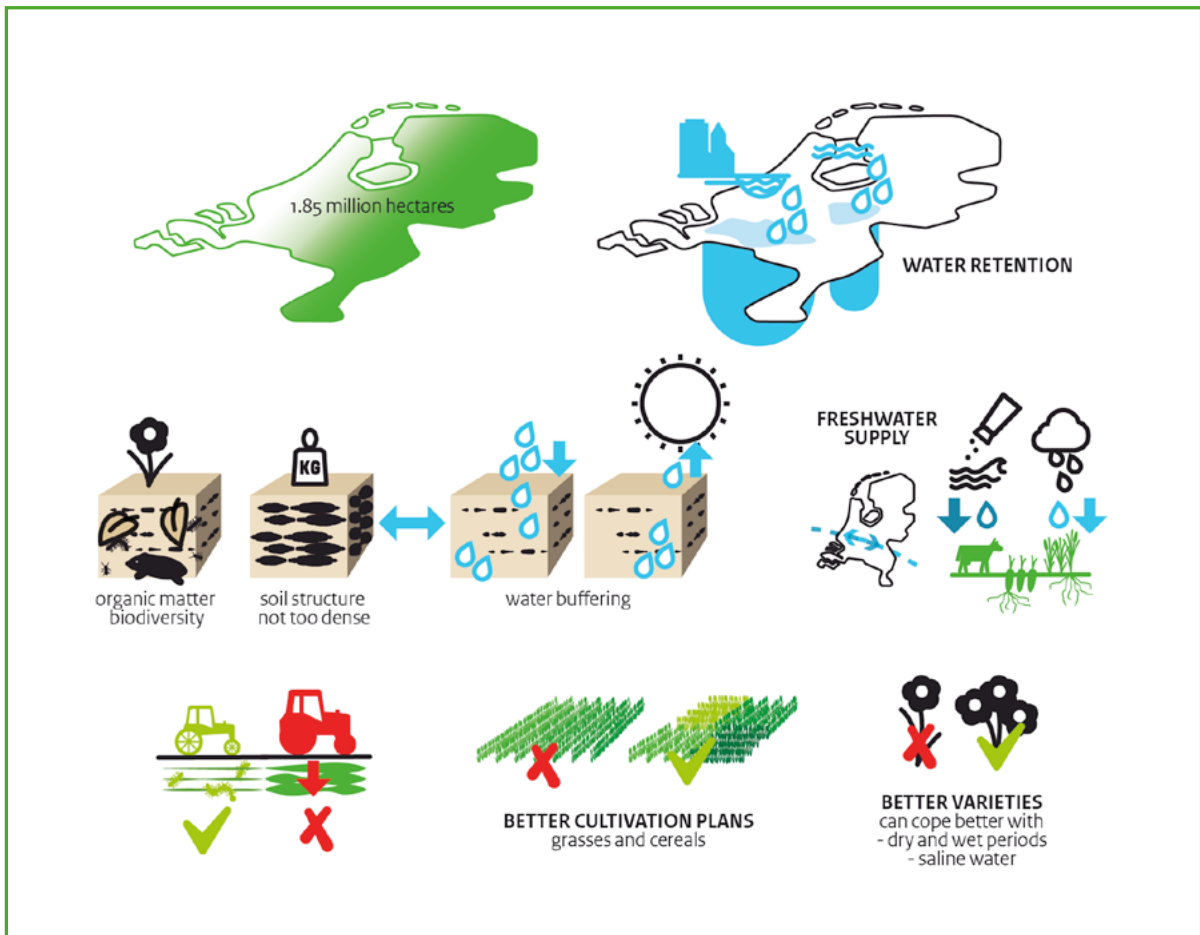




Action Programme for Climate Adaptation in Agriculture



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Preface

Dusty fields, arid grasslands and dried up ditches and streams. In the summers of 2018 and 2019, this was the picture in many areas in the Netherlands. If you didn't know better, you'd have thought you were in the south of France.

We cannot predict what the weather will be like in the coming summers. What we do know for certain is that the Netherlands will experience more extreme weather in the future. Not only heat and drought, but also very wet periods with heavy rain and hail. We are used to changeable weather in the Netherlands, and Dutch farmers are certainly familiar with it. But now the climate itself is changing. Farmers are already experiencing the effects, such as poorer harvests and damage to greenhouses and barns.

Therefore, the focus of this *Action Programme for Climate Adaptation in Agriculture* is on adapting. It shows how farmers and horticulturists can respond to changing climate conditions, by working on creating better soils and selecting plants, fruits and cultivation systems that are better able to cope with the changing climate. Farmers do not have to face these challenges alone. Nor should

they, as the impact of climate issues reaches far beyond farmyards. When it comes to the availability of fresh water, for example, regional water authorities, provinces and municipalities are reviewing together what is needed. This can vary enormously from region to region.

Climate change requires society as a whole to adapt. A lot is already being done. I have drawn up this Action Programme together with the Dutch Federation of Agricultural and Horticultural Organisations (LTO), the Ministry of Infrastructure and Water Management (I&W), the Association of Regional Water Authorities (UvW), the Association of Provincial Authorities (IPO), the Association of Netherlands Municipalities (VNG) and the Dutch Association of Insurers (VvV). Together we will keep working towards sustainable agriculture that provides us with a sufficient supply of high-quality food, provides farmers with a good income, and contributes to a healthy living environment.

Carola Schouten,
Minister of Agriculture, Nature and Food Quality

Summary

Background

The climate has changed in recent decades and this change is expected to continue even if the Paris targets are achieved. Climate change has major consequences for the Netherlands. The scenarios for 2050 published by the Netherlands Meteorological Institute (KNMI) in 2014 indicate that by 2050 the Netherlands will be warmer, wetter and possibly more prone to drought in summer, and that sea levels will have risen further. KNMI also expects that certain weather extremes, such as heat waves and heavy showers, will occur more frequently by 2050. These effects of climate change are expected to occur by 2050. But today the Netherlands already has to contend with precipitation extremes, drought, heat waves and salinisation. This has consequences for agriculture. These include:

- Reduced crop yields and/or quality loss of agricultural products due to precipitation, storms, hail, waterlogged soils and prolonged droughts in areas with insufficient availability of fresh water.
- Damage to means of production, such as greenhouses and barns, due to hail, storms or lightning.

The greater the weather extremes, the more difficult it is to anticipate them.

The climate and its development are in the spotlight. In 2018, agriculture experienced damage due to severe flooding, hail and severe drought. The 2019 growing season was also hot and dry, which particularly affected farmers in the east and south of the Netherlands on the higher sandy soils.

Farmers have been uniquely aware of the weather and climate since time immemorial and have the experience to anticipate climate change. But climate change is happening faster than expected. Extremes are occurring in quick succession. Risks are increasing. This issue transcends farmyards. It requires joint analysis and action by government authorities, farmers and chain partners.

What problems does climate change pose to agriculture?

This Action Programme focuses on open and covered cultivation and livestock farming (all farm animals). The Action Programme aims to ensure that agriculture can cope better with the effects of the trend towards wetter, warmer, and drier conditions, rising sea

levels and greater extremes (highs and lows) in river levels. The focus is on adoption to climate change; not on trying to prevent it (mitigation). That said, opportunities to link up with other measures for adaptation and mitigation will obviously be taken up.

When it comes to open cultivation, climate change can lead to salinisation, sinking groundwater levels, crops receiving too much or too little water, accelerated compaction of peatland and bogs, crop desiccation and sunscald, and new diseases and pests. These effects vary greatly per region and per soil and water system. Improvements to the soil and water system and to crops and cultivation systems can reduce the effects of climate change. Climate change can also impact covered cultivation. For example, flooding can reach crops through the soil. In livestock farming, climate change necessitates well-designed barns and areas where animals can shelter when it gets hot. In addition, transporting livestock can cause heat stress.

How can the agriculture sector adapt to climate change?

To counteract the effects of climate change, farmers can adapt their operations. The quality of the soil plays an important role in this. Many programmes at national, provincial/regional and area level are aimed at improving the quality of agricultural soils. An example of this is the National Programme for Agricultural Soils. For a number of aspects, farmers depend on other parties, such as regional water authorities, provinces and municipalities. Furthermore, the effects of climate change vary greatly from region to region. Climate adaptation therefore requires a regional approach. Cooperation on a regional scale makes it possible to jointly adopt overarching measures. Government authorities can facilitate and encourage this through measures and by removing obstacles in legislation and regulations. For effects that cannot be reduced by these efforts, (collective) risk management can be considered. Because of the economic and social importance of agriculture, the problems climate change poses to agriculture require collective action.

Climate adaptation in agriculture Challenges

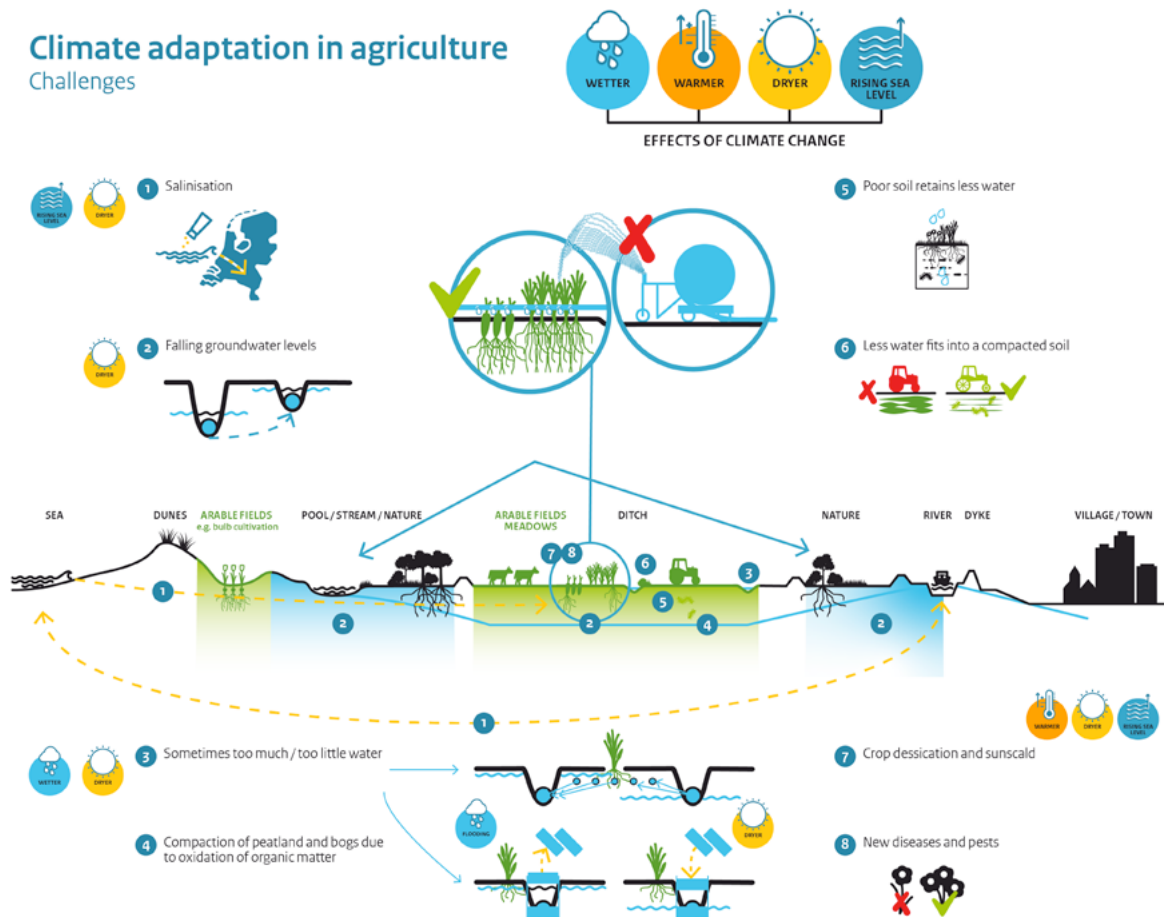


Figure 1: Outline of the climate adaptation challenges faced in open cultivation.

What is already being done?

Work on climate adaptation in agriculture is ongoing in various programmes.

National programmes include (but are not limited to) the Delta Programme for Spatial Adaptation (DPRA), the Delta Programme for Fresh Water (DPZW), the National Programme for Agricultural Soils (NPL) and the Delta Plan for Agricultural Water Management (DAW). After the drought in 2018, the Minister of Infrastructure and Water Management (I&W) set up a temporary Drought Policy Table with the Ministry of Agriculture, Nature and Food Quality (LNV) to make proposals for policy adjustments based on the experiences gained. The Drought Policy Table has since described the effectiveness of measures taken in 2018 and the economic effects of the drought, and made recommendations on various matters, including the displacement series governing the allocation of water during scarcity, groundwater, salinisation, and distribution of the water in the IJsselmeer. These are all matters that are important to agriculture. The results of the Drought Policy Table were sent to the House of Representatives in early April

2019¹. In addition to the Drought Policy Table and national public programmes, private parties, including insurers and chain parties in the agriculture sector, are also involved. Arrangements are being set up, including public-private partnerships focused on knowledge and innovation (Top Sector Programmes), soil and water management, risk management, regional agreements and pilot projects.

In 2010, the Broad Weather Insurance Scheme was set up to facilitate risk management. The Broad Weather Insurance Task Force is working on further optimising this (financial) safety net for damage that cannot be prevented by adaptive measures.

What more needs to be done?

As part of the National Climate Adaptation Strategy (NAS), and in response to the damage caused by hail and flooding in 2016 and 2017, a national dialogue on climate adaptation in agriculture was

¹ Letter to the House of Representatives on initial results of the Drought Policy Table, April 4, 2019, www.rijksoverheid.nl/documenten/kamerstukken/2019/04/04/eerste-resultaten-van-de-beleidstafel-droogte

held for the first time in the autumn of 2017 with stakeholders, including farmers, insurers and regional water authorities, which focused on flooding, damage to agriculture and insurability. A second dialogue (working conference) with the parties was held in early 2019 in response to the drought in 2018 and to further detail an approach to climate adaptation in agriculture. The central themes were water availability, salinisation, economical water use, water retention and discharge and climate-proof crops and cultivation systems. Soil management was mentioned as a crucial point, as well as focusing on the needs of farmers, involving chain partners (with respect to soil, crop protection and livestock farming), a regional approach, cooperation, knowledge and innovation (new techniques) and learning from each other in an organised way. The meeting produced many suggestions for actions. The Project Group on Climate Adaptation in Agriculture, comprising representatives of LTO, UvW, IPO, LNV and VvV, as well as representatives of the national DPRA, DPZW and NAS programmes, has developed this Action Programme partly on the basis of this input.

Action Programme for Climate Adaptation in Agriculture

This Action Programme for Climate Adaptation in Agriculture outlines what is currently being done on climate adaptation in the various national programmes and policy tables, what actions have already been planned or initiated and what additional stimulus will be provided. In line with the needs of society, this Action Programme focuses on the needs of farmers and the prospects of their businesses in relation to climate change. The focus is on specifying options for farmers, chain partners and government authorities, and on detailing the preconditions with the parties involved so that they can implement these options. These options include improving soil quality and the availability of fresh water. A key basis for these options has been provided by the National Programme for Agricultural Soils (NPL) of LNV, the Delta Programme for Spatial Adaptation (DPRA) and Delta Programme for Fresh Water (DPZW) developed under the authority of I&W and the Delta Commissioner, and the Delta Plan for Agricultural Water Management (DAW) developed by the LTO, the national government and regional water authorities.

The Action Programme specifies:

- what is already being done in national programmes for climate adaptation in agriculture;
- what additional efforts are required for agriculture within these programmes, and whether these efforts are in scope of the relevant programmes (and can therefore be addressed in there), and;
- additional stimulus on top of current programmes.

In addition, the Action Programme shows where programmes and projects interlink and where connections can be strengthened.

This Action Programme links up to the Delta Programme and the recommendations by the Drought Policy Table (the texts of both of which have been agreed upon by the parties involved).

The actions

This Action Programme has five pillars:

Pillar 1: Water System includes actions to strengthen national, regional and local cooperation on drought, flooding and water quality, including salinisation. The aim is to be prepared for drought and to prevent future crises where possible by making agriculture and nature more resilient to the effects of climate change. In addition, the aim is to limit the damage caused by the effects of climate change, such as flooding, desiccation and the deterioration of water quality. This is done by implementing the Delta Programme for Fresh Water (DPZW) and the Delta Programme for Spatial Adaptation (DPRA). To the extent that they relate to agriculture and climate adaptation, these programmes are supplemented by the recommendations of the Policy Table and the recommendations in the report on the evaluation of the water shortage crisis management in 2018 (*Evaluatie Crisisbeheersing Watertekort 2018*). In addition, agriculture will be more explicitly engaged in the policy with regard to water availability, in stress tests and in risk dialogues and the implementation programmes of the DPRA and DPZW. The practical knowledge gained by farmers and regional water authorities will be used better on a systematic basis.

Pillar 2: Soil System includes actions that link up to the National Programme for Agricultural Soils. Soil is a crucial factor in making agriculture climate-proof. Improving the soil structure and applying soil measures increases the water-retaining capacity of farming soils. In addition, improving soil quality in the broadest sense (physical, chemical and biological) can support crops in coping with extreme weather conditions. To this end, sustainable management of agricultural soils is being made measurable, and the Soil Summit in September 2019 has been used to foster climate adaptation.

Pillar 3: Crops and Cultivation Systems links up to the Vision for the Future of Plant Protection by 2030, focused on making plants and cultivation systems resilient (*Toekomstvisie gewasbescherming 2030, naar weerbare planten en teeltsystemen*). This vision for the future is an important basis for achieving climate-proof crops and cultivation systems. In addition, Pillar 3 provides a pre-competitive stimulus for the development and preservation of starting materials. It develops knowledge about adaptive cultivation systems and, where necessary, improves regulations with regard to measures to protect against frost and extreme showers, such as hail covers.

Pillar 4: Livestock Farming focuses on climate adaptation for all farm animals, such as dairy cattle, pigs and poultry. These animals will experience more heat and UV radiation. They may also be exposed to new animal diseases as a result of climate change.

Climate adaptation will be included in the Benchmark for Sustainable Livestock Farming (*Maatlat duurzame Veehouderij*) and the policy for new barn systems.

Pillar 5: Supporting Instruments specifies three supporting instruments: 1) regional approach, 2) knowledge and innovation, and 3) risk management. These instruments cut across the other four pillars and provide comprehensive support for the goals in each of these pillars. The regional approach will be strengthened by increasing the focus on soil and climate adaptation in the Delta Programme for Agricultural Water Management (DAW) and by utilising current pilot projects and area processes for climate adaptation. In addition, LNV is working with the parties involved to draw up a knowledge agenda for climate adaptation in agriculture. Knowledge dissemination and risk management within the agricultural business community will be further strengthened. Farmers taking preventive measures will be the basis for climate-proof management of business risks. A knowledge platform will be set up to support farmers. Despite all efforts, extreme weather events will continue to cause damage to farming operations in the future. Farmers can often take out insurance to cover this, for example through the Broad Weather Insurance Scheme. This Action Programme provides for the further development of this insurance scheme for the period 2021-2027. Furthermore, the Action Programme explores possibilities for setting up private savings facilities and options for dealing with flooding ensuing from the water system as a result of extreme precipitation.

Introduction

Why is an Action Programme for Climate Adaptation in Agriculture needed?

The climate has changed in recent decades and this change is expected to continue even if the Paris targets are achieved. Climate change has major consequences for the Netherlands. The scenarios published by the Netherlands Meteorological Institute (KNMI) in 2014 indicate that by 2050 the Netherlands will be warmer, wetter and possibly more prone to drought in summer, and that sea levels will have risen further. KNMI also expects that certain weather extremes, such as heat waves and heavy showers, will occur more frequently by 2050. These effects of climate change are expected to occur by 2050. But today the Netherlands already has to contend with precipitation extremes, drought, heat waves and salinisation. This has consequences for agriculture.

These include:

- Reduced crop yields and/or quality loss of agricultural products due to precipitation, storms, hail, waterlogged soils and prolonged droughts in areas with insufficient availability of fresh water.
- Damage to means of production, such as greenhouses and barns, due to hail, storms or lightning.

The greater the weather extremes, the more difficult it is to anticipate them.

The urgency of climate adaptation has increased in recent years due to weather extremes

Climate change is regularly making headlines. In recent years (2016-2018) agriculture has suffered damage due to heavy flooding and hail, as well as exceptional drought in summer. The drought was caused by a combination of a long period of hot weather, insufficient precipitation and insufficient inflow of surface water via the Rhine. The Netherlands is well prepared for drought. The measures taken in recent years, partly based on lessons learned from previous droughts, proved to be effective in 2018. The Delta Programme for Fresh Water (DPZW) aims to improve the availability of water in the Netherlands on a systematic basis. Under the current programme of freshwater measures, the government authorities and water users involved are investing €400 million, including in the IJsselmeer buffer, the water supply to the western Netherlands, water retention in areas with sandy soils in the eastern and southern Netherlands, groundwater reservoirs under agricultural land, more efficient irrigation and smarter water management. Nevertheless, problems occurred in 2018. Examples were the salinisation of the IJsselmeer and Amsterdam-Rhine Canal, falling groundwater levels in the east and south of the country and the effects of low water levels in rivers and canals on the transport chain. Due to the drought, agriculture experienced

problems and damage that affected cultivation, harvesting and the storage of products. It is estimated that the economic impact of the 2018 drought on Dutch agriculture totalled between €820 million and €1,400 million (Ecorys, 2019). This means that agriculture was the sector most heavily impacted by the drought, which overall had an economic impact of between €900 million and €1,650 million. Following the drought, the Minister of Infrastructure and Water Management (I&W) established a temporary Drought Policy Table to evaluate the 2018 crisis approach and make proposals for policy adjustments. LTO advised the policy table through the Physical Living Environment Consultation Body (OFL), which consists of representatives of interest groups.

The Drought Policy Table has since described the effectiveness of measures taken in 2018 and the economic effects of the drought, and made recommendations on various matters, including the displacement series governing the allocation of water during scarcity, groundwater, salinisation, and distribution of the water in the IJsselmeer. These are all matters that are important to agriculture. These results were sent to the House of Representatives in early April 2019. In late 2019, the policy table adopted recommendations on the remaining matters, such as water distribution during a crisis, (climate-proof) agriculture and the relationship with water quality¹. These recommendations include, among other things, introducing a ban on daytime sprinkler irrigation, granting exceptions to rules on manure and CAP greening, and the possible need to develop new irrigation systems for agriculture.

The temporary Drought Policy Table underlines the importance of climate adaptation for agriculture. It is important to prepare for and take measures that are needed in the short term, and also to prepare for and have the ability to take necessary measures in the longer term.

Social need and collaboration

As part of the National Climate Adaptation Strategy (NAS), and in response to the damage caused by hail and flooding in 2016 and 2017, a national dialogue on climate adaptation in agriculture was held for the first time in the autumn of 2017 with stakeholders, including farmers, insurers and regional water authorities, which focused on flooding, damage to agriculture and insurability. A second dialogue (working conference) with the parties was held in early 2019 in response to the drought in 2018 and to further detail an approach to climate adaptation in agriculture. The central

¹ Final report of the Drought Policy Table, 18 December 2019, <https://www.rijksoverheid.nl/documenten/rapporten/2019/12/18/eindrapportage-beleidsstafel-droogte>

themes were water availability, salinisation, economical water use, water retention and discharge and climate-proof crops and cultivation systems. Soil was mentioned as a shared concern, as well as focusing on the needs of farmers, a regional approach, cooperation, knowledge and innovation (new techniques) and learning from each other. After the conference, the Project Group on Climate Adaptation in Agriculture, which includes relevant parties such as farmers and regional water authorities, set to work to develop this Action Programme.

Focus of the Action Programme

In line with social needs, the needs of farmers and the prospects of their businesses in relation to climate adaptation are central to this programme. The focus is on specifying options for farmers, chain partners and government authorities, and on detailing the preconditions with the parties involved so that they can implement these options. These options include improving soil quality and the availability of fresh water. A key basis for these options has been provided by the National Programme for Agricultural Soils (NPL) of LNV, the Delta Programme for Spatial Adaptation (DPRA) and Delta Programme for Fresh Water (DPZW) developed under the authority of I&W and the Delta Commissioner, and the Delta Plan for Agricultural Water Management (DAW) developed by the LTO, the national government and regional water authorities.

Contents of the Action Programme

This Action Programme for Climate Adaptation in Agriculture outlines what is being done in the various national programmes on climate adaptation, as well as the actions planned or already initiated to this end for the coming years. It indicates which actions specifically taken on agricultural climate adaptation are within scope of these programmes. In addition, the Action Programme specifies additional actions. This Action Programme has been drawn up for farmers, agricultural chains and government authorities. The Action Programme is an elaboration of the agriculture policy objective set out in the National Climate Adaptation Strategy (NAS, 2016) and its implementation programme (UP NAS 2017-2019). This Action Programme links up to the Delta Programme and the recommendations by the Drought Policy Table (the texts of both of which have been agreed upon by the parties involved).

Targets and target terms

The Action Programme for Climate Adaptation in Agriculture focuses on the following goals:

- By 2030, all entrepreneurs in agriculture and horticulture will be prepared to deal with climate change in a sustainable and effective way².

² 'In a sustainable and effective way' means that farmers take targeted measures in the context of adapting to climate change in such a way that the continuity of their business is safeguarded, within the requirements of society with regard to sustainable production.

- By the end of 2021, the risks, bottlenecks and opportunities with respect to climate adaptation will have been identified for each sector and type of land use in agriculture by conducting a review of water availability, stress tests and risk dialogues, and policy instruments will have been prepared or deployed to resolve the bottlenecks and seize the opportunities.

The time horizons for the climate scenarios of the Royal Netherlands Meteorological Institute (KNMI) are set around 2050 and the end of the 21st century.

In 2021, KNMI will update the new insights, based in part on the IPCC report due to be published in 2021. In 2023, KNMI will publish the new scenario table for professional users. The new insights will be incorporated into agricultural climate adaptation policy, so that they can be taken into account in the adjustment of relevant plans at different levels.

A revision of the Action Programme in 2022 is planned on the basis of new scientific insights and the results of the review of water availability, the stress tests and the risk dialogues. Appendix 1 provides an overview of related policy goals.

Approach

What are we going to do to make agriculture climate adaptive?

The Action Programme offers options that farmers, chain parties and government authorities can implement to deal with the four trends (wetter, drier, warmer and rising water levels) and weather extremes. At present, farmers and government authorities can already use available options for dealing with weather extremes like hail, storms, flooding and drought. These options are also described in this Action Programme.

Duration

The Action Programme is a multiannual programme that runs up to 2030. It will be evaluated and adjusted before its end date.

Scope

The Action Programme focuses on agriculture and horticulture, with an emphasis on open cultivation (arable farming, outdoor horticulture, bulb growing, fruit growing and tree nurseries) and livestock farming. Greenhouse horticulture is included because this sector is also affected by climate change, albeit in a different way than open cultivation. The focus of the Action Programme is on adaptation, not on trying to prevent climate change (mitigation). That said, opportunities to link up with other measures for adaptation and mitigation will obviously be taken up.

Pillars

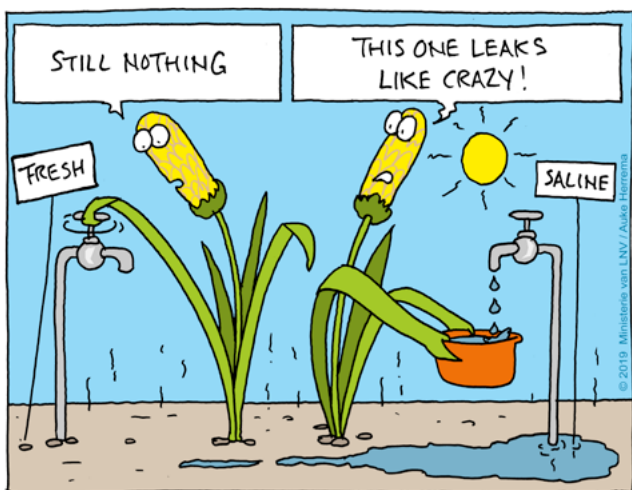
The pillars Water System, Soil system, Crops and Cultivation Systems, Livestock Farming and Supporting Instruments are central to the approach to making agriculture more climate-proof. For these matters, the challenges and actions will be specified, as well as the party or parties implementing them and the target terms.

The five pillars of the Action Programme

The following sections describe the five pillars of this Action Programme: the Water System, the Soil System, the Crops and Cultivation Systems, Livestock Farming and the Supporting Instruments. For each pillar, the challenges and the actions needed to achieve more climate-adaptive agriculture are specified.

Pillar 1: Water System

The aim of pillar 1 is to be prepared for drought and to prevent future crises where possible by making agriculture and nature more resilient to the effects of climate change. In addition, the aim is to limit the damage caused by the effects of climate change, such as flooding, desiccation and the deterioration of water quality. The availability of water is being improved through economical use, better retention and smarter distribution of water. This also links up to the issues of water quality and salinisation.



Agriculture and drought

The Drought Policy Table has made various recommendations that are relevant to climate adaptation in agriculture.

In 2019, explanatory information was added to the national displacement series governing the allocation of water during scarcity to ensure that this displacement series can be applied more effectively – both nationally and regionally – and this explanatory information will be further detailed in 2019 and 2020. In doing so, the interests of agriculture, such as those of capital-intensive crops, will be taken into consideration in a transparent manner.

LNV aims to ensure that it is well-prepared for taking emergency measures in the event of any climate-related crises, so that quick action can be taken if necessary. For example, LNV and the Netherlands Enterprise Agency (RVO) are setting up sector consultations for the agriculture and nature sectors. This serves as an example of how to implement the action advised by the Drought Policy Table to organise a 'pilot light organisation' for the agriculture, industrial and energy sectors that consults on important issues in the 'cold phase', so as to enable quick action and quick implementation of the consultation structure in the event of drought and water shortages. An important point to consider in setting up of this sector consultation is how good lines of information can be established between the agricultural sector and the water managers, both at national and regional level.

The Delta Programme for Fresh Water (DPZW) ensures proper preparations of the communications in the event of a drought or imminent drought. This gives farmers an insight into the availability of fresh water and the risks of drought and how they can anticipate these risks.

Furthermore, water managers and provinces are more explicitly linking up the groundwater and surface water systems to ensure active management of water stocks. In areas with an inflow of surface water, the regional water authorities in these areas will supply extra water where necessary and possible. In areas without an inflow of surface water, the regional water authorities and landowners will take measures to retain and infiltrate water as much as possible. In this way, groundwater can be replenished as much as possible in good time during periods of excess precipitation, which ensures its availability in times of drought, including for agricultural use.

In collaboration with LNV and regional water authorities, the eastern and southern provinces of the Netherlands are mapping the effects of groundwater withdrawals on the management of water stocks, and drawing up a plan for monitoring and managing the groundwater stocks.

As part of the Smart Water Management project under the DPZW 2019, water managers have agreed to adopt harmonised lines of reasoning and to make cross-management agreements on the joint distribution of water in the case of imminent or acute water shortages, flooding or salinisation.

The IJsselmeer is the most important freshwater buffer of our country. The Drought Policy Table has recommended that the distribution of water between the various types of use, the

margins in this distribution and the relationship with water level management should be well documented. In 2019, administrative agreements were made regarding the distribution of water during the 2019 drought season.

In 2019-2020 the Administrative Platform for the IJsselmeer Region (BPI) will conduct a joint fact-finding study with all stakeholders into the robustness of the IJsselmeer region, so as to better map the margins in the main water system, in regional water systems and in the water demand of users, such as agriculture. The provinces that include areas at higher elevations with sandy soils are researching the exchange of water between the soil and atmosphere and the moistness of the soil. In the future, this will help to make better decision in whether to retain or discharge water.

In cooperation with LNV and LTO, DPZW is developing knowledge about the effects of water availability on crop yields. This knowledge is made available to farmers and agricultural professionals. The Ministry of Infrastructure and Water Management (I&W) is improving calculations of the drought-related economic damage to agriculture in 2018.

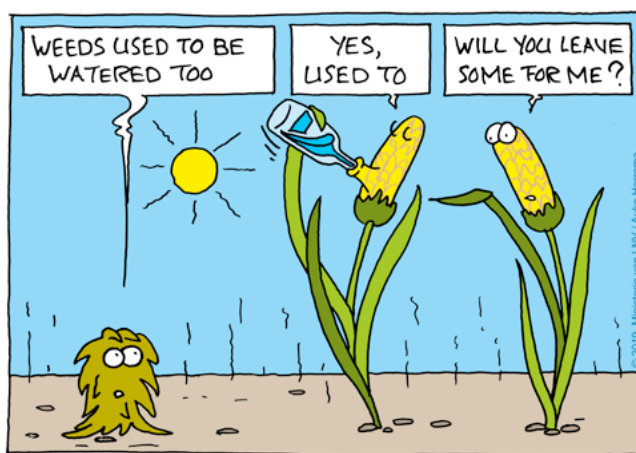
Drinking water companies, water managers and provinces are taking operational and infrastructural measures to safeguard the inflow of water as effectively as possible in times of drought. To this end, the relationship with the scope for water withdrawal under the permits is also taken into account. It is relevant for various parties to know the current salinity of surface water. The current salinity in the main water system is published via <https://waterinfo.rws.nl/#!/kaart/zouten>.

In periods without precipitation, the Netherlands is largely dependent on surface water flowing in from Germany and Belgium, especially via the Rhine and Meuse. In 2019 and 2020, I&W will use the regular cross-border river basin consultations between the Dutch national government and regional water managers (Rhine Ministerial Conference) to put drought effects and measures on the agenda and to include them in the cross-border river basin management plans.

Action: Development of water demand viewer
On behalf of LNV, the Netherlands Enterprise Agency (RVO) launched the development of the water demand viewer (drought viewer) in 2019, the first version of which will be operational in 2020. As part of LNV's preparations for possible new droughts in 2019 and subsequent years, LNV has made the RVO's data and geographic information system (GIS) centre 'drought crisis-proof' so that they can provide data and maps to regional water managers for more informed decisions on sprinkler irrigation bans and exemptions to those bans. This will enable water managers to make more informed decisions about matters such as irrigation bans and exemptions to those bans in a drought.

Action: Assessment of drought measures for agriculture 2018
During the drought in 2018, exemptions were applied to policy rules on manure and greening measures under the EU's Common Agricultural Policy. In addition, instead of a total ban on sprinkler irrigation, it was decided to adopt a daytime sprinkler irrigation ban for certain areas. In 2019, the Drought Policy Table assessed whether these measures are suitable for application in future similar droughts.

Action: Research into the need for new irrigation systems
In response to the Drought Policy Table, LNV is examining whether agriculture needs to develop new irrigation systems to use water more efficiently, particularly during droughts.



Improving water shortage crisis management

In response to the drought, the crisis approach was also evaluated. The findings of the report on the evaluation of the water shortage crisis management in 2018 were sent to the Dutch House of representatives in late April 2019¹.

The report found that the crisis management organisation operated successfully.

The LCW, MTW, RDOs², I&W, LNV, provinces and water managers will further improve information management. They increase awareness of the crisis approach and further strengthen crisis communications by means of additional communication (resources) on water distribution, drought effects, groundwater availability, water quality and regional differences.

¹ Letter to House of Representatives on evaluation of water shortage crisis management in 2018, 25 April 2019, www.rijksoverheid.nl/documenten/kamerstukken/2019/04/25/evaluatie-crisisbeheersing-watertekort-2018

² LCW: National Coordinating Committee for Water Distribution (*Landelijke Coördinatiecommissie Waterverdeling*);
MTW: Water Shortage Management Team (*Managementteam Watertekorten*);
RDO: Regional Drought Consultation Body (*Regionaal Droogte-overleg*)

There are good examples of climate adaptation in agriculture and the water system that deserve to be adopted more widely:

- Underground storage (buffering) of surface water (for example by tomato grower Prominent in collaboration with KWR, 's-Gravenzande, codema.nl/ondergrondse-wateropslag-helpt-tegen-wateroverlast)
- Rain-Levelr approach, where horticulturists help local residents to keep dry feet by freeing up space in their rainwater reservoir or silo before heavy rainfall to prevent sewage overflow. They do this on a voluntary basis. (for example in the area of Delfland, where the regional water authority pays on allowance for this, rainlevelr.com)
- The Regional Freshwater Scan (*Regioscan Zoetwater*) gives farmers an indicative overview of the costs and benefits of freshwater measures, such as adjustable drainage, water storage in the soil and drip irrigation. In the first phase, the effectiveness of the instrument has been examined in two study areas: the Raam catchment area (Aa en Maas Water Authority) and the polders of Anna-Paulowna and Oostpolder (Hollands Noorderkwartier Water Authority). In the second phase, an improved version will be applied in two further study areas (Chaamse Beken, Brabantse Delta Water Authority, and Twello, Vallei en Veluwe Water Authority). <https://www.stowa.nl/publicaties/regioscan>
- Making agreements about groundwater level through an area approach (following the example set by the pilot project of De Stichtse Rijnlanden Water Authority (HDSR) on subsidence in peat meadow area, www.hdsr.nl/beleid-plannen/veenweide)
- Use of other irrigation techniques, by individual entrepreneurs (using more efficient sprinkler irrigation methods, using drip irrigation, applying precision agriculture), and also collectively through an area approach (e.g. Spaarwater drip irrigation method, www.spaarwater.com/nw-27227-2/nieuws/druppelirrigatie)
- Smart, sustainable and practical solutions to water issues,

including maintaining the freshwater lens at an adequate level, freshwater storage, water management, etc.

(Example: Spaarwater project, www.spaarwater.com/pg-27227-7-101931/pagina/versterken_neerslaglens.html).

- Applying more digital and technological developments (e.g. the ZLTO's sprinkler irrigation signal app, www.zlto.nl/beregeningssignaal)
- Focusing on water reuse (e.g. reusing effluent from sewage treatment plants in agriculture to prevent crop damage in dry periods, www.waterwinst.nl/project/bavaria-bierboer-water)
- Enabling farmers to measure the chloride content of surface water and to provide this data to their regional water authority in connection with the water intake (e.g. farmers measure water in Noordelijk Zandgebied in cooperation with Hollands Noorderkwartier Water Authority (HHNK), www.greenity.nl/nieuws/telers-noordelijk-zandgebied-meten-zoutgehalte-water)
- Applying smart water management in relation to flushing in connection with salinity (e.g. cooperation on Amsterdam-Rhine Canal and North Sea Canal during the drought in 2018, www.slimwatermanagement.nl/nieuws/nieuwsbe-richten/effectieve)
- Setting up a desk for administering the relevant money flows to farmers, including assisting farmers through 'farmyard coaches'. (e.g. portal of Hollands Noorderkwartier Water Authority, landbouw-portaalnoord-holland.nl, and 'Bodem Up' in Noord-Brabant, www.zlto.nl/bodemup)
- Freshwater incentive schemes (e.g. water-saving scheme of Rivierenland Water Authority in cooperation with LTO, www.waterschaprivierenland.nl/cvdr/CVDR603146_2/Stimuleringsregeling+waterbesparende+maatregelen+agrari%C3%ABrs.html, 'Protecting Agriculture and Nature' scheme of Vechtstromen Water Authority, www.vechtstromen.nl/over/landbouw-water/landbouw-peil).

Delta Programme for Fresh Water (DPZW)

By determining the availability of water through dialogue and analyses, government authorities and water users jointly create a transparent overview of the current and future situation, discuss possible optimisations, and make agreements on measures to be taken by government authorities and water users. In this way, they work towards an efficient and broadly supported balance between water supply and demand. Through the Delta Programme for Fresh Water (DPZW) all government authorities and water users involved invest in water availability through economical use, better retention (i.e. buffering) and smarter distribution of water. This involves substantial investments in both the main water system and the regional water systems. Water availability is a shared responsibility of water managers and users. Cooperation between water managers and farmers will be further strengthened by involving agriculture more closely in the detailing of measures on water availability. This is managed by the six

freshwater regions: West-Nederland, Hoge Zandgronden Oost, Hoge Zandgronden Zuid, IJsselmeergebied, Zuidwestelijke Delta and Rivierengebied. The goal is to further strengthen the area programmes, in which the activities of the water managers and those of the farmers are programmed, funded and achieved in an integrated way (by efficiently combining work). Wherever it makes sense, room to 'get involved' is offered to other parties, such as organisations that manage nature areas.

Economical use of water is important. Agriculture plays an important role here. Some of the new delta scenarios predict that the surface area requiring sprinkler irrigation will increase by around 55 to 60% by 2050 (autonomous development). Water managers and water users, including the agriculture sector (both sector organisations and individual entrepreneurs) are working together on optimising the regional water system, active soil management and self-sufficiency and circularity among entrepre-

neers. To this end, the water managers are creating a transparent overview of the availability of water in periods of drought. This also makes it clear to users which effects of (extreme) climate-related events are at their own risk. This approach is strengthened by linking up to the Delta Plan for Agricultural Water Management (DAW).

Delta Programme for Spatial Adaptation (DPRA)

Under the Delta Programme for Spatial Adaptation (DPRA), all government authorities have started or will start work on the stress test and risk dialogue, and they will draw up implementation programmes by the end of 2020. The stress test examines the vulnerability of the whole of the Netherlands to flooding, heat waves, drought and inundation. This includes the effect on agricultural land of both heavy rainfall and water shortages (groundwater seepage, limited inflow of surface water and/or salinisation). Following the risk dialogue between government authorities, sectors and private individuals, ambitions will be defined and it will be determined how to allocate the related measures and risks to each of the actors. Based on this, regional implementation programmes will be drawn up. In doing so, the interactions between built-up areas and the countryside will be utilised together with the sectors (e.g. water storage or buffering in the countryside as a water management service). To this end, optimal use will be made of the knowledge gained in recent years on freshwater availability.

Action: Providing better information and organising risk dialogues in agriculture

Through stress tests, water managers (municipalities, regional water authorities and provinces) provide insight into the vulnerability of areas and sub-areas. In the risk dialogues, they will engage in discussions with water users, including farmers, about their expectations of the capabilities of water managers to optimise the water supply, and about the measures water users can take themselves. This happens both prior to and during extreme weather situations, such as droughts. Based on this, users can take measures, seek alternatives, and discuss an effective approach to climate adaptation with water managers. To this end, the knowledge gained about water availability through the DPZW will be widely used. As part of the DPRA, resources will be developed for the risk dialogue. In addition to the participants to the DPRA, LNV, the Ministry of Economic Affairs (EZK) and LTO will also be involved in this approach.

Action: Holding a meeting on the countryside in relation to the DPRA

In order to better link up the focus on the countryside (agriculture and nature) to the area processes of the DPRA (stress tests, risk dialogues and implementation agendas), LNV will together with the DPRA organise a meeting with the stakeholders involved in early 2020. The goal is to get a good picture of what is being done with respect to climate adaptation in the countryside in the DPRA processes, and to identify if and where additional efforts are needed.

Action: Informing farmers about the DPRA approach
In cooperation with other parties, including LTO, the DPRA will inform the decentralised government authorities and entrepreneurs in the sectors involved about the approach and tools.

Nature-agriculture interaction

Retaining water in preparation for droughts and temporarily storing water when extreme showers or flooding occurs not only requires a strong water system, but also a resilient and robust natural environment. It requires that the natural environment has characteristics, such as a natural range of ecosystems and robust connections, through which it can cope with the pressure of climate change. In this way, nature can be part of the solution to the problem of climate adaptation, also in sectors other than agriculture.

Possible measures that can be taken in this respect are:

- creating climate buffers, so that when water courses are high, excess water can be stored for future use in droughts (water storage in natural reservoirs, and slowing down rapid water discharges),
- restoring meandering streams, so that water is discharged less quickly,
- creating retention reservoirs and preserving the capacity of raised bogs to soak up water.

An action programme is also being developed for climate adaptation in nature. It will focus on the possible actions that can be taken by government authorities (provinces, regional water authorities), nature managers and farmers (nature-inclusive agriculture) to make the hydrological regime and nature's role in it more sustainable.

Pillar 2: Soil System

Soil is seen as a crucial factor in making agriculture climate-proof. Improving the soil structure and applying soil measures increases the water-retaining capacity of farming soils. In addition, improving soil quality in the broadest sense (physical, chemical and biological) can support crops in coping with extreme weather conditions.

National Programme for Agricultural Soils (NPL)

With the National Programme for Agricultural Soils (NPL), LNV is working on systematically improving agricultural soils in the Netherlands.

The main goal of this programme is that all agricultural soils are managed sustainably by 2030. This is beneficial to soil fertility and serves as the basis for tackling a number of important social challenges:

- Climate challenge, increasing carbon storage.
- Climate adaptation, ensuring better water buffering in case of extreme drought and precipitation.
- Improving water quality and the soil's purification capacity.
- Increasing biodiversity; underground biodiversity is one of the factors that determines above-ground biodiversity.

We are working with private and public parties on this national agricultural soil programme to achieve the main goal. This programme will be detailed along four tracks (see also the letter to the House of Representatives of 25 April 2019 on the NPL, Parliamentary Paper 30015, no. 58):

- **Knowledge.** The aim is to develop and disseminate knowledge about the measures to be applied in sustainable soil management, carbon capture and broad soil quality (nutrients and carbon, soil structure and soil life).
- **Policy.** Where necessary, policies of the national government (including with regard to the new Common Agricultural Policy, the review of the policy on agricultural leases and the review of manure policy) will be adjusted to provide positive incentives for sustainable soil management.
- **Agricultural chain.** The highly productive agricultural system raises dilemmas in choosing between short-term and long-term interests. Entrepreneurs need to keep their businesses going by earning as much revenue as possible. It is not always easy to reconcile this imperative with the need for long-term investments to ensure good soil quality. The aim is to work with parties to develop innovations to facilitate the necessary transitions.
- **Regional.** Regional initiatives for better soil management are being strengthened, expanded and supported.

What can farmers do to ensure soils have good water-retaining properties?

- minimising soil tillage and reducing its intensity: no tillage or non-turning tillage
- intercropping and using lighter machinery
- crop rotation with cover crops (such as cereals or grasses) and new crops (e.g. sorghum)
- growing catch crops and green manures
- minimising ploughing of grassland, creating herb-rich grassland, using deeper-rooting varieties
- using solid manure/compost with a high organic content, straw and crop residues

Organic matter is important for good adaptive soil

- better infiltration, less flooding
- more water storage and better moisture-supplying capacity
- less erosion and compaction
- better soil aeration and soil moisture and soil is easier to till
- greater soil resilience and soil biodiversity

Soil and Subsoil Implementation Programme

In addition, the Soil and Subsoil Implementation Programme (of the Ministry of Infrastructure and Water Management (I&W) includes actions aimed at climate adaptation in agriculture. In 2017, example projects relating to climate adaptation in the countryside were made accessible. In addition, the possible actions have been outlined that can be taken to deal with subsidence in the countryside, and the Enriching Agriculture Programme has been launched. The aim of this programme aims is to introduce an adapted agricultural system with a positive impact on land use, soil quality and climate resilience.

Climate change and peat meadows

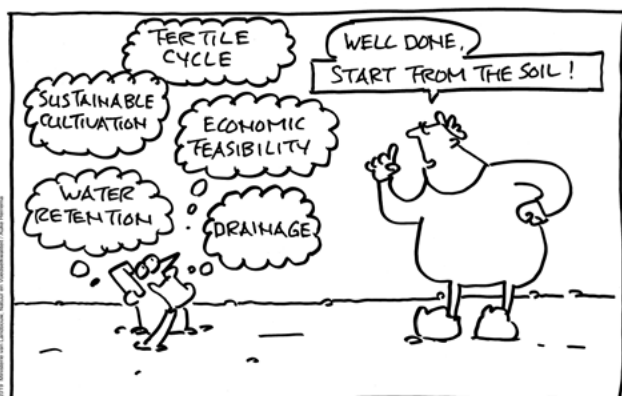
Rising sea levels and drought are exacerbating the problems of salinisation and subsidence. Salinisation and subsidence can reduce agricultural yields. These effects occur in the peat meadow areas. In these areas, subsidence also causes the emission of greenhouse gases. These adverse effects can be reduced by raising the groundwater level and taking a mix of other measures, such as underwater drainage techniques and exploring new revenue models based on the cultivation of wet crops and monetising CO₂. Applying such measures gives agriculture in peat meadow areas the prospect of being able to adapt to these specific effects of climate change. Both the Delta Programme and the National Programme for Agricultural Soils promote the implementation of these measures.

Action: Making sustainable management of agricultural soils measurable

In 2019, a start was made on making the target for sustainably managed agricultural soils measurable. Climate adaptation is part of sustainable management. In 2019, a start was made on conducting a baseline measurement of the status of agricultural soils in the Netherlands. To this end, an unambiguous set of measuring instruments for soil quality and soil management is being developed together with stakeholders.

Action: Climate Adaptation in the Soil Summit 2019

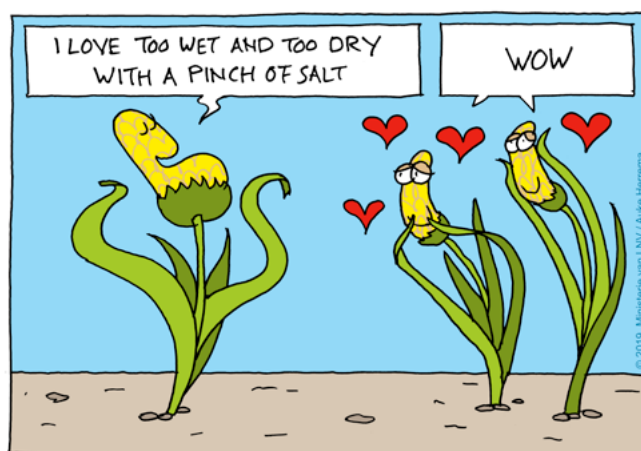
In September 2019, LNV organised a broad soil summit for stakeholders and initiators, in order to widely disseminate the programme and, above all, facilitate the exchange of knowledge and experiences. During this summit, LNV highlighted climate adaptation in agriculture. The Soil Summit will in future be organised annually to monitor the progress made towards achieving the target of managing all Dutch agricultural soils sustainably by 2030.



SOIL QUALITY

Pillar 3: Crops and Cultivation Systems

Besides having good soil and sufficient fresh water, it is important that farmers are able to select and use robust – climate-proof – crops and cultivation systems. Crops that are (more) resilient to diseases and pests, for example, but also to drought and flooding. As part of the process of adapting to weather extremes and other effects of climate change, such as salinisation, farmers may decide to switch to other cultivation methods or crops, such as intercropping, saline-tolerant vegetables, or crops that thrive in dry or wet conditions. In preparation for or during prolonged droughts, and in order to conserve natural resources in line with LNV’s vision for circular agriculture, farmers are also expected to use water economically when producing food products. These and other aspects relating to adaptation to the effects of climate change in agriculture are central to this pillar.



Resilient plants and cultivation systems

In order to achieve climate-proof crops and cultivation systems, this will be linked up to the Vision for the Future of Plant Protection by 2030, focused on making plants and cultivation systems resilient to climate change (*Toekomstvisie gewasbescherming 2030, naar weerbare planten en teeltsystemen*).

The goal of this vision is that by 2030, Dutch agriculture and horticulture will involve sustainable production with resilient plants and cultivation systems, which will give far fewer opportunities to diseases and pests and help to avoid the use of plant protection products as much as possible. Whenever plant protection products are used, this will be done in line with the principles of integrated plant protection (IPM), virtually without emissions into the environment and virtually without residues. This in turn will create an enduring economic perspective for agriculture and horticulture.

This vision has three strategic goals:

1. Plant and cultivation systems are resilient.
2. Agriculture, horticulture and nature are connected.
3. Virtually no emissions into the environment and virtually no residues on products.

Achieving the goals ‘Plants and cultivation systems are resilient’ and ‘Agriculture, horticulture and nature are connected’ is important to be able to make crops and cultivation systems more climate-proof.

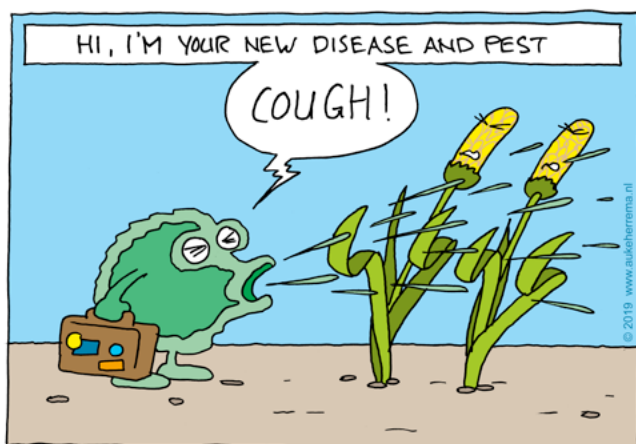
By 2030, plant protection will be based on *resilience*: crops are able to take some punishment, while cultivation systems are largely self-regulating. As a result, diseases and pests will have fewer opportunities, reducing the need to intervene to a minimum. Wherever necessary, ‘smart’ adjustments will be made, meaning that they are as specific with regard to time and place as possible and as ‘green’ as possible. The resilient, robust systems will have intrinsic resilience to more extreme weather conditions caused by climate change (drought or flooding) or will be physically protected against them (covered cultivation). Optimum soil quality is an important basis for the resilient cultivation system and growers

will take this into account in their operations in order to preserve it. These yet-to-be-developed robust production systems will lead to greater continuity in yields and quality, and will strengthen relationships in the chain as a result.

Agriculture, horticulture and nature are connected. Connecting agriculture, horticulture and nature is an important part of circular agriculture, as described in LNV's entitled 'Agriculture, Nature and Food: Valuable and Connected' (*Landbouw, Natuur en Voedsel: Waardevol en Verbonden*). Utilising (functional agricultural) biodiversity on and around agricultural land also contributes to making plants and cultivation systems resilient.

Breeding climate-proof and resistant crops

In order to achieve a robust and sustainable cultivation system, it is important to develop new crops. The plant breeding sector is constantly working on new crops that are resistant to diseases and pests and better able to cope with changing climate conditions. To this end, mainly conventional breeding techniques are used. The use of new breeding techniques, such as CRISPR-Cas, can accelerate the development of new crops. This is important for the ambitions on sustainable climate-adaptive agriculture, particularly where there are major challenges around crop protection or drought, heat and salinisation. A basic principle in expanding the application possibilities of new techniques is that no species boundaries may be crossed. It should be emphasised that this concerns forms of breeding that can also be achieved using conventional techniques, but which can now be achieved more precisely and more quickly. At present, this requires full authorisation under the European Directive on Genetically Modified Organisms. The Netherlands advocates a revision of this Directive at the European level. The call for this to be included in the work programme of the new European Commission has been supported by a majority of EU member states (Agriculture and Fisheries Council of 14 May 2019).



In addition, LNV is working on an adequate (knowledge) infrastructure and legislation and regulations. This will provide the basis for good plant breeding. LNV carries out this incentive policy in part through the Horticulture and Starting Materials Top Sector Programme. The development of starting materials is the

responsibility of the breeding companies. These companies are tailoring their breeding approaches to climate adaptation, such as with respect to resistance to diseases/pests or drought, in order to develop new crops suited to local conditions. The breeding sector operates internationally, has a solid revenue model and access to knowledge from other countries in the field of climate and abiotic and biotic stress factors. This approach is also supported for arable farming and open field cultivation, as set out in the climate agenda for arable farming (*Klimaatagenda voor de akkerbouw*) and the action programme for plant health (*Actieprogramma plantgezondheid*) of BO Akkerbouw, the professional organisation of Dutch arable farmers, and in the vision for healthy cultivation (*Vitale Teelt*) of the Dutch Royal General Bulb Growers' Association (KAVB).

LNV's policy is aimed at:

- Research, innovation and knowledge sharing
- Access to and preservation of genetic resources (starting materials)

Action: Development and preservation of starting materials
LNV provides a pre-competitive stimulus for the development and preservation of starting materials.

The Horticulture and Starting Materials Top Sector Programme is investing in 'Better Plants for New Demands': biotic (diseases, pests) and abiotic (drought, wind, etc.).

Climate-proof cultivation systems and techniques

Changes in the climate eventually require changes in cultivation systems. This is because the health and resistance of crops partly depends on the quality of the soil and the selected cultivation system. The Vision for the Future of Plant Protection by 2030, focused on making plants and cultivation systems resilient, tackles this matter in relation to diseases and pests, resilient crops and systems and the possible actions farmers can take in this respect. Climate change can lead to lower production yields and quality loss in crops. In order to protect crops against weather influences, farmers are increasingly taking management measures such as earlier harvesting or installing covers. In some situations, it may be an option to switch from open field cultivation to alternative systems, which have the added benefit of reducing the need for crop protection products due to the reduced occurrence of fungi. But the transition to such alternative cultivation systems is costly and may not be feasible or desirable everywhere. New developments such as foil greenhouses may also offer prospects in this respect.

It is important to be able to make a sound business decision on this that takes into account the local conditions (area-specific approach). This requires access to the right knowledge. Although a great deal of practical knowledge is available in the sector, education, knowledge dissemination and awareness raising remain important. The regulations on (hail) covers, greenhouses, water reservoirs and water supply facilities will also need to be aligned to this. At present, for example, the regulations applied to hail covers differ between municipalities. This depends on whether the hail cover is considered to be a structure based on the designated agricultural use.

In addition, the risk of diseases and pests, drought stress, water damage and the like is smaller with shorter cultivation periods and products that are ready for harvest faster. It is important to focus on the difference between capital-intensive solutions (e.g. horticulturists growing leek in water) and capital extensive solutions (harvesting earlier, using alternative varieties, combined cropping systems). At present, we have insufficient knowledge about these aspects.

Action: Knowledge about adaptive and combined cropping systems

LNV and LTO are developing and disseminating knowledge about adaptive and combined cropping systems, including shortening growing periods or growing crops at other times of the year, using lighter and/or smaller machinery and applying crop rotation. This also includes the development of revenue models.

Action: Integral improvement of crops and cultivation systems

The parties committed to the Vision for the Future of Plant Protection by 2030 aim for an integrated approach to the development of robust crops and cultivation systems. This should ensure that farmers have less need for plant protection products and can choose from crops with strong roots systems which will improve soil quality and will also be more resilient to weather extremes, such as drought and flooding.

Action: Economical water use

To promote economical water use in agriculture and in line with its vision for circular agriculture, LNV is in consultation with the LTO and Wageningen Research focusing on the development and dissemination of knowledge aimed at efficient (economical) use of water in crop production. This includes considering the question whether alternative and/or precision irrigation systems need to be developed in agriculture, which was also raised in the Drought Policy Table.

Action: Exploring regulations on protective measures
VNG, LNV and LTO are exploring differences in municipal regulations and possibilities for making agreements on the rules on the application of protective measures, such as hail caps.

Adjustments in covered cultivation

In greenhouse horticulture, heavy precipitation can lead to flooding in greenhouses and crops being submerged. There are also a number of practical aspects when it comes to preventing flooding, such as installing more robust rainwater drainage for greenhouses and making greenhouses watertight to prevent ingress of water. Regardless of the size of the available rainwater reservoirs, prolonged droughts can lead to a shortage of irrigation water. Good water is not only essential to crop cultivation, but also to achieving environmental goals, such as emissions reductions. Businesses can apply reverse osmosis to obtain good irrigation water from groundwater, for example, but this technique is generating debate, as it returns the residual product to the source.

Examples of climate adaptation in greenhouse horticulture

- In order to limit flooding, Delfland Water Authority and the greenhouse horticulture sector have developed Rainlevelr, a solution through which reservoirs can be used to prevent flooding. Rainlevelr currently still involves discharging the rainwater from the reservoirs, but the hope is that the water will in future be infiltrated into the subsoil (see: www.rainlevelr.com).
- COASTAR® involves underground freshwater storage that bridges the gap in time and space between water supply and water demand. In addition, this approach prevents further salinisation by capturing brackish water and using it for freshwater production (see: www.coastar.nl).

Pillar 4: Livestock Farming

Livestock farming (all farmed animals, such as dairy cattle, pigs and poultry) is also impacted by climate change, which affects both the production of feed and livestock husbandry practices. Adaptation with respect to the production of feed, such as grass and maize, is addressed as part of the focus on crop cultivation (see Pillar 3): Crops and Cultivation Systems).

The effects of climate change in relation to livestock husbandry practices, such as heat stress and UV radiation in relation to animal welfare, transport of animals and livestock management systems, new animal diseases and making livestock farming more climate-proof, are central to this.

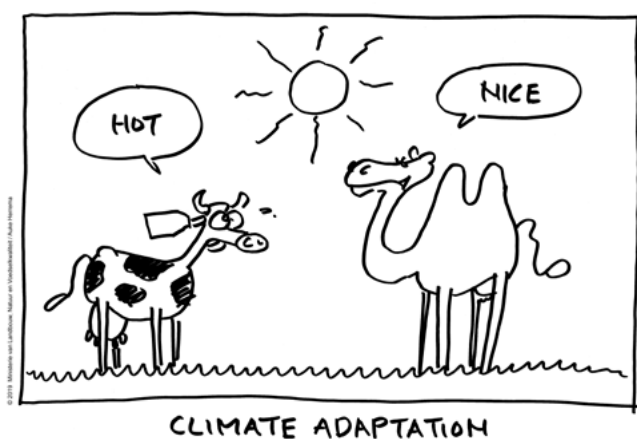
UV load and increase in hot days

Farm animals, especially those grazing in pastures, are experiencing an increase in UV radiation and more and longer periods of higher temperatures. Farmers have a duty of care, which means they must take measures to prevent suffering of animals. In addition, animals that are outdoors should be provided protection against poor weather conditions, such as extreme temperatures. The regulations on grazing in pasture allow sufficient flexibility to meet these needs during periods with high temperatures.

Heat stress

One of the main aims of the policy on sustainable livestock housing is to reduce emissions of substances such as fine particulate matter and greenhouse gases into the air. Research is also being conducted into new livestock housing systems. Climate adaptation is not yet considered in this research. Housing systems with ventilation and misting are already available, but not yet systematically incorporated into operations. With regard to the transportation of farmed animals in relation to heat, the Netherlands Food and Consumer Product Safety Authority (NVWA) and the sector (farmers, livestock hauliers, slaughterhouses) have adopted the National Plan for the Transportation of Livestock in Extreme Temperatures. Above certain temperatures, measures

must be taken. In the event of weather extremes, NVWA will carry out more checks. The National Plan for Livestock Transportation in Extreme Temperatures is evaluated every six months. Slaughterhouses are included in this plan. Specific points for attention in the event of high temperatures are the waiting areas and times for animals at slaughterhouses. This can be addressed by limiting waiting times and using shaded areas, for example.



Emerging animal diseases and zoonoses

The effects of climate change, such as warmer, drier or wetter conditions, may lead to the emergence of new animal diseases and zoonoses (infectious diseases in animals that are contagious to humans and vice versa) in the Netherlands. This could include the spread of viruses by insects. The veterinary infrastructure in the Netherlands is geared towards rapidly detecting known diseases as well as new and unknown diseases. An important instrument for this is basic monitoring³, which is carried out by the Animal Health Service (GD Animal Health). For zoonoses, an integrated human-veterinary risk analysis structure is in place⁴, which means that the Netherlands is also prepared for any new zoonoses. Consequently, new animal diseases or zoonoses are quickly detected.

Action: Climate adaptation in instruments for sustainable livestock farming

In consultation with LTO, LNV will include climate adaptation in the schedules of requirements for new livestock housing systems and the Benchmark for Sustainable Livestock Farming. Farmers themselves will take heat management measures to protect animal welfare and keep up production yields, such as milk yields.

³ <https://www.gddiergezondheid.nl/diergezondheid/monitoring/hoewerkt-het>

⁴ <https://www.onehealth.nl/over-one-health/zoonosenstructuur>

Pillar 5: Supporting Instruments

This section describes the cross-cutting instruments that will contribute to achieving the goals and taking the actions on the matters discussed in the four previous pillars. Instruments that mostly focus on a single pillar are included in that pillar.

The following three supporting instruments are central to this pillar:

- Regional approach
- Knowledge and innovation
- Risk management

Regional approach

The effects of climate change vary greatly from region to region. Climate adaptation therefore requires a regional approach. Farmers themselves can take a number of measures, depending on the local situation. Cooperation on a regional scale makes it possible to jointly adopt overarching measures. Improving the water system requires regional action. The DPRA, DPZW and DAW programmes focus on strengthening regional cooperation. Climate adaptation in agriculture is explicitly incorporated in the approach of these programmes, and farmers are engaged in this. In 2020 and 2021, I&W, LNV and LTO will programme measures in the DAW to address climate change challenges. For pillar 1 (Water System) it has been stated that the displacement series governing the allocation of water during scarcity will be made more region-specific. The regional water system will be optimised. It has also been stated that climate adaptation in agriculture must be more clearly included in the current area processes, stress tests and risk dialogues.

Action: Making better use of the practical knowledge gained by farmers and regional water authorities

Each year, the lessons learned in areas affected by weather extremes are gathered regionally and made generally available. Action owners: regional partners (DAW) in cooperation with LTO.

Using spatial planning instruments for climate adaptation in agriculture

Municipalities, regional water authorities, provinces and the national government are working on water availability analyses and conducting stress tests and risk dialogues. In addition, many area processes are ongoing in which the agriculture sector is involved. This leads to the identification of challenges and adoption of implementation programmes for each area. In some areas, climate change may require different revenue models for farms in the future. Such as models involving water retention, the cultivation of new or different crops, new cultivation systems or nature management. The options provided by the Dutch Environment and Planning Act (*Omgevingswet*) for area-specific integrated solutions are becoming more important.

The Environment and Planning Act provides a number of core instruments. The environmental and spatial strategy (*omgevingsvisie*, OVI) and the programme under the Environment and Planning Act, in particular, are important to climate adaptation in agriculture. The environmental and spatial strategy addresses matters related to the physical living environment, such as agriculture and climate adaptation. Environmental and spatial strategies are developed at the national, provincial and municipal levels, where they are referred to as the NOVI, POVI and GOVI, respectively. Programmes enable government authorities to achieve specific policy goals. For these programmes, government authorities can define environmental values. The other core instruments are general and decentralised rules for the protection of the physical living environment, the environmental permit and the project decision. In addition, the national government and regional government authorities draw up an environmental and spatial agenda for each part of the country, which defines shared challenges and ambitions and includes agreements on matters such as climate adaptation in agriculture and the countryside. For this purpose, the Netherlands has been divided into five parts, and climate adaptation in agriculture will therefore be included in five national environmental and spatial agendas.

Through area pilot projects and area processes, area parties (municipalities, regional water authorities, provinces, farmers) assist the agriculture sector and farmers in a relevant region in becoming more climate-proof. To this end, use will be made of the knowledge and results obtained from the water availability analyses, stress tests and risk dialogues conducted by government authorities. In addition, optimal use will be made of the options provided by the Environment and Planning Act – such as environmental and spatial strategies and agendas – to reach integrated area-specific decisions so as to make agriculture more climate-proof.

Action: Integrating climate adaptation agriculture into spatial policy

The following actions will be taken to integrate the outcomes of pilot projects into governmental spatial policy:

- Taking stock of the ongoing pilot projects and identifying the areas and agricultural sub-sectors served by them.
- Organising the process of learning and sharing lessons from these pilot projects.
- Organising the process whereby the lessons learned lead to more large-sale projects in areas where no pilots have been conducted yet. Scaling up best practices to make them standard operating procedures.

Action owners: area parties (provinces, municipalities, regional water authorities, farmers and DPRA/DPZW)

Knowledge and innovation

Knowledge and innovation are an important factor in making agriculture more climate-proof.

This involves developing, disseminating and applying knowledge, as well as promoting the preconditions for the development and application of innovations.

This is described in more detail in the following section.

Developing, disseminating and applying knowledge about climate adaptation

Climate adaptation requires that farmers take measures. The responsibility for this lies with the farmers themselves. The parties in the chain and government authorities can help, for example with respect to knowledge and innovation. This involves conducting research and developing and applying new techniques and working methods. But is also requires sharing existing knowledge about farming and related aspects, such as good examples and practices on farms and at regional water authorities. This requires a solid knowledge infrastructure. In addition, specific attention will be paid to linking up KNMI's new climate scenarios to the effects on agriculture, including through the Delta Programme.

The knowledge and innovation approach to achieving climate adoption will focus on the following aspects: agricultural soils and soil measures, climate-proof crops and cultivation systems, cultivating new and salt-tolerant crops, irrigation systems and precision irrigation, salinisation and saline tolerance (in relation to crops and soil) and adaptive livestock housing systems and measures. In addition to these agriculture-specific aspects, it is important to develop and disseminate innovations, new and existing knowledge in the water domain and the region, en to ensure that this is applied by water users and regional parties, such as farmers and government authorities.

Action: Knowledge agenda and infrastructure

The existing knowledge infrastructure, such as the research in Top Sector Programmes (Water, Agriculture & Food, Horticulture & Starting Materials), DPRA, DPZW, DAW and the knowledge track of the National Programme for Agricultural Soils (NPL) will be used to develop and disseminate knowledge and to achieve innovations. To do this effectively and efficiently, in 2020 a knowledge agenda and approach for climate adaptation in agriculture (including with respect to knowledge dissemination) will be drawn up by LNV together with the parties involved (government authorities, agricultural sector). This will be updated periodically. The programming study by Wageningen University & Research on climate adaptation in urban areas and the countryside will be one of the building blocks of the knowledge agenda. This study concerns the detailing of one of the six missions of the Agriculture, Water and Food knowledge area set up under the Coalition Agreement 2017. This also includes the development of revenue models.

Action: Thematic proposal to use knowledge resources under the National Science Agenda (NSA)

LNV is participating in the thematic proposal by ministries to use knowledge resources available under the National Science Agenda (action line 2) for research into climate adaptation. This proposal, which will run for five years and has a total cost of €5 million, was submitted by the programme team of the National Climate Adaptation Strategy (NAS) to the Netherlands Organisation for Scientific Research (NWO) in early 2019. A contribution totalling €2 million has been granted for this thematic proposal, which is now being further elaborated. This thematic proposal is based on the following policy question: 'What are the success factors for achieving a healthy living environment, which is increasingly under pressure from climate change, and how can we best adapt our behaviour and living environment to climate change, so that its impact on humans, animals and plants is substantially reduced?'

Action: Agriculture in climate scenarios, weather alerts and weather reports

The aim is to ensure that the new climate scenarios of the Royal Netherlands Meteorological Institute (KNMI) provide more specific information about trends that are relevant to agricultural sub-sectors and areas. In addition, extreme weather events should provide more specific information on agriculture, so that farmers can better anticipate expected extreme weather events, particularly heavy showers, extreme rainfall and drought.

Identifying, selecting and applying measures to limit damage

Climate change requires farmers to adapt their businesses and operations to avoid the frequent occurrence of severe damage due to climate change. To this end, they can take ad hoc measures or long-term measures, such as buffering. Increasing sprinkler irrigation during droughts or digging an extra ditch when flooding occurs will not solve the problem of climate change. We need to gain a better understanding of how damage can be systematically prevented through a series of interlinking measures, which may also have consequences for adjacent farms or other land uses. These measures must be assessed on the basis of their contribution to the envisaged goal, their applicability in the business and regional context, the costs involved and level of effort required, and how they interact with or contribute to other goals farmers are tasked with. For example, goals with respect to circular agriculture, the vision for the future of crop protection by 2030, climate mitigation and biodiversity. A network project (field network) with farmers is a fruitful context for identifying measures, making a plan and discussing it using all the experiences and expertise of farmers and relevant stakeholders, such as the regional water authorities. In this way, farmers can test promising measures at the business and regional level in a coordinated way. This will provide a practical insight into feasible and effective measures that can then be disseminated and applied elsewhere. The DAW can play an important role in this.

Action: PPP programme for field networks on climate adaptation in agriculture

In 2019, as part of the research for the Agriculture & Food and Horticulture & Starting Materials Top Sectors and the mission-driven programmes for Agriculture, Water and Food, LNV initiated the development of a field networks programme on climate adaptation in agriculture, in collaboration with Wageningen University & Research, LTO and area parties. This multiannual public-private partnership (PPP) programme focuses on innovation at farm level and sharing and dissemination of knowledge to and by farmers and area parties, to contribute to the strengthening and acceleration of developments in climate-proof agriculture. €180,000 has been provided for this, enabling us to make a start on this programme. The first step is to take stock of the current projects and opportunities in terms of areas, cultivation methods and networks with farmers, regional water authorities and other land and water users. An integrated approach to water and soil management, such as water retention, and robust varieties and cultivation systems, including alternative cultivation plans and tillage methods, are central to this. In this approach, the effects on other aspects, such as environmentally friendly plant protection, CO₂ storage and emissions, and loss of minerals, will also be carefully considered. Private contributions are needed to fund this PPP. Action owners: LNV, LTO, area parties (provinces, regional water authorities).

Risk management

These actions encourage risk management by farmers in arable farming with open cultivation and land-based livestock farming in the Netherlands. The motto here is: *Risk management is something you have to do, it is part of your business!* The recent extreme weather situations have triggered farmers to take action on this.

Risk management by farmers

The goal of risk management is to ensure that risks are identified in time, so that farmers can estimate the consequences if the risk were to materialise and take appropriate measures to address this, thus better safeguarding the continuity of their business. Risk management is about risks and opportunities, but also about risk appetite and resilience. A weather risk poses a threat to the continuity of a farmer's business when the impact of this risk (= probability of risk x resulting loss) exceeds the resilience of their business. Risk management starts with a good risk analysis. If the possible consequences are small and the probability of the weather risk materialising is also small, it requires little further attention. If the consequences of a weather risk are greater and the probability of the weather risk materialising is also relatively high, farmers must take action. Sector organisations and policy-makers will improve the collation of current knowledge, structure it better, and, where necessary, conduct research to identify new, appropriate instruments. For open cultivation and land-based livestock farming, the management of weather risks requires the active development and dissemination of knowledge. This can be

done by setting up a knowledge platform. This knowledge platform can be detailed together with the agricultural educational institutions, sector organisations, banks and insurers. This knowledge platform will then boost the level of competence in terms of 'risk management' among farmers. The knowledge about preventive measures for weather risks in open cultivation has increased considerably in recent years and will probably need to be developed further in some sub-areas. The Knowledge Platform can then make experiences gained in the Netherlands and other countries (e.g. Israel) available to stakeholders. Knowledge will be gathered and made accessible through information materials, training modules and courses for current and future farmers. In addition, banks and insurers can contribute to sharing knowledge about climate adaptation when discussing their products with farmers, etc.

Action: Knowledge platform on risk management
LNV is facilitating the consultations to establish this knowledge platform. The Common Agricultural Policy provides options for organising a knowledge platform for these sub-sectors.

Further development of financial safety net instruments

If farmers are still exposed to high-scoring risks after taking measures to prevent and limit damage, they remain at risk. In 2010, the Broad Weather Insurance Scheme (BWV) was introduced. LNV, sector representatives and providers of this scheme have since been working on improvements in the Broad Weather Insurance Task Force. As a result, the scheme is increasingly accessible to growers. The aim is to continue the scheme as a subsidised weather insurance scheme in the Common Agricultural Policy period 2021-2027. If the Broad Weather Insurance Scheme is not sufficient, saving money for emergencies could offer a solution. At present, keeping cash in reserve is not financially advantageous, so farmers hardly ever do this. It will be reviewed what means are suitable for saving for emergencies and how this can be set up in a way that makes business sense.

Action: Further development of the broad weather insurance scheme 2021-2027
Action by the Broad Insurance Scheme Task Force to set up the Broad Insurance Scheme for the new Common Agricultural Policy period.

Action: Exploring options for emergency savings fund
In the spring of 2019, together with sector representatives, banks and insurers, we explored the options for facilitating an emergency savings fund that enables farmers to save cash for emergencies in a way that makes business sense. Based on the initial explorations, it has been agreed to seek and share further information. Conclusions will then be drawn and, if promising opportunities are identified, follow-up actions will be formulated for those together with the required actors. Action owner: LNV in collaboration with Dutch Federation of Agricultural and Horticultural Organisations (LTO)

Risks of flooding ensuing from the water system

Water systems must meet the flooding standards set by the province. This is taken care of by the regional water authority, which will in principle continue to take care of this when the climate deteriorates. However, the risk of flooding, and therefore the risk of damage, including to agriculture, remains⁵. This damage is not recoverable from the government. If flooding occurs solely due to water courses overflowing their banks (horizontal flooding), the resulting damage is currently not insurable.

Various parties, including the regional water authority and KNMI, will make knowledge and information available to help farmers better assess their risks with regard to flooding and how to deal with those risks.

Action: Exploratory study into damage caused by flooding ensuing from the water system

LNV, I&W, UvW/regional water authorities, IPO/provinces, LTO and insurers are examining how damage caused by flooding ensuing from the water system should be addressed. The following will be explored:

- what information/communications from regional water authorities and other parties the agricultural sector needs in order to prevent or limit damage.
- whether LNV, LTO and insurers can set up an arrangement that would reimburse part of the losses caused by horizontal flooding.
- Regional water authorities can be involved in this process in order to clarify risks and the delineation of responsibilities.

⁵ In other words, there is a risk that weather conditions are more extreme than the conditions assumed in setting the standard.

Governance and funding

The Action Programme for Climate Adaptation in Agriculture has been adopted by the parties involved with climate adaptation in agriculture, and has been jointly drawn up by these parties. These parties also have an important role in managing, funding and implementing the programme.

Governance

This Action Programme describes what is being done on climate adaptation in agriculture in the various national programmes and specifies additional actions. Climate change has an impact on a large number of matters and current programmes. Through this Action Programme, current programmes will be better linked up and strengthened. Coordination and linking up to related, relevant policies is important for the success of the Action Programme.

Many current projects and programmes have organised their own administrative management. The actions set out in this Action Programme are implemented where possible within those existing structures, such as DPRA, DPZW, DAW and NAS.

There is no body where all parties involved in the development and implementation of this Action Programme are represented. If necessary, ad hoc administrative consultations can be organised with the parties involved. The various existing administrative bodies will be used to advance the Action Programme.

The following parties have contributed to the development of this Action Programme and will be involved in its implementation:

- Organisations and entrepreneurs in agriculture and horticulture, including: Dutch Federation of Agricultural and Horticultural Organisations (LTO)
- Regional water authorities, Association of Regional Water Authorities (UvW)
- Municipalities, Association of Netherlands Municipalities (VNG)
- Provinces, Association of Provincial Authorities (IPO)
- National government: Ministry of Infrastructure and Water Management (I&W), Ministry of Agriculture, Nature and Food Quality (LNV)
- Insurers

Funding

This Action Programme will help to ensure that climate adaptation in agriculture gets a recognisable place in the national programmes. In addition, the parties involved have specified additional actions.

Ensuring that current programmes are (more) focused on climate in adaptation agriculture and taking specific actions will require funding and human resources. Some of these resources have already been allocated, and some will be allocated specifically to climate adaptation in agriculture under this Action Programme. Some actions are implemented and funded outside the national programmes.

In addition, the new Common Agricultural Policy and the National Strategic Plan are being prepared. The Common Agricultural Policy will continue to play an important role in safeguarding and funding measures for climate-proof agriculture after 2021. In addition, there are regional budgets and funding options that can contribute to climate adaptation in agriculture. These options are not included in this section.

The following national programmes are relevant to climate adaptation in agriculture:

Delta Programme for Spatial Adaptation (DPRA)

The aim of the Delta Programme for Spatial Adaptation (DPRA) is to ensure that the Netherlands has a climate-proof and water-robust spatial design by 2050. Government authorities will ensure that damage caused by flooding, heat stress, drought and floods is limited. To strengthen and accelerate the approach to climate adaptation, the Dutch national government has concluded the Administrative Agreement on Spatial Adaptation with the other Dutch government authorities. €20 million will be made available to support decentralised authorities in implementing the Delta Programme for Spatial Adaptation through to 2020. Thereafter, the national government intends to deploy a further €150 million to €250 million in national government funds on a one-off basis. In the Administrative Agreement on Spatial Adaptation it has been agreed that provinces, municipalities and regional water authorities intend to contribute an additional €300 million. The decentralised authorities will invest these funds in adaptation measures in urban water management and the water system in the countryside. Agriculture is one of the sectors that can benefit from the measures taken by decentralised authorities, as these measures will make the water system more robust.

Delta Programme for Fresh Water (DPZW)

The Delta Programme for Fresh Water (DPZW) aims to make the Dutch water supply climate-proof and water-robust, with an effective and widely supported balance between water supply and water demand. Providing insight into the availability of water is critical to this, as this insight makes the risks of freshwater shortages visible. In addition, stepped investments are being made to make the freshwater supply more robust, to better retain the available water and to use it more economically. €400 million is available for DPZW measures through to 2021, and subsequently a similar budget is expected to be available through to 2027. Agriculture is one of the sectors targeted by the DPZW. Under the DPZW, €7 million was made available in March 2019 for measures as part of the implementation of actions advised by the Drought Policy Table. This amount will be co-funded by the regional parties.

Actions of LNV ensuing from Drought Policy Table

The actions of LNV that ensue from the Drought Policy Table are not part of a national programme and are therefore additional. This concerns the actions relating to Common Agricultural Policy rules for measures with regard to manure and greening, the ban on daytime sprinkler irrigation, and (new) irrigation systems in agriculture. These actions are implemented by LNV. As a follow-up to the recommendations of the Drought Policy Table, LNV has commissioned RVO to develop a water demand viewer (drought viewer).

Knowledge and innovation

In the Agriculture & Food, Horticulture & Starting Materials and Water Top Sectors, the following research programmes are relevant to adaptation in agriculture:

- Public-private partnership (PPP) fields networks programme for climate adaptation in agriculture (2019: €180,000).
- PPPs for Soil, Precision Farming, 'Better Plants for New Demands' (breeding)

In 2019, in part thanks to efforts in this Action Programme, the National Climate Adaptation Strategy (NAS) programme team submitted the proposal for a National Science Agenda (NSA) focused on climate adaptation to the Netherlands Organisation for Scientific Research (NWO). It will run for a period of five years has a total cost of €5 million. The ministries involved (LNV, I&W, Health, Ministry of Welfare and Sport (VWS) and Ministry of Foreign Affairs (BZK) will contribute 50% to the research programme. A contribution totalling €2 million has been granted for this proposal.

Broad Weather Insurance Scheme

In 2010, the Broad Weather Insurance Scheme (BWV) was introduced. Since then, LNV, sector representatives and providers of the Broad Weather Insurance Scheme have been working to improve the scheme, making it increasingly accessible to growers. A subsidy budget of €74 million has been made available for the Broad Weather Insurance Scheme for the period 2015-2020 under the Common Agricultural Policy.

Climate funds

Under the Coalition Agreement 2017, the national government has set up the Climate Envelope, which provides funding for climate mitigation measures (to reduce greenhouse gas emissions) as part of the Climate Envelope. Agriculture is one of the sectors that can deploy funding from this Climate Envelope. This concerns not only climate mitigation challenges, but also other measures, such as water and soil measures, that are needed to make agriculture climate-adaptive. This means that in implementing this Action Programme, steps can be taken to deploy funding from the Climate Envelope (linking up). Under the Climate Agreement of 28 June 2019, the national government will make €970 million available in the period 2020-2030 to achieve the ambitions for climate goals in the Agriculture and Land Use sector. The funding under Climate Agreement will be used, among other things, for transitions in the countryside, such as with respect to agricultural soils and peat meadows:

• National Programme for Agricultural Soils (NPL)

The goal of the National Programme for Agricultural Soils (NPL) is that all agricultural soils are managed sustainably by 2030. Soil is the linking factor between farm management and climate adaptation, and also plays a role in relation to climate mitigation.

Farmers can make a big impact through soil measures, such as in terms of better retaining water in preparation for droughts. The National Programme for Agricultural Soils has a budget of €28 million for the period up to 2030 (through the Climate Agreement). This budget is used, among other things, to improve the soil structure of agricultural land, thereby making it more climate-proof.

• Climate change and peat meadows

Rising sea levels and drought are exacerbating the problems of salinisation and subsidence. Salinisation and subsidence can reduce agricultural yields. These effects occur in the peat meadow areas. In these areas, subsidence also causes the emission of greenhouse gases. These adverse effects can be reduced by raising the groundwater level and taking a mix of other measures, such as underwater drainage techniques and exploring new revenue models based on the cultivation of wet crops and monetising CO₂. Applying such measures gives agriculture in peat meadow areas the prospect of being able to adapt to these specific effects of climate change. Both the Delta Programme and the National Programme for Agricultural Soils promote the implementation of these measures. In addition, the Climate Agreement will include a specific approach for peat meadows. Through the Climate Agreement, the government has made €100 million available for a voluntary cessation scheme for farmers in the peat meadow areas. €176 million will be available for other measures up to 2030.

Common Agricultural Policy

As the EU's Common Agricultural Policy and its implementation in Dutch law through the National Strategic Plan (NSP) for the period 2021-2027 are still under development, the relevant contents and funding are not yet known. The aim is that the Common Agricultural Policy will continue to play an important role in safeguarding and funding measures for climate-proof agriculture after 2021.

Appendix 1: Goals of related policies

Target terms for Ministry of Agriculture, Nature and Food Quality (LNV)

- LNV's vision entitled 'Valuable and Connected' (*Waardevol en Verbonden*):
- In LNV's vision for circular agriculture, 2030 is used as the target year.
- National Programme for Agricultural Soils (*Nationaal Programma Landbouwbodems*, NPL):
- All agricultural soils sustainably managed by 2030; the soil and its improvement are an important basis and precondition for climate adaptation in agriculture.
- Vision for the future of plant protection by 2030 (*Toekomstvisie gewasbescherming 2030*):
- One of the aims is to achieve a sustainable production by 2030, comprised of resilient plants and cultivation systems and where agriculture and horticulture are connected with nature. 2027, the target year of the EU Water Framework Directive, is also a relevant year.
- Sixth Action Programme under the EU Nitrates Directive:
- The current Action Programme runs until 2021, after which a seventh Action Programme will come into force. 2027, the target year for the Water Framework Directive, is also relevant for the Nitrates Directive.

Other relevant target terms

- Sustainable Development Goals (SDGs):
- The 193 member states of the United Nations (UN) have adopted the development agenda for 2015-2030. The agenda consists of 17 goals. These are the Sustainable Development Goals, commonly abbreviated to SDGs. They apply in all countries and to all people.
- National Climate Adaptation Strategy (*Nationale klimaatadaptatiestrategie*, NAS):
- The current Implementation Programme for the NAS expired at the end of 2019. We expect and aim to continue the implementation of the NAS beyond 2019, in anticipation of the new climate scenarios of the Netherlands Meteorological Institute (KNMI). Based on the new scenarios, an update of the NAS is conceivable (2023-2024).
- Delta Programme:
For the national Delta Programme, 2050 is the target year for the analyses focused on (solving) water safety, freshwater and spatial adaptation issues. The following goals have been formulated for these three themes:

- Water safety: By 2050 the Netherlands will meet the statutory safety standards.
- Spatial adaptation: By 2050 Netherlands will have a climate-proof and water-robust spatial design.
- Fresh water: By 2050 the Netherlands will be resilient to scarcity of fresh water.

The Delta Programme 2015 incorporates the delta decisions of 2014 and the preferential strategies, i.e. the standards, frameworks and measures. The Delta Programme 2021 (which will be published on Budget Day in 2020) will include the new delta decisions, as revised in connection with new developments and/or insights, and the preferential strategies.

- In the context of climate adaptation in agriculture, the Delta Programme for Spatial Adaptation (DPRA) and the Delta Programme for Fresh Water (DPZW) in particular are important:
 - The Delta Programme for Spatial Adaptation has set as an intermediate target that water-robust and climate-proof policies and actions should be implemented by 2020, and it sets 2050 as the year by which the Netherlands should be 'water-robust and climate-proof'. This will be done through stress tests, risk dialogues and climate adaptation implementation programmes. To this end, it has been agreed that the risk dialogues and implementation programmes will be completed by 2020. Thereafter, government authorities and other parties will implement these programmes.
 - The Delta Programme for Fresh Water will map water availability for the urgent areas in 2021. Party based on this, preparations are already being made for the second phase of the Delta Programme for Fresh Water. The second phase of the freshwater measures under the Delta Programme for Fresh Water runs from 2022 through to 2027.
- Delta Plan for Agricultural Water Management (*Deltaplan Agrarisch Waterbeheer*, DAW):
The Dutch Federation of Agricultural and Horticultural Organisations (LTO) has agreed with the Association of Regional Water Authorities (UvW) to work together on the water task in the countryside. The ambition of the Delta Programme for Agricultural Water Management is:
 1. By 2021, 80% of the remaining water quality problems will be solved in a way to this motivating and stimulating, and 100% of these problems will be solved in this way by 2027.
 2. By 2021, the agricultural water supply will be sustainable through the economical use of water at the individual farm level, water conservation at the area level and smarter distribution and buffering at the national level.

3. Through area processes, new spatial instruments and innovative techniques, the agricultural production potential at regional level will be increased by 2% per year.

In 2019, as part of the DAW stimulus, the DAW support team consulted with farmers and regional water authorities to identify bottlenecks in the water system. The goal is to identify the challenges for each regional water authority and the measures through which farmers can contribute to the tackling the challenges. In 2020 it will be examined whether this can be translated into a joint programming of agricultural measures and those of the regional water authorities. The new Common Agricultural Policy can provide support in achieving these agricultural water and soil measures.

- KNMI scenarios:

The time horizons for the climate scenarios of the Royal Netherlands Meteorological Institute (KNMI) are set around 2050 and the end of the 21st century. In 2021, KNMI will update the new insights, based in part on the IPCC report.

In 2023, KNMI will publish the new scenario table for professional users.

Appendix 2:

Relevant national programmes for adaptation in agriculture

General agricultural policy

(<https://www.rijksoverheid.nl/onderwerpen/landbouw-en-tuinbouw/landbouwbeleid>)

Programmes for which LNV has primary responsibility:

- Vision of LNV / circular agriculture (www.rijksoverheid.nl/ministeries/ministerie-van-landbouw-natuur-en-voedselkwaliteit/visie-lnv)
- National Programme for Agriculture Soils (NPL) (www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2019/04/25/kamerbrief-over-het-nationaal-programma-landbouwbodems/kamerbrief-over-het-nationaal-programma-landbouwbodems.pdf)
- Nature-inclusive agriculture (www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2017/07/10/kamerbrief-over-natuurinclusieve-landbouw/kamerbrief-over-natuurinclusieve-landbouw.pdf)
- Knowledge and innovation policy, Top Sectors Policy (www.topsectoren.nl)
- Policy on resilient plants (www.rijksoverheid.nl/actueel/nieuws/2019/04/16/weerbare-planten-en-teeltsystemen-essentieel-voor-toekomst-gewasbescherming)
- Policy on plant protection (www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2019/04/16/toekomstvisie-gewasbescherming-2030-naar-weerbare-planten-en-teeltsystemen/19074533+bijlage.pdf)
- Manure policy (www.rijksoverheid.nl/onderwerpen/mest)
- Livestock farming policy (www.rijksoverheid.nl/onderwerpen/veehouderij/duurzame-veehouderij)
- Animal welfare policy (www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2018/10/04/kamerbrief-over-dierenwelzijn/kamerbrief-over-dierenwelzijn.pdf),
- Common Agricultural Policy (www.toekomstglb.nl/over-het-glb/kamerbrieven/), (www.rijksoverheid.nl/documenten/kamerstukken/2018/03/15/kamerbrief-over-voortgang-onderhandelingen-gemeenschappelijk-landbouwbeleid-glb en www.rvo.nl/onderwerpen/agrarisch-ondernemen/gemeenschappelijk-landbouwbeleid/gemeenschappelijk-landbouwbeleid)

- Climate adaptation in nature (ruimtelijkeadaptatie.nl/overheden/nas/nas-nieuws/2018/dialog-natuur)

Programmes for which LNV does not have primary responsibility:

- Delta Programme (www.deltacommissaris.nl/deltaprogramma/deltaprogramma-2020), Delta Programme for Spatial Adaptation (DPRA) (www.deltacommissaris.nl/deltaprogramma/gebieden-en-generieke-themas/ruimtelijke-adaptatie), Delta Programme for Fresh Water (DPZW) (www.deltacommissaris.nl/deltaprogramma/gebieden-en-generieke-themas/zoetwater)
- Knowledge for Policy / National Science Agenda (NWA) (www.nwo.nl/beleid/wetenschapsagenda)
- Drought Policy Table (<https://www.rijksoverheid.nl/documenten/kamerstukken/2019/12/18/kamerbrief-over-eindrapportage-beleidsstafel-droogte-nederland-beter-weerbaar-tegen-droogte>), (www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2019/04/04/eerste-resultaten-van-de-beleidsstafel-droogte/eerste-resultaten-van-de-beleidsstafel-droogte.pdf)
- Delta Plan for Agricultural Water Management (DAW) (agrarischwaterbeheer.nl/content/deltaplan-agrarisch-waterbeheer)
- Foundation for Applied Water Research (STOWA) (<https://www.stowa.nl/deltafacts/zoetwatervoorziening/droogte/effecten-klimaatverandering-op-landbouw>)
- Royal Netherlands Meteorological Institute (KNMI) (www.knmi.nl/kennis-en-datacentrum/uitleg/climate-scenarios)
- Administrative Agreement on Climate Adaptation (www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2018/11/20/bestuursakkoord-klimaatadaptatie/bestuursakkoord-klimaatadaptatie.pdf) en <https://ruimtelijkeadaptatie.nl/overheden/sra/>)
- Climate envelopes (www.rijksoverheid.nl/actueel/nieuws/2018/03/09/kabinet-investeert-300-miljoen-euro-in-klimaat)
- National Strategy on Spatial Planning and the Environment (NOVI) (www.denationaleomgevingsvisie.nl)

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