamageexpected) WILCOXON(TESTVALUE=8)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05 CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The median of Q26_1 % of damage expected equals 8.	One-Sample Wilcoxon Signed Rank Test	,003	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

Appendix 3

Directional Measures

			Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Ordinal by Ordinal	Somers' d	Symmetric	-,395	,149	-2,475	,013
		Q16 I take measures to prevent damage, cause by drought Dependent	-,331	,131	-2,475	,013
		Q15 I experience a lot of damage from drought in the growing season Dependent	-,488	,183	-2,475	,013

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Appendix 4

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	-,555	,153	-3,467	,002[c]
Ordinal by Ordinal	Spearman Correlation	-,555	,147	-3,469	,002[c]
N of Valid Cases		29			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Appendix 5

Directional Measures

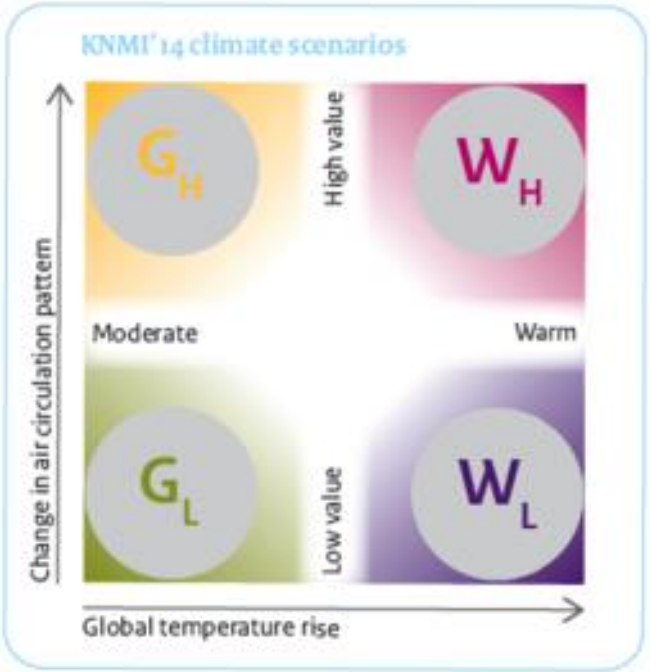
			Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Ordinal by Ordinal	Somers' d	Symmetric	,640	,109	5,352	,000
		Q18 I feel supported by the government Dependent	,641	,106	5,352	,000
		Q19 I feel supported by agricultural organisations Dependent	,639	,114	5,352	,000

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

\

Appendix 6 KNMI'14 scenarios



Appendix 7 Questionnaire

Beoordeling droogte-effecten door agrarische ondernemers

Q0 Als student aan de Rijksuniversiteit Groningen doe ik onderzoek naar de ervaringen van agrarische ondernemers met droogte. Deze enquête gaat over de (toekomstige) droogte in de zomer en het groeiseizoen en de effecten daarvan op de landbouw. Allereerst zullen er een aantal profielvragen worden gesteld, waarna de enquête dieper in zal gaan op het onderwerp. Alle gegevens zullen uiteraard vertrouwelijk worden behandeld en geanonimiseerd door de onderzoeker. Alvast bedankt voor uw medewerking.

o Ik ga hiermee akkoord (1)

Q1 Wat is uw geslacht?

o Vrouw (1)

o Man (2)

o Dit wil ik liever niet delen (4)

Q2 Ik heb een leeftijd tussen de ...

o < 20 (1)

o 20 - 30 (2)

o 31 - 40 (3)

o 41 - 50 (4)

o 51 - 60 (5)

o 61 - 70 (6)

o > 70 (7)

o Dit wil ik liever niet delen (8)

Q3 Mijn postcode is.... (Graag invullen in de vorm: 1234AB). Mocht u dit niet willen invullen kunt u deze vraag uiteraard overslaan.

_____

Q4 Hoeveel hectare grond heeft u in gebruik?

_____

Q5 In welke provincie heeft u uw bedrijf?

- o Noord-Holland (1)
- o Zuid-Holland (2)
- o Utrecht (3)
- o Zeeland (4)
- o Brabant (5)
- o Limburg (6)
- o Gelderland (7)
- o Overijssel (8)
- o Flevoland (9)
- o Drenthe (10)
- o Friesland (11)
- o Groningen (12)

Q6 Hoe heeft deze enquête u bereikt?

- ▢ Via de Watercommissie (1)
- ▢ Via de LTO (2)
- ▢ Via de Facebook-groep Boeren in actie Noord Holland (3)
- ▢ Via Greenport (5)
- ▢ Ontwikkelingsbedrijf Noord-Holland Noord (6)
- ▢ Anders namelijk... (4) _____

Q7 Waar heeft u op gestemd tijdens de laatste Tweede Kamer verkiezingen?

- o VVD (1)
- o PVV (2)
- o CDA (3)
- o D66 (4)
- o GroenLinks (5)
- o SP (6)
- o PvdA (7)
- o ChristenUnie (8)

- o Partij voor de Dieren (9)
- o 50Plus (10)
- o SGP (11)
- o DENK (12)
- o FvD (13)
- o Dit wil ik liever niet delen (14)

Q8 Welk type landbouw beoefent u?

- o Melkveehouderij (1)
- o Akkerbouw (2)
- o Bollen- en/of bloementeelt (3)
- o Boomteelt (5)
- o Fruitteelt (6)
- o Glastuinbouw (7)
- o Vollegrondsgroenteteelt (8)
- o Gemengd (9)
- o Overig dierhouderij, namelijk... (10) _____
- o Overig open teelt, namelijk... (11) _____

Q9 Stelling: Ik maak momenteel onderdeel uit van een familiebedrijf

- o Waar (1)
- o Niet waar (2)
- o Dit wil ik liever niet delen (3)

Q10 Hoeveel jaren heeft u dit bedrijf al?

0 10 20 30 40 50 60 70 80 90 100

Aantal jaren ()

Q11 Stelling: Ik ervoer veel last van de extreme droogte in de zomer

- o Zeer mee oneens (1)
- o Mee oneens (2)
- o Neutraal (3)
- o Mee eens (4)

o Zeer mee eens (5)

Q12 Stelling: Ik maak me zorgen om het klimaat

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q13 Stelling: Ik heb voldoende kennis op het gebied van weersverwachtingen

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q14 Stelling: Ik heb vertrouwen in het KNMI

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q15 Stelling: Ik ondervind momenteel veel schade van droogte in het groeiseizoen

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q16 Stelling: Ik neem voldoende maatregelen om de schade, veroorzaakt door droogte, zo klein mogelijk te maken

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q17 Stelling: Ik ben zuiniger met water omgegaan na de afgelopen droge zomers

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q18 Stelling: Ik voel mij gesteund door de overheid bij schade door droogte

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q19 Stelling: Ik voel mij gesteund door landbouworganisaties bij schade door droogte

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q20 Van welke partijen verwacht u steun bij schade door droogte? Er zijn meerdere antwoorden mogelijk.

▢ Landbouworganisaties (1)

▢ Het ministerie (2)

▢ De provincie (3)

▢ Verzekeringen (6)

▢ Waterschappen (7)

▢ Anders, namelijk: (4) _____

▢ Ik verwacht geen steun bij schade door droogte (5)

Q21 Calculeert u schade door droogte in als bedrijfsrisico?

o Ja (1)

o Nee (2)

o Ik heb geen schade door droogte (3)

Q22 Wat voor steun zou u graag ontvangen? Dit zou financiële steun kunnen zijn, maar ook informatie, collectieve maatregelen, versoepeling regels, belastingverlaging, samenwerkingsprojecten, etc.

o Ik wil graag de volgende steun ontvangen: (4)
_____

o Ik hoef geen steun te ontvangen (5)

Q23 Stelling: Ik ben andere gewassen gaan verbouwen vanwege de afgelopen droge zomers

o Mee eens (1)

o Mee oneens (2)

o Ik ben iets anders gaan doen namelijk... (3)
_____

Q24 Stelling: De afgelopen droge zomers waren geen incidenten, en zullen in de toekomst veel vaker voorkomen

o Zeer mee oneens (1)

o Mee oneens (2)

o Neutraal (3)

o Mee eens (4)

o Zeer mee eens (5)

Q25 Hoevaak, in de komende 30 jaar, verwacht u dezelfde droogte in de zomer als de afgelopen twee jaar

0 3 6 9 12 15 18 21 24 27 30

Aantal keren ()

Q26 Hoeveel % minder denkt u te oogsten door schade als gevolg van droogte?

0 10 20 30 40 50 60 70 80 90 100

Schade in % ()

Q27 Welk scenario is volgens u het meest realistisch voor de toekomst?

o Een warm scenario met 2 graden Celsius stijging van de temperatuur en drogere zomers en nattere winters. (1)

o Een warm scenario met 2 graden Celsius stijging van de temperatuur. Verder geen veranderingen. (2)

o Een gematigd scenario met 1 graad Celsius stijging van de temperatuur en drogere zomers en nattere winters. (3)

o Een gematigd scenario met 1 graad Celsius stijging van de temperatuur. Verder geen veranderingen. (4)

o Geen idee (5)

o Anders, namelijk: (6) _____

Q28 Wat kan er volgens u beter gedaan worden om agrarische ondernemers te helpen in tijden van droogte?

_____

Q29 Welke maatregelen neemt u momenteel tegen droogte?

o Ik neem de volgende maatregelen: (1)
_____

o Ik neem momenteel geen maatregelen tegen droogte (2)

Q30 Kan ik met u contact op nemen voor een interview?

o Ja, mijn e-mail adres is... (1) _____

o Nee, liever niet (2)

Q31 Mocht u nog met vragen of opmerkingen zitten kunt u deze hieronder stellen. Klikt u daarvoor alstublieft eerst het vinkje aan voordat u iets typt. U kunt meerdere vinkjes aanklikken, waardoor u zowel een vraag kan stellen als een opmerking kunt geven.

☐ Ik heb een opmerking, namelijk... (1)
_____

▢ Ik heb een vraag, namelijk... (graag met e-mail adres) (2)
_____

▢ Ik heb verder geen vragen en/of opmerkingen (3)

Q32 Ontzettend bedankt voor het invullen van de enquête! U heeft de enquête nu afgerond.

Appendix 8 Letter of consent

Consent to take part in research

- I……..voluntarily agree to participate in this research study.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that participation involves being interviewed about drought in The Netherlands and helping to create different scenarios that can be tested in a questionnaire.
- I understand that I will not benefit directly from participating in this research.
- I agree to my interview being audio-recorded.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by using synonyms and disguising any details of my interview which may reveal my identity or the identity of people I speak about.
- I understand that disguised extracts from my interview may be quoted in a bachelor thesis.

- I understand that if I inform the researcher that myself or someone else is at risk of harm they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.

- I understand that signed consent forms and original audio recordings will be retained in the personal computer of the researcher, which can be accessed by the researcher only until this summer latest.

- I understand that a transcript of my interview in which all identifying information has been removed will be retained for two years.
- I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.

- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Names, degrees, affiliations and contact details of researchers (and academic supervisors when relevant).

Peter Leliveld – Student Spatial Planning & Design

Tel: 0610642072

Email: peterleliveld@gmail.com

L.G. Horlings – Supervisor

L.G.Horlings@rug.nl

---------- ----------

Signature of participant Date

I believe the participant is giving informed consent to participate in this study

---------- ----------

Signature of researcher Date

Appendix 9 Interview questions

- Wat heeft u de afgelopen twee jaar gemerkt van de droogte, zowel vanuit het perspectief van agrarisch ondernemer als van bestuurders? Hoe heeft u dat ervaren?
- Ziet u daar veel van... dat boer zuinig omgaan met water en maatregelen nemen?
- Merkt u veel initiatieven vanuit de boeren zelf?
- Vanuit welke partij verwachten de boeren het meeste steun bij schade of bij het duurzamer maken van het bedrijf?. Deze vraag had ik ook in de enquête. Hoe ziet u dat?
- Qua enquête, wat denkt u dat de inschatting van boeren kan veranderen, welke variabele zullen een rol spelen. Bijvoorbeeld in het vorige interview hadden we het ook over dat we eigenlijk verwachten dat leeftijd misschien wel een rol speelt bij hoe serieus boeren de droogte inschatten? Ziet u dat ook zo?
- En wat kan er vanuit de LTO voor deze mensen gedaan worden? Wat probeert de LTO hierbij bij te dragen?
- En ziet u nog verandering in gewassen? Door de droogte dat mensen andere gewassen gaan verbouwen of andere manier gewassen verbouwen.
- Welke problemen levert droogte op? Is dat voornamelijk verzilting?
- Ziet u de intensiviteit van buien ook erg toenemen?
- Hoe schat u zelf in dat de boeren de toekomst van de droogte in zullen schatten?
- Dus u ziet wel voldoende kennisniveau bij de boeren om zich aan te passen en om daar mee om te gaan?
- Ziet u daarin dat er nog verschillende soorten gewassen gebruikt worden tegenwoordig? Dat mensen zich aanpassen door andere gewassen te gebruiken? Of is het voornamelijk door echt andere methodes toe te passen?
- Verwacht u veel verschillende inzichten ten opzichte van de voorgaande verwachtingen van de KNMI?
- Heeft u het gevoel dat de overheid genoeg doet om de boeren te steunen om nieuwe maatregelen te nemen?
- Hoe heeft u de laatste 2 jaar ervaren op het gebied van droogte? Ook vanuit de LTO.
- Ziet u ook dat de waterschappen de laatste jaren veel meer de richting op zijn gegaan van water vasthouden i.p.v. afvoeren bij veel neerslag?
- In welke periode denkt u dat de droogte het ernstigst is?
- Denkt u dat leeftijd, of het feit dat het een familiebedrijf is nog uitmaakt voor hoe boeren omgaan met droogte? Dat ze sneller misschien extra maatregelen zullen nemen?
- Zijn er nog steun pakketten voor de boeren zelf voor als ze ‘adaptiever’ willen worden of meer maatregelen willen nemen?
- Voelen boeren zich ook gesteund daarin… Dat ze zeggen van … we worden actief geholpen?
- Maar wordt daarin ook intensief samengewerkt met de wetenschap, om beter gewassen voor de droogte te creëren?
- Wat vond u van de enquête?
- Is niet alleen droogte het probleem maar ook heel veel neerslag tegelijkertijd?
- Zijn er maatregelen te noemen die zouden kunnen helpen om meer water vast te houden?
- Zijn er geen mogelijkheden om in bassins water op te slaan in de winter?

- Vindt u dat er genoeg aandacht is voor de situatie op Texel?
- Wat verwacht u in de toekomst qua droogte? Hoe schat u de situatie in over 10 á 20 jaar?
- Heeft de verandering van het klimaat ook nog positieve effecten voor u?
- Zou het feit dat het een familiebedrijf is nog een invloed kunnen hebben op wel of geen investeringen voor de toekomst?
- Vind u dat er vanuit de Lto en de waterschappen genoeg informatie verstrekt wordt?