Climate-Smart Agriculture in Egypt and Jordan

Building blocks for a vision to create a climate-resilient agricultural sector

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In Egypt and Jordan there is a need for the agricultural sector to adapt to the changing climate and its associated pressure on the countries' natural resources. Climate-smart agriculture is a concept that tackles the intertwined challenges focussing on food security, adaptation and mitigation in agriculture. This study aims to define building blocks, for a vision on how the Netherlands can support Egypt and Jordan in their transitions towards climate-smart agriculture in the next 10 years. Interviews were held to collect lessons learned in Dutch-funded projects over the past 4 years. Recommendations were designed based on these lessons learned and together with national actors and experts from Wageningen University and Research.

Keywords: Climate-smart agriculture, Egypt, Jordan, water management, policy

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Summary

Introduction and aim of this study
Egypt and Jordan are two countries located in the Middle east and North Africa region where there is a need for the agricultural sector to adapt to the changing climate and its associated pressure on its natural resources. Both countries are arid and receive little precipitation. Moreover, the volume of renewable water resources entering the countries through their transboundary rivers, the Nile Basin and Jordan Basin, is limited and creates challenging water management conditions. Even without the additional effects of climate change, water scarcity is a factor that needs strong consideration when developing food systems in these countries. As agriculture itself is one of the larger contributors to greenhouse gas emissions there is necessity but also potential to mitigate emissions within this sector.

Climate-smart agriculture (CSA) is a concept that tackles the intertwined challenges that agriculture faces as described above. The concept has multiple objectives which are defined as three pillars and are as follows i) sustainably increase agricultural productivity and incomes; ii) adapt and build resilience of people and food systems to climate change and; iii) reduce and/or remove greenhouse gas emissions, where possible.

The Netherlands have been supporting both countries in the past years to develop their agricultural sector through either small and large projects. The aim of this study was to define recommendations, so called building blocks, for a vision on how the Netherlands can support Egypt and Jordan in their transitions towards CSA in the next 10 years.

Method
To achieve this aim, several steps have been undertaken. Firstly, literature was collected on climate-smart agriculture and related transitions and scaling strategies. To have a better understanding of the context, literature on agriculture, climate change and current related policies was collected on both countries. Secondly, semi-structured interviews were held with experts that have been working in Dutch-funded projects in one of the two countries. From these interviews, lessons learned were collected based on four analysis lenses: relevance, sustainability, scaling and social inclusion. The lessons learned were used to form a first draft of recommendations. Afterwards, workshops in both Egypt and Jordan were organized with national stakeholders to discuss both the lessons learned and recommendations. The last step in this project was to discuss the recommendations and to make them more actionable with experts for Wageningen University and Research working in Egypt and/or Jordan.

Lessons learned and recommendations
The projects that were assessed during the interviews were mostly targeting early adopting farmers, which were more commercially oriented farmers. Only a couple of projects focussed on the small-scale farmers. All projects were working towards the first pillar of CSA (increasing productivity), a small amount is also focussing on the second pillar (adaptation) and only one of the twelve projects has as main focus to mitigate climate change, pillar 3.

An important lesson learned found for Egypt was that siloed governmental departments challenge the holistic approach which is needed for climate resilience and climate-smart agriculture. Moreover, a large group of the farmers in Egypt are smallholders, where most of the interventions were focussing on the commercial large farmers, making these not immediately accessible for the bulk. In Jordan it was found that most projects work through private sector parties who are often willing to invest, this does not support institutionalizing and formalizing CSA as this is the role of the government. Besides, projects did not explicitly consider social inclusion aspects, especially gender equality within their proposals and implementation.

For Egypt the following recommendations were designed:

1. *Keeping the mixture of different CSA interventions but with a larger focus on water*
2. *Considering CSA as a long-term process and not as projects*
3. *Contextualize and localize the projects*
4. *Ensure each intervention knows it scaling pathway*
5. *Building partnerships using the Dutch Diamond Approach*
6. *Reach the smallholder*
7. *New developments could be focusing on climate leadership development, access to climate funding, agricultural digitalization, multi-annual programme on agriculture, baseline assessment on climate change an food system vulnerability*

For Jordan the following recommendation were designed:

1. *Set-up a long-term program or plan on building climate resilience*
2. *Make sure climate-smart agriculture projects are truly climate smart*
3. *Focus more on water smart*
4. *Focus on capacity building of various CSA stakeholders through knowledge institutes*
5. *Work through and with local partners*
6. *Contextualization and understanding farmers' incentives*
7. *Embed scaling mechanisms and strategies within projects*
8. *Create access to CSA finance*
9. *Develop knowledge on how to include women in climate-smart agriculture*

Next steps

This project designed building blocks, based on experiences and projects in the past, for Dutch policy makers that are working in Egypt and Jordan to support visions on CSA in Egypt and Jordan. The lessons learned and the recommendations that are found in this study, can be used for such vision development.

Besides these building blocks it was felt that during the workshops and focus group discussions in both countries people acknowledged multiple times that the usefulness of such interactions. The focus group discussion showed us that WUR colleagues already have and will continue to develop a wide array of knowledge and experience which can support building resilient food system in countries like Egypt and Jordan.

Abbreviations and acronyms

Agricultural Credit Cooperation	ACC
Climate Action Tracker	CAT
Climate Change, Agriculture and Food Security	CCAFS
Climate information services	CIS
Climate-smart Agriculture	CSA
Conference of the Parties	COP
Consultative Group on International Agricultural Research	CGIAR
Embassy of the Kingdom of the Netherlands	EKN
Food and Agriculture Organization	FAO
General Data Protection Regulations	GDPR
Government of the Netherlands	GoNL
Greenhouse gasses	GHG
Intergovernmental Panel on Climate Change	IPCC
Jordan Cooperatives Cooperation	JCC
Knowledge and Innovation Center	KIC
Memorandum of Understanding	MoU
Middle-East and North Africa	MENA
Ministry of Agriculture	MoA
National Action Plan for Adaptation	NAPA
National Action Plan	NAP
National Agricultural Research Center	NARC
National Climate Change Commit	NCCC
Nationally Determined Contribution	NDC
Nationally Determined Contribution	NDC
Nature-inclusive agriculture	NIA
Netherlands Enterprise Agency	RVO
Netherlands Water Partnership	NWP
Wageningen University & Research	WUR
Water Resource Management	WRM
Water User Associations	WUA
World Food Program	WFP

1 Introduction

1.1 Aim

The aim of this study is to define recommendations, so called building blocks, for a vision on how the Netherlands can support Egypt and Jordan in their transitions towards climate-smart agriculture (CSA) in the next 10 years.

These building blocks may form a basis for the programming of future projects addressing climate change related issues in the agricultural sector of Egypt and Jordan. Lessons learned from various CSA interventions that have been implemented in the last four years (2018-2022) or are currently ongoing with financing from the Dutch government were collected and used to design these building blocks. Furthermore, these buildings blocks were tested with key stakeholders related to CSA in Egypt and Jordan during workshops and later discussed with Wageningen University & Research (WUR) experts during focus groups.

Figure 1 *Map of Egypt and Jordan located in the MENA region (Responsible Travel, n.d.)*

It is clear that not only the agricultural sector needs to become more climate smart. Simultaneously, transitions are needed in the water resources management and energy sectors as these are closely linked with the agriculture sector. This study therefore will also take a Water-Energy-Food Nexus approach into account.

1.2 Methodology

A climate-smart agriculture framework is used to create a categorized overview of the various kinds of interventions. The lessons learned are gathered from experts who have been practicing CSA in Egypt and Jordan in a wide portfolio of Dutch-funded projects (Annex 1). The projects were selected by the Embassy of the Kingdom of the Netherlands (EKN) in both countries. The two criteria for the selection where i) they needed to be Dutch funded and ii) they should have started after 2017. The first criteria was chosen because building blocks are designed on how the Netherlands can support CSA in Egypt and Jordan. Non-Dutch funded projects may give other lessons learned that are not necessarily applicable for the Netherlands. The second criteria was chosen to have the most recent insights on the context in which the projects operate. This study did not normatively evaluate the individual interventions against their proposals and plans. However, it uses four analysis lenses which are commonly used during project and program evaluations:

relevance, sustainability, scaling and social inclusion. By using these lenses, reflective learning on the CSA interventions is fostered which helps to create the lessons learned. The relevance dimension assesses how much the interventions contribute to the CSA demands and needs of the countries and its people, the sustainability dimension assesses how project outcomes where sustained beyond project duration, the scaling dimension looks into how the intervention and/or portfolio of interventions help to scale CSA from project level towards the ultimately required wider societal transition towards climate resilience whilst the social inclusion dimension looked into the distributional aspects and effects of climate change and the adaptation to it.

This study used interviews, workshops and focus group discussions to collect data, this is explained further in Sections 1.2.2, 1.2.3 and 1.2.4. In regard to the privacy of the people working along during the interviews, workshops and focus group discussion in this project, the names and other information cannot be given in accordance with the General Data Protection Regulations (GDPR).

1.2.1 Literature study

At the start of the project, literature on different and relevant concepts was collected. First, the concept of CSA itself is studied in more depth to have a broader understanding of the concept. The focus was on transitions and scaling strategies, which are both essential in creating support and change of a system. This literature is used to design a framework for the questionnaire and the interviews described in the next section. Moreover, literature around the water-energy-food nexus was collected to identify how it fits within the CSA concept. As COP27 was taking place this year (2022), a small description is given how the project fits within this conference. To have a better understanding of the context, literature on both agriculture and climate change was collected on both countries.

1.2.2 Interviews

For the selected projects, personal interviews were arranged with key informants from the teams implementing these projects (mostly via online communication) to acquire detailed information about the project and their contribution towards CSA. Seven projects in Egypt were discussed and five in Jordan. Prior to the interviews, interviewees were requested to fill a questionnaire to categorize the interventions on the CSA framework (Annex 2). An interview guideline was developed for this purpose, using among others the relevance, sustainability, up-scaling and social inclusion dimensions. Moreover, and the questions were partly based on the literature study as described in 1.2.1, and can be found in Annex 3. Most of the interviewees are linked to Dutch organisations implementing the projects. People interviewed were predominantly of Dutch origin, while some of them are of Egyptian or Jordan origin (and occasionally from other countries). Some of the Dutch people interviewed are resident in Egypt and/or Jordan or have at least a long track-record of working experiences in Egypt and/or Jordan.

1.2.3 Workshops

To come to a shared understanding of the building blocks for a vision on CSA for Egypt and Jordan, workshops were organized with national stakeholders in Egypt and Jordan to further discuss the lessons learned and recommendations resulting from the interviews. In each country, one workshop of around five hours was planned. Stakeholders represent the various facets of the Dutch Diamond Approach and come from the government, private sector, civil society and knowledge institutes. In this way, priorities and promising recommendations shared by the variety of stakeholders and partners, which best support the climate-transition, can be identified. Workshop participants were selected by the EKNs in Egypt and Jordan. Participants were predominantly of Egyptian and Jordanian origin, while some were of Dutch origin or from other countries. Besides plenary presentations, Q&A and discussions, the workshop programme entailed round table discussions in four smaller groups in which the lessons learned and recommendations were discussed. In these pitches the participants could address the issues and subject that they thought to be important. These are summarized in Annex 4. The workshops were complemented by field trips and informal non-structured interviews for purpose used to provide further depth and validation of the initial interviews.

1.2.4 Focus group discussions

After the workshops the lessons learned and recommendations further developed with the outcomes from the discussions. To make the recommendations more actionable, the knowledge and experience of WUR colleagues were harvested during focus group discussions. Beforehand, the participants of the focus groups received the draft report including the lessons learned and recommendations. To lead the discussion, guiding questions were designed per recommendation. The outcomes of these discussions are incorporated in the recommendations.

1.3 Reading guide

The next chapter (Chapter 2) explains different concepts and theories used in this report, such as climate-smart agriculture, climate change as a societal transition, the role of scaling, water-energy-food nexus and the Conference of the Parties 27 (COP27). Chapter 3 describes the key climate change and agriculture related issues in Egypt and Jordan and the Dutch policy agenda (2022) on international trade and development. Chapter 4 describes the lessons learned from the assessed interventions that were distilled from the interviews and workshops. Chapter 5 provides recommendations that are the so called buildings blocks. These are based on the outcomes of the interviews (Chapter 4) and based on the feedback from the workshops and focus group discussion. Chapter 6 gives a conclusion of this study.

2 Background and concepts related to climate-smart agriculture

2.1 Definition climate-smart agriculture

Egypt and Jordan are two countries, located in the Middle East and North Africa (MENA) region, that are highly vulnerable for the effects of climate change. Both countries are highly dependent on their natural resources which are highly sensitive to climate change (AbdelMonem et al., 2022). One of the natural resources that is under high pressure is water (AbdelMonem et al., 2022 & Hellegers et al., 2022). Both countries are arid and located in transboundary river basins, respectively the Nile Basin and the Jordan Basin. The limited precipitation within these countries and the fact that large parts of the scarce renewable water resources is entering the countries through their transboundary rivers, create challenging water management conditions. Even without the additional effects of climate change, this is a factor that needs strong consideration when developing sustainable agriculture.

Simultaneously, agriculture itself is one of the larger contributors to greenhouse gases (GHG) emissions which need to be addressed with mitigating measures. According to IPCC 6th Assessment report agriculture, forestry and land use contribute 13-21% of the total GHG emissions (IPCC, 2022). To increase their sovereign food security and economic development, both countries are increasing domestic food production, productivity, and profitability.

A concept that tackles the intertwined challenges discussed above is climate-smart agriculture (CSA). CSA has multiple objectives which are defined as the three CSA pillars (see Figure 2) as follows (FAO, 2013; Lipper et al., 2014):

1. Sustainably increasing agricultural productivity to support equitable increases in incomes, food security and development. This includes developing agricultural systems withing planetary boundaries like water availability and biodiversity requirements;
2. Adapting and building resilience to climate change from the farm to (inter-)national levels;
3. Developing opportunities to reduce GHG emissions from agriculture compared with past trends.

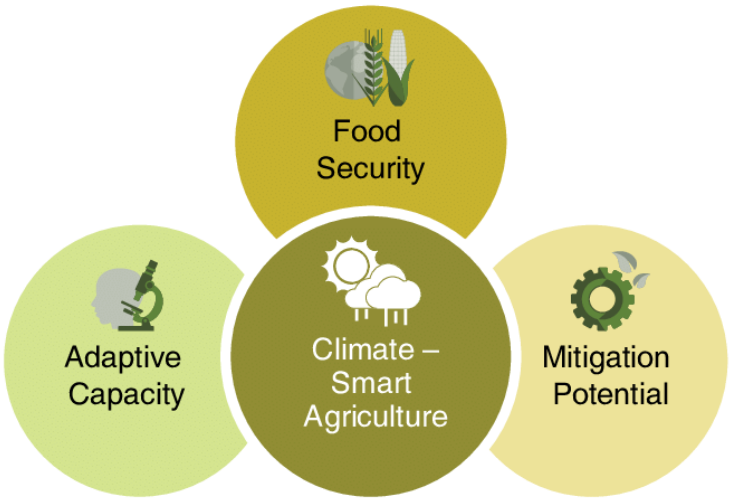

Figure 2 *Three pillars of climate-smart agriculture (Jat et al. 2020)*

FAO (2013) states that "CSA is not a new agricultural system, nor is it a set of practices. It is a new approach, a way to guide the needed changes of agricultural systems, given the necessity to jointly address food security and climate change". The Climate Change, Agriculture and Food Security (CCAFS) Programme of the Consultative Group on International Agricultural Research (CGIAR) identified various entry points for making agriculture more climate smart and can be categorized in:

1. CSA practices;
2. CSA systems approaches;
3. Enabling environments for CSA.

Although not precisely or formally defined one could argue that CSA practices are interventions that can be applied at a field scale by individuals like by farmers. System approaches take a more holistic approach and tend to work on higher spatial scales and assume some sort of collaboration on CSA between different food system actors. Enabling conditions are supposed to service many individuals and possibly work on the scale of entire countries. Public services, policies and institutional arrangements fall within this category and it is often governments which are creating these conditions. As both countries are water scarce, in this report climate-smart agriculture has a water focus, sometimes referred to as climate- and water-smart agriculture.

It is believed that a mixture of linked interventions being applied at these different scales (see Table 1) are needed to come to true climate-smart transitions.

Table 1 *CCAFS and author constructed entry points distributed over three different scales: field, landscape and institutional.*

Practices	**System Approaches**	**Enabling Environments**
Field level	**Landscape level**	**Institutional level**
Soil management	Landscape management	Index-based insurance
Crop production	Value chains	Climate information services
Water management	Food System Approach	Infrastructure
Livestock management	Integrated water resource management	Policy engagement
Forestry and agroforestry	Integrated natural resource management	Institutional arrangement
Capture fisheries and aquaculture		Gender and social inclusion
Energy management		Climate funding
Livelihood diversification		
Migration		

2.2 Mitigating and adapting to climate change: a societal transition

The three pillars of CSA (creating sustainable and inclusive food systems, adapting to climate change and mitigating possible contributions to GHG emission by food production) can all be interpreted as transitional changes. Meaning that it is not just a matter of changing a few technologies or policies, it means changing the entire food system into a new state. Such a systemic change requires various types of interventions from possible technologies and practices working towards climate resilience and more biodiversity-inclusivity, from different ways of managing systems like the integrated management of water and natural resources, to a different way of governance where for example the government co-creates appropriate enabling conditions together with the people such all can adapt and change.

Some argue that one even needs to re-define the world's economic model and abandon the current environmental economics (people, profit, planet) as it does not create sufficient incentives to truly be able to establish sustainable human-nature relationships (Guinot, 2020). The current approach is strongly leaning on trying to reduce negative environmental impacts of human activities whilst pursuing GDP-growth. Newer economic paradigms are being developed and assume a decoupling of natural resources use from GDP-

growth, like circular agriculture described by De Boer and van Ittersum (2018), or which apply a wider definition of development that goes beyond GDP and includes additional human wellbeing factors or even assuming some sort of de-growth pathways (Guinot, 2020).

Systemic change of food systems also means it needs simultaneous changes on multiples scales. From plot scale where individual farmers can make a difference, to landscapes on which many ecological processes manifest which need to be restored to national scales where sovereign nation states through policies, policy instruments and institutional arrangements create the right enabling conditions. In a world where food systems are linked through international trade, with an international flow of materials along commodity chains and movement of labour, such a transition even has a global component (Hull and Liu, 2018; Newig et al., 2020).

It is clear that such transitions would need efforts and contributions from a multitude of actors. Individual farmers, actors in the value chain like seed- and other agricultural input providers, buyers, processors and transporters, and financers; technical, vocational and academic educators and extension officers; researchers at agricultural universities and in National Agricultural Research Centres; policy-makers, civil servants and political leaders at various governance levels and; the civil society like members of cooperatives, community development association, women groups and local and international development NGOs. The Dutch Diamond Approach, which stands for intense cooperation between public sector, private sector, academia and civil society, promotes and facilitates such a multi-stakeholder approach.

With the water, energy and food sectors being intrinsically linked (see Section 2.4), CSA should be accompanied by climate-smart and sustainable changes in how the countries generate, use, share and hence manage water and energy resources.

When it comes to climate adaptation, one has to understand that people's vulnerability to climate change differ often conditional on their socio-economic characteristics. Obviously, the vulnerability of highly educated, commercially oriented and large-scale farmers is different from the ones owning just a small amount of hectares of land and/or not having had education opportunities. Due to limited access and control over land, finance, education, information and political decisions, especially women and younger generations in the agricultural sector in Jordan and Egypt are vulnerable (OECD, 2020). So are the international labourers and immigrants (like Egyptian workers and Syrian refugees in Jordan).

In a final self-evaluation of their work on CSA in the past decade, the CCAFS team defined some remaining key questions which relate to these transitional change aspects:

- There are sufficient policies. No more need for more policies. How to build capacities at the right level such that these policies are brought into action?
- How to bring technical solutions to scale?
- How to create access to finance for smallholder farmers such that they can adapt?
- Transitions need reflective learning. How to build capacities and organizational culture that allow that.
- How to ensure that that research gets in the hand of people needing it?

2.3 Scaling of CSA

One of the key issues of climate change mitigation and adaptation is that one needs to reach huge numbers of people, while time and resources for interventions are limited. Hence, scaling is crucial. In this study the definition of scaling is adopted as "a process or processes that lead to the introduction of CSA technologies with demonstrated effectiveness through a program delivery structure particularly aiming to improve coverage and equitable access to the CSA innovation(s) and realization of improved social, economic and environmental benefits" (Makate, 2019, p. 38). This definition is adapted from IIRR (2000) who defined scaling up as efforts to bring more quality benefits to more people over a wider geographical area more quickly, equitably and that such benefits have a lasting impact.

Makate (2019) argues that scaling mostly happens in so-called action arenas: places where different sorts of stakeholders interact to achieve the outcomes they desire (not necessarily being the same outcomes for all). Such action arenas could be groups of stakeholders linked through value chains and markets, cooperatives, innovation hubs and platforms, social and spiritual movements, community-based affiliations or through specifically designed scaling mechanisms such as climate smart villages.

Kirina et al. (2022) studied scaling of CSA in East Africa. They identified various scaling strategies such as:

- Piloting and testing of technologies through farmer field schools and/or demonstration plots
- Living labs
- Capacity building of various CSA-related stakeholders
- Partnership building including PPPs and across value chains
- Leadership building
- Curriculum development
- Funding
- Policy advocacy

It was observed that CSA scaling tends to occur in 3 waves:

1. Testing of technologies in various contexts and value chains
2. Developing of scaling mechanisms
3. Scaling hinged on evidence, sensitive and responsive to the socio-economic and agro-ecological dynamics, accounting for synergies and trade-offs between the CSA's three pillars and across scales.

Most scaling interventions cover at least the first wave. The second wave is often only done after the first wave has been finished. It was argued that the third wave can only be reached when scaling mechanisms are included in interventions from the very start. They conclude that a scaling design should be integral to the development of any interventions that promote CSA. This asks for a theory of scaling next to, or as part of the theory of change of interventions.

Since scaling is a long-term process often covering tens of years, mechanisms to maintain the momentum, mobilization of resources, and monitoring and learning are crucial elements for consideration. In their study for East Africa, it was found that CSA interventions, often initiated by donors and other international development partners were rather un-linked and un-coordinated. Kirina et al. (2020) promotes the so-called Sequencing, Integration and Layering (SIL) model. Sequencing involves the phasing of interventions through different projects or partners often in the same location. CSA interventions should then ideally be integrated with different aspects of other projects. CSA interventions should be rolled out in a layered manner where introduced interventions re-reinforce and build on previous efforts. Such a programming and implementation model of CSA interventions fuels scaling by capitalizing on synergies and tapping on pooled resources.

A large list of enabling and hindering factors affecting scaling of CSA as found by Kirina et al. (2020) is listed in Annex 5.

2.4 Nexus thinking

In order to optimize the efficiency and broader environmental effectiveness of climate-smart agricultural activities in Egypt and Jordan, it is recommended to carry out a quantitative nexus assessment. This should be done after identification of climate smart agricultural investment/focus areas from the Netherlands to Egypt and Jordan and will provide a prioritization in investment areas and themes.

Environmental and climate systems interact with each other and to the broader environment. This means that the actions in one particular sector have an effect on one or more sectors. Agricultural production for example requires water for irrigation, energy for driving pumps and mechanization and indirect to produce fertilizers. The same applies to water abstraction for drinking purposes, which requires energy for its treatment and distribution and may have potential adverse effects on groundwater levels (when abstracted

from groundwater). Next to this, water is needed to sustain ecosystems in water bodies, meaning that this water cannot be used for other purposes. At the same time, interventions in one sector may provide positive synergies to other sectors. Knowing the trade-offs and synergies of interventions is important to rank interventions and make sure that trade-offs (if any) can be addressed at an early stage. The concept that described these interactions is called nexus thinking.

Projects and programs that focus on climate adaptation and/or mitigation are expected to provide synergies with the environment (e.g. carbon storage in soils may also increase soil organic carbon) but might also cause trade-offs. However, quantitative knowledge of climate interventions on the level of interaction with the broader socio-economic and natural environment is not yet well understood. This knowledge would however be of relevance as it allows to prioritize climate change related projects and programmes; those with most positive effects and synergies could be given a higher priority than those with lower effects. This is important as financial resources are limited and should be spend as effective as possible.

A quantitative nexus approach can provide this insight. Using system dynamics which can connect climate change interventions (projects, programmes) with environmental factors, within particular water, soil, energy, agricultural production and biodiversity, these insights can be provided. An example of a quantitative Water, Energy, Food nexus assessment has been developed through funding from the Dutch Ministry of Foreign Affairs for Jordan, United Arab Emirates and the Netherlands in 2021. The results of this exercise which presents synergies and trade-offs of water, agriculture and energy related interventions can be seen at the project website.

2.5 COP27

The 27th Conference of Parties (COP), the supreme decision-making body of United Nations Framework Convention on Climate Change (UNFCCC) took place in Sharm el-Sheikh on 7-18 November 2022. Its priorities were set on i) strengthen and mainstream resilience; ii) finance climate action; iii) accelerate immediate climate action and; iv) building credibility and trust in non-party stakeholder's action. More specially for this study, the urgent need for sustainable and climate-smart agriculture is a fact with the outcome of the latest IPCC report and knock-on effects of the Ukraine crisis that started early 2022.

The Egyptian COP27 Presidency developed a number of flagship initiatives to scale up climate action in Africa and developing countries. One of these is called the FAST (Food and Agriculture for Sustainable Transformation) initiative with the objective "to increase climate finance contributions to agriculture and food systems to one-third of the total share by 2030, with at least two-thirds for adaptation in developing countries". Three pillars of implementation are defined to achieve this goal: i) assessment, guidance and knowledge-sharing; ii) facilitating finance; iii) policy integration.

The Netherlands Agricultural Counsellor in Egypt wrote a concept note in which the NL-Masr CaWSA (Climate and Water Smart Agriculture) project is proposed. The aim of the project would to generate climate action through peer-to-peer knowledge exchange and capacity development by generating business cases through climate funding. Within this proposed project the Dutch Diamond Approach is essential, taking into account the governments, private sector, knowledge institutes and civil society.

An important starting point for the study presented in this report is to identify the challenges, lessons learned and other experiences that are generated by Dutch funded projects. It may form the basis for such a program like future programming in the field of Climate and Water Smart Agriculture. Some of the findings of this study were incorporated within a COP27 session to create outreach on the subject with other actors. This session took place on 14 November 2022.

3 Agriculture and climate change in Egypt and Jordan

In this chapter a description of the Egyptian and Jordanian agricultural sector, issues relevant to CSA, strategies and Dutch collaboration is given. It is based on literature and not on the interviews.

3.1 Dutch policy on Foreign Trade and Development Cooperation

The Government of the Netherlands (GoNL) has written in her policy document on Foreign Trade and Development Cooperation to commit to limit the global warming to 1.5 degrees (Ministry of Foreign Affairs, 2022). Moreover, the policy document describes the goal to support countries to adapt to climate change and its consequences while at the same time improve biodiversity. Both mitigation and adaptation are therefore important goals and these are both linked to CSA, as explained in Chapter 2.

Egypt has been categorized as a combination country, meaning that there is an integrated focus on international trade and development cooperation. Moreover, a 'combination track' will be explored in the area of climate- and water-smart agriculture. This will allow EKN and Netherlands Enterprise Agency (RVO) to apply more resources and capacity in Egypt. Moreover, it should become more appealing for Dutch business to make large investments. Thematically, the focus is on sustainability and the digital transition. The goal is the create more opportunities for trade and to have equal trade agreements. This is assumed to create long-term impacts.

The agenda in Jordan focusses on development cooperation. The key specific goal in this development cooperation agenda is to increase the capacity and ability of Jordan to host refugees from especially Syria (Ministry of Foreign Affairs, 2019). Also, in Jordan the thematic focus is on sustainability and the digital transition.

3.2 Egypt

3.2.1 Agricultural sector

In 2015, the population in Egypt counted 92 million people and is expected to grow to over 151 million people in 2050 (FAO, 2017). A vast majority of the population is living along the Nile Valley and in the Delta while part of the population is living in the desert and coastal regions. The food production in Egypt is mostly located in the Nile Valley and Delta and a few oases in desert. However, since the 1990s commercial agricultural activities also expanding towards the desert for the production of industrial and export crops (including potatoes, barley and citrus). Most recently priority was giving to growing wheat to be more self-sufficient with the context of the Ukraine crisis. Currently, over 50% of the cereal consumption is imported in Egypt (Christoforidou, 2022). Most farming systems in the desert are specialized production systems applying monocultures and intensive chemical input use to maximize production specifically focused on the high-end market and for export. The share of arable land in the new land has mainly increased on the basis of the use of limited groundwater reserves. Except for a small region along the Mediterranean coast, all crops are watered through irrigation. The main cultivated food and feed (crops) include: wheat, maize, barley, rice, berseem (Egyptian clover), sugar crops, food legumes & vegetables, fruits (particularly citrus) and fish (Radwan et al., 2019).

Overall Egypt's agricultural water use efficiency is already high to cope with the water scarcity partially achieved through reuse of drainage water. Egypt's water resources are managed by the Ministry of Water Resources and Irrigation (MWRI), with agriculture as by far the largest user of irrigation water, with a share

of about 85%. The deep groundwater resources are mostly non-renewable with sometimes high salinity levels and must therefore be used prudently with a long-term planning horizon (Terwisscha van Scheltinga et al., 2021).

3.2.2 Issues relevant to CSA

According to the Intergovernmental Panel on Climate Change (IPCC, 2022), Egypt´s Nile Delta is one of the world's three "extreme" vulnerability hotspots, and future projections indicate that Egypt will suffer from the following climate change impacts: sea level rise; water scarcity and deficit; and an increase in the frequency and intensity of extreme weather events such as heat waves, flash floods, heavy rains, sand and dust storms. A sea level rise of 1 meter would decrease the arable land in the delta with one million feddans (1 feddan is 0.42 hectare). A water demand increase of up to 10% is expected to higher temperatures. All impacts together are assumed to contribute to a up to 24% average crop yield decrease. The groundwater used is often non-renewable and hence needs an exit strategy. Increasingly more saline groundwater is being pumped up in older agricultural land reclamation schemes, illustrating this is mostly a fossil resource. Strategies to cope with water scarcity, such a moving from flood irrigation to 'modern irrigation technologies' like sprinkler or drip may have trade-offs for soil health such as increased salinity or reduction is soil microbiology.

3.2.3 International and national strategies to climate change

Egypt's Sustainable Development Strategy, Vision 2030 follows the Sustainable Development principle as a general framework for improving the quality of lives and welfare, dealing with economic, social, and environmental dimensions. It addresses modernization of agriculture as well as climate plans however lacks clear goals, indicators and implementation strategies.

The objective of the National Strategy for Adaptation to Climate Change and Disaster Risk Reduction is to increase the flexibility of the Egyptian community when addressing the risks and disasters resulting from climate change and its impact on various sectors and activities. It further aims at strengthening the capacity to absorb, contain, and reduce the risks and disasters caused by climate change.

Egypt submitted its Nationally Determined Contribution (NDC) to the UNFCCC in 2015. Egypt has prepared three National Communications on National Adaptation Plans for Action to the UNFCCC (1990, 2010, 2016). The second National Communication addressed the vulnerability and adaptation of various sectors in Egypt to potential impacts of climatic changes. The third one updated the vulnerability and adaptation assessment with a focus on health, tourism and biodiversity.

The National Council for Climate Change (NCCC), established in 2015, is an inter-ministerial committee and the key-decision body responsible for coordinating climate policy development and implementation across Egyptian ministries and agencies. In November 2017, the Adaptation Task Force was established to serve as the operational arm of the NCCC The Egyptian Environmental Affairs Agency (EEAA) within the Ministry of Environment is the lead agency to manage Climate Change adaptation and mitigation.

The joint UNDP-UN Environment National Adaptation Plan Global Support Programme (NAP-GSP) providing technical guidance to the NAP processes concluded that Egypt is currently facing some challenges like:

- Limited availability of climate information services.
- Limited institutional capacity to undertake complex cross-sectoral and cross-scalar adaptation planning.
- Insufficient financial resources and budgets allocated to adaptation threaten the sustainability and scaling up of adaptation actions.

The Climate Action Tracker (CAT) is an independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement. As Egypt does not have yet a quantifiable emissions reduction target, nor has it updated its NDC since 2015, CAT rates the Egyptian policies and action towards the mitigation target under the Paris Agreement as insufficient.

3.2.4 Dutch collaboration

Within the framework of development cooperation, the Netherlands and Egypt have, for over 40 years collaborated in water management. The water cooperation between the Netherlands and Egypt has largely taken place under the direction of the Egyptian-Dutch Advisory Panel on Water Management. The aim of the collaboration is to improve the efficiency and management of water, and to reduce the vulnerability to climate change.

The water panel consists of Dutch and Egyptian representatives from the relevant Ministries, private sector / social sector and knowledge institutions. The panel is led at a ministerial level with a secretariat in the Netherlands Water Partnership, funded by the Partners for Water program.

The cooperation with Egypt is based on the three themes derived from this Memorandum of Understanding (MoU):

- Coastal management;
- Sanitation and wastewater treatment;
- And agriculture and water.

Egypt has requested the Netherlands to assist the country in developing plans for more efficient water use in agriculture.

3.3 Jordan

Jordan is an upper- middle income country with a population of over 10 million people (Christoforidou et al., 2022). The country is hosting around 673,000 registered Syrian refugees (World Bank, n.d.; UNHCR, 2022a). However, considering also the unregistered refugees estimations state that there must be around 1.3 million Syrian refugees in Jordan (3RP Joint-Secretariat, 2020). Around 70% of the Syrian refugees live outside the camps in urban, peri-urban, and rural areas of Amman, Irbid, Mafraq, and Zarqa, which are governorates located in the north of Jordan (UNHCR, 2022b).

3.3.1 Agricultural sector

Jordan is an arid country, with irrigated and rainfed areas. The country can be divided roughly into the Jordan Valley, a region with irrigated agriculture and where most vegetables and fruits. More to the west are the Highlands, here most rain falls and rainfed agriculture is been practiced. In 2017 most farms (including livestock) have less than 10 hectares (97.7%) and only 0.1% has more than 200 hectares. The main commodities are vegetables, fruit trees, olive, almost, citrus and dates, as well as wheat, barley and legumes. Water availability for irrigation is depending on rainfall and the surface water in the Jordan river. The irrigated area is around 19% of the total cultivated area, however it is the most important area when it comes to economic and export value. The key governmental stakeholders in the agricultural sector are Jordan's Ministry of Agriculture (MoA) with three technical arms The Agricultural Credit Cooperation (ACC) The Jordan cooperatives cooperation (JCC) and The National Agricultural Research Center (NARC) (World Bank, 2021).

3.3.2 Issues relevant to CSA

Water scarcity is an important factor constraining agricultural growth and climate change is expected to lead to further reduction of water availability. Groundwater has been a reliable source for decades for agricultural purposes as well as for domestic and industrial. The recharge of the groundwater is lower than its abstraction which will cause 40% of Jordan's groundwater system at risk of depletion by 2030 (Mercy Corps, 2014). At the moment 91% of treated wastewater is reused for agriculture. Another challenge for the agricultural sector is the export of fruit and vegetables. As a result of the regional crises in Syria and Iraq more than 50% of the export to and through Syria dropped down and 75% of the export to Iraq (World Bank, 2021).

With water and export as two main challenges in the agricultural sector of Jordan, it is important for CSA interventions to focus on this.

3.3.3 International and national strategies to climate change

The World Bank (2021) collected most recent plans and policies that were made by the Jordan government internally or with international collaboration.

- National Water Strategy 2016-2025: to achieve sustainable management of water and sanitation for all Jordanians.
- Green Growth National Action Plan 2021-2025: to expand Jordan's climate and sustainable development ambitions by mainstreaming green growth, climate change and sustainable development objectives into sectoral strategic frameworks. The sectors are agriculture, energy, tourism, transport, waste and water.
- National Climate Change Adaptation Policy 2013-2020: To achieve a pro-active, climate risk resilient Jordan; remaining a low carbon growing economy, sustainable water and agricultural resources, healthy ecosystems and climate resilient communities.
- Nationally Determined Contribution (NDC) action plan: To reduce greenhouse gasses, as well as increasing adaptation capacity of the water sector, agricultural sector and energy sector. It is in line with Jordans National Climate Change Policy and National Green Growth Plan.
- National Strategy and Action Plan to Combat Desertification 2015 -2020: to have a productive and sustainable use and management of land resources to support poverty reduction, environmental sustainability and national economy.
- Jordan National Vision and Strategy 2025: focusses on providing opportunities for all, promoting the rule of law and equal opportunities, increasing participatory policy making, achieving discal sustainability and strengthening institutions.

3.3.4 Dutch collaboration

The GoNL is supporting Jordan to deal with the economic and social impact that the regional turmoil had on this country. In 2018, GoNL selected Jordan as a focus country and subsequently committed to support Jordan over 4 years (2019-2022), with a significant portion of support allocated to the agriculture sector, with a strong focus on horticulture. The horticulture sector has been prioritized for interventions because of its potential to contribute to economic growth, food security and employment generation for Jordanian host communities and Syrian refugees (Ministry of Foreign Affairs, 2019).

4 Lessons learned on Dutch support on CSA

This chapter describes the lessons learned based on the experiences of the staff having implemented Dutch-funded CSA interventions in Egypt and Jordan (for seven projects in Egypt and five in Jordan). Section 4.1 gives an overview of the project characteristics that were assessed using the online questionnaire. The sections 4.2 and 4.3 discuss the lessons learned for respectively Egypt and Jordan, based on information gathered during the interviews and workshops and roughly categorized under the four selected analysis lenses: relevance, sustainability, scaling and social inclusion.

4.1 CSA characteristics of assessed projects

The following section is based on the results from a questionnaire that the interviewees were asked to do before the interview took place. Questions address which type of farming systems were being targeted in the project works, which CSA pillars are covered and which CSA entry points are used (for information on CSA see Section 2.1).

4.1.1 Farming systems

Most of the assessed projects were targeting early adopting farmers, which are often medium or large-scale and more commercially oriented farmers. In many projects the condition of co-financing of the CSA interventions by the farmers themselves is applied to create better buy-in and ownership. Smallholders are often unable to make such investments.

One project was solely working with smallholder farmers, located in Upper Egypt. In Jordan, most projects are working in horticultural sector. A part of these projects works on simple greenhouse development or open-field horticultural development with smallholders. In most of the projects there was an activity to have a demonstration of technologies or agricultural practices. At these demonstrations, smallholder farmers were often invited on field days or in related trainings.

4.1.2 CSA pillars

All the assessed projects work towards improving food security, one of the pillars of CSA. Sustainably increasing productivity and building more competitive agricultural sectors were often the goals of the addressed projects. In Jordan, also job (livelihood) creation formed a strong underlying agenda for the CSA interventions. The second CSA pillar of adapting to climate change was often mentioned as well and most of the projects however were cognizant of climate change within their scope and somehow worked towards building an adaptive capacity of farming. The implemented interventions often had a positive effect on adaptation although it had not necessarily always been the key goal of the intervention. Examples of such interventions are the project on saline agriculture and nature-inclusive farming. It was found that most of the assessed projects do not purposely work towards climate mitigation as their key goal. However many projects are implementing types of farming systems that are assumed to release less GHGs than conventional farming resulting from a decrease in use of agro-chemical inputs and/or reduced energy demand. Solely the carbon farming with basalt project in Egypt by the Heliopolis University, which is not directly funded by GoNL, is explicitly addressing mitigation, is explicitly addressing mitigation.

4.1.3 CSA entry points

Figure 3 shows that at the field scale the assessed projects most often the use soil management, crop and water management as CSA entry points. Appropriate water management is obviously important in both countries with water scarcity being a serious problem and most projects work on irrigated crop production systems. One of the assessed interventions in Jordan specifically also worked on migration, where in the

intervention focus was on the job creation for Syrian refugees. Here migration seems more linked to the political situation in Syria than to a deliberate choice to change livelihoods because of climate change and to move elsewhere. Livestock management, which is a climate change vulnerable sector as well, was addressed in one where one of the objective was to investigate the potential of alternative livestock fodder.

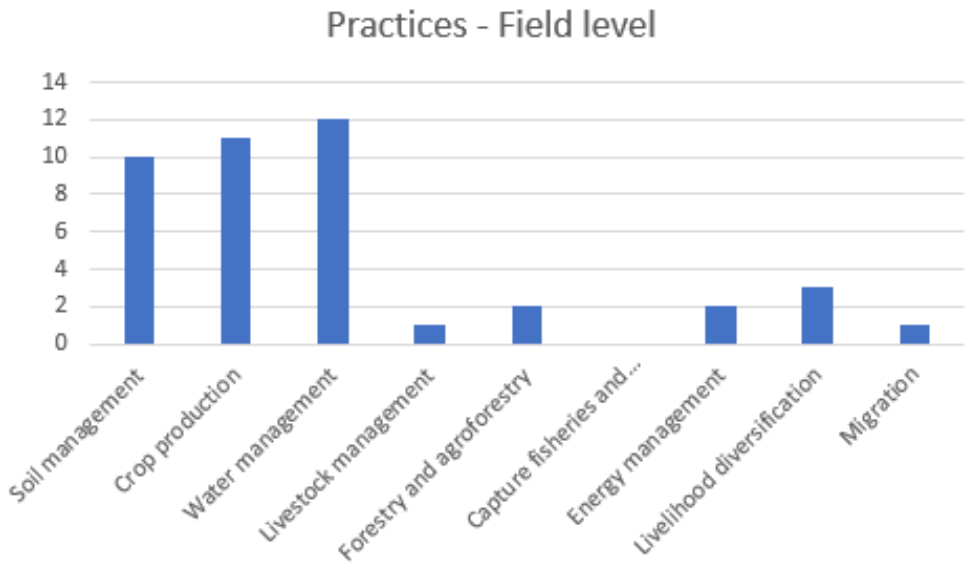

Figure 3 *How interventions cover various entry points at field level in assessed interventions in Egypt and Jordan, with on the vertical axis the amount of projects that indicated working on it.*

Figure 4 shows how implemented interventions relate to systemic approaches often applied to create CSA. In both countries, the assessed interventions are often linked to water resources management. The projects in Jordan are mostly geared towards the horticulture sector development and linked to value chains. There was often collaboration with input suppliers, entail market exploration and post-harvesting measures related to food waste. Focus on landscape management and natural resources management are relatively low in the assessed projects. Both types of approaches tend to have a more ecosystem-restoration and nature conservation orientation which seem not yet to be prominent ambitions in these countries within Dutch funded projects.

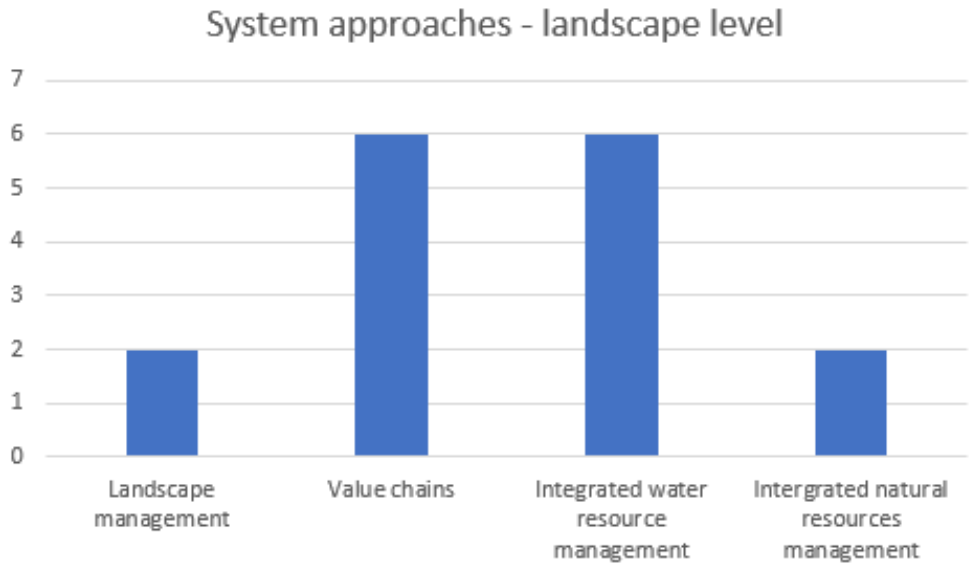

Figure 4 *How interventions in assessed CSA projects in Egypt and Jordan cover entry points on a systems level, with on the vertical axis the amount of projects that indicated working on it.*

Figure 5 shows that on an institutional level many of the implemented projects include the establishment of some type of institutional arrangement. Moreover, addressing gender and social inclusion issues was found in most of the projects but mostly as indirect and or cross-cutting effect. Only one intervention worked on building climate-resilient agricultural or water infrastructure. Climate funding was also addressed by one project.

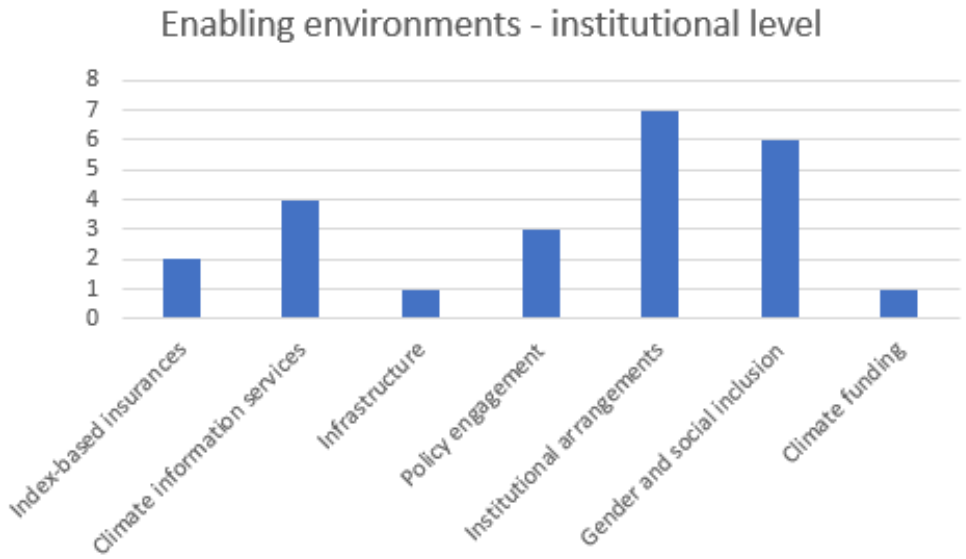

Figure 5 *How interventions in assessed CSA projects in Egypt and Jordan support entry points on an institutional level, with on the vertical axis the amount of projects that indicated working on it.*

In summary, the assessed CSA interventions:

- mostly work with and target medium to large-scale more commercially-oriented farmers
- work most of all on the productivity pillar, secondly on adaptation and only limitedly on mitigation
- mostly implement CSA practices at field level (44 times), secondly on creating an enabling environment (24 times) and least with systemic approaches (16 times)
- mostly work soil, crop and water management at field level
- most work with value chains and IWRM on the landscape level
- with institutional arrangements and on gender and social inclusion on the institutional level

4.2 Lessons from project implementers in Egypt

4.2.1 Relevance

Carbon farming

SEKEM together with the Egyptian Ministry of Environment are exploring various ways of climate mitigation ranging from promoting reduction in agro-chemical fertilizer use, reduction of methane emission from organic waste through composting, replacing fossil fuel-based farming operations with renewable energy ones and carbon farming through afforestation and soil carbon sequestration through organic fertilizing.

The Heliopolis University (part of SEKEM) has developed a conceptual carbon farming and crediting scheme and is trying to raise awareness and build support for this. Such credit scheme would be able to provide direct financial incentives for farmers to sequester carbon in the soils and/or through on-farm afforestation. Its feasibility is tested for organic farms in the Egyptian context and calculated that if Egypt's organic farms would move to accredited carbon farming this would generate EGP 1.3 billion (EUR 72 million).

Feasibility of carbon farming in other contexts like in agriculture on desert-reclaimed land has not been validated yet. Sceptics challenge the concept of carbon farming here as soils are relatively poor and often need intensive fertilizer use. There are only limited water resources available for non-food vegetation production and for organic manure production. Additionally, organic matter may decay relatively fast in these hot and arid environments which makes the soil carbon sequestration challenging in these regions.

Egypt being an emerging economy with and growing commercial agricultural sector, it could make sense and would be cost-efficient to first test and roll out such carbon farming mechanisms with Egypt's large-scale farmers. During the workshop it is mentioned that it needs to be made very clear what is the "catch" for the farmers. For many smallholder farmers having relatively small-sized plots, individual carbon farming gains may be limited. Transaction costs of convincing of those farmers to participate may be high as well as the transaction costs for operating such a smallholder scheme. Building then on an successful scheme with large-scale farmers may decrease such transaction costs.

Obviously carbon sequestration in soils can have positive co-benefits such as increased soil moisture capacity (which possibly reduces water needs and hence less water costs for farmers) and increased yield. Building on such incentives may help to create support for carbon schemes for smallholder farmers. This is exactly also one of the approaches the Desalt project is applying in the old lands in the Nile delta where through cover crops, mulching and agroforestry evaporative demand is reduced whilst organic soil matter benefitting soil water management is being built.

Nature-inclusive farming

Nature-inclusive farming is not only supposed to reduce negative impacts of farming on ecosystems. In addition, it is supposed to create healthier ecosystems in which the food production is taking place, assuming this will contribute to an increase in productivity and resilience against climate change.

One example of nature-inclusive farming is organic farming where one ambitions to reduce the use of synthetic fertilizers and pesticides to the minimum and replace it with organic substitutes and alternative biological pest control. It is assumed that the feasibility for organic farming is moderate in many of parts of Egypt as most Egyptian soils outside the delta and Nile valley are poor.

Improving Egypt's organic waste management might provide an opportunity for a composting mechanism that might then help to facilitate the provision of organic matter. This includes both decentralized composting at farm level as well as the development of a composting industry based on urban organic waste collection.

The market-pull for organically or nature-inclusively produced food commodities in Egypt is also still limited. Possibly only some of the international export oriented farming is connected to markets with consumers that are inclined towards nature-friendly consumption. Having said this, SEKEM has been proving that organic farming is profitable within the Egyptian context. Since about 40 years this organization has working towards sustainable and inclusive agricultural development using holistic approach that combines ecology, economy, societal and cultural life.

Nature-inclusive farming as defined above has the aim to create wider societally-oriented co-benefits like increased biodiversity and ecosystem resilience through landscape approaches and or combined with ecological restoration of degraded lands. For such type of development it is often difficult to pinpoint how these co-benefits result in individual gains for farmers and/or how their personal investment into it would provide returns. With such limited direct incentives, promotion and application of nature-inclusive agriculture cannot be left to the farmers and market, but needs strong steering through governmental policies and support. On-farm increase of biodiversity could result from more diverse cropping like combining traditional crops with flower and fruit production like explored in the PharosFarms project.

Climate information services (CIS)

When it comes to CIS, it is clear that one needs to differentiate the systems that are being developed for making strategic decisions by governments and governmental authorities (like WaPOR) and those that are intended for individual farmer's use (like Irriwatch). The latter systems are being taken up by service provision enterprises such as Tamkeen and Platfarm which are integrating Irriwatch in service delivery

packages. It is important to consider possible barriers for large-scale adoption like accessibility of the information to farmers (what is the smartphone coverage under smallholders), affordability (can farmers pay for such services) and understandability (what is the literacy rate among farmers and how do they understand the CIS terminology and indicators).

CISs which are intended to improve water savings are suitable for farmers that manage their own water resources like through a private groundwater well. However, most farmers are connected to some sort of larger irrigation scheme with often outdated infrastructure and management mechanisms. Many of such older schemes still work with fixed time slots for water delivery to farmers' plots. In such cases, there is no strong incentive for individual farmers to then practice water saving unless they would be able to store excess water themselves on their plots and skip next time slots.

Information services and open data sharing constraints
The initiative by FAO and IHE with the Egyptian government to embed WAPOR as a CIS in the Ministry of Water and Irrigation and build capacities on water accounting is developing slowly as various security checks still need to be passed. Overall, there is limited motivation to openly share information on water resources on a formal level by Egyptian authorities. This results from the challenging transboundary water context with upstream countries like Ethiopia and Sudan. This may hinder successful embedding of such systems.

WaPOR is used as a water accounting tool works near real-time data. Obviously, its finest spatial resolution of 30 by 30 m is only suitable for farm-level water accounting for the larger commercial farmers with high amounts of hectares of land. At his moment WaPOR is not suitable to be used as forecasting tool. New developments are planned such it allows for forecasting too.

Security issues were just mentioned above. Security limitations also exists for flying drones with sensors for high precision agriculture and hence currently provide a barrier for large-scale uptake of such technologies.

Saline farming
Adopting more salt-tolerant crop varieties will help to stretch the land productivity of salinization prone areas like in the Nile delta. However, this should be considered as a curative measure which needs a constant and flexible adaptation in the various segments of the value chain. With sea level rise and without the ability to better flush out built-up salts the soils of the agricultural plots, salinization is only slowed down, not stopped nor reversed. It is mentioned when promoting saline farming, one needs to be transparent and clear on the eventual outcome of such a curative approach. Eventually an exit strategy is needed.

Application of water saving irrigation methodologies to overcome the limited water availability issue needs to be considered in coherence with salinity control as regular flushing of the salt building-up in the soils remains to be needed in the future. During the workshop also desalinization of brackish and saline groundwater through decentralized solar panel powered reverse osmosis is being promoted. A wide-scale adoption of such technology should need to be very carefully planned as its costly and eventually a finite solution. A national wide monitoring of groundwater use, its salinity and how leads to soil salinization and hence reduce crop yields which could form the basis for such long-term planning is currently not existing.

Dutch cooperation modalities
The assessed Dutch interventions related to CSA seem to have a more prominent agriculture lens than a water lens. It was mentioned by many interviewed experts that with agriculture being a big water user and production being so dependent on water resources availability CSA should always simultaneously include both lenses, also known as nexus thinking.

Applying both lenses in CSA interventions requires a few working modalities. Firstly, people directly involved in project implementation need to be able to work multi-disciplinary which is a competency often still needing to be developed. Secondly, it also needs involving multiple institutional stakeholders since that the fields of agriculture and water resources management are organized in separate authorities. In Egypt, relevant authorities would be the Ministry of Agriculture and the Ministry of Water Resources and Irrigation. Additionally the Ministry of Environment is crucial when it comes to climate change affairs.

Such classic sectoral-thinking is present in the recipient countries like Egypt and Jordan. However, the differentiated thinking in water and food is actually also present in The Netherlands where the different lenses often end up in differentiated programs and projects run through different ministries.

One classic issue in the Dutch combi-agenda of cooperation, trade and investment with the purpose of contributing to SDGs which was being mentioned is how much Dutch interventions should balance introducing and promoting Dutch technologies and innovations versus building institutional capacities of Egyptian organizations such that they can develop such services themselves. For example, how to balance promoting using services from a highly advanced Dutch seed company like Rijk Zwaan with building the capacities of the Egyptian-based seed sector? Ideally one would work based on an integrated seed sector development approach where the different diamond approach stakeholders, Dutch and Egyptian co-create. But what if such integrated approach is not possible yet as capacities are not there or stakeholders feel that such approach creates unwanted dynamics and competition?

Local continuous presence or representation of the Dutch implementation partners was mentioned as being appreciated by Egyptian local partners. Taking a more equal partner / co-creation style by the Dutch development sector seems to be preferred by local partners over a more "Northern expert teaches Egyptian farmers" style.

4.2.2 Sustainability

Local partners
When reaching out and trying to involve larger groups of farmers, is was mentioned that is recommendable to work through locally established entities like NGOs or Community Development Associations. It helps to create legitimacy to the intervention and to create trust and ownership. It also supports to overcome language barriers as many Egyptians do not communicate other than in their local language. Obviously working through local organizations allows for better context-specific working. However, it may come with an trade-off of being less reflective and adaptive (see next section).

Farmer cooperatives are generally not well developed in the Egyptian context. However, farmers are often somehow associated and possibly through these associations part of the embedding of project outcomes can take place.

Being reflective and adaptive
It was mentioned by various experts that many local partner organizations, individuals within those organizations, and local farmers are unexperienced and uncomfortable with using reflective and evaluative approaches, e.g. on progress on reaching planned goals. People seem not to be trained in it nor does it seem to be part of common Egyptian culture. This limited ability to be able to reflect partially results from limited educational opportunities but also from a more traditional, hierarchical and instruction-driven culture of doing things. Another factor being mentioned is that many farmers (or service providers) are in a rather competitive mode (resulting from the challenge of scarce land and water resources and market opportunities) which limits their willingness to contribute to peer learning.

Many of the assessed projects seem to prefer working with more educated intermediaries in Egypt than with the less-educated farmers and stakeholders as climate change adaptation does require some level of reflectiveness. This challenges the social inclusions aspect of the interventions. The limited level of reflectiveness reduces the ability for project teams to steer and adapt project interventions. This may be less an issue for projects with relatively simple project goals like the ones showcasing CSA technology feasibility. However many of the CSA interventions have multiple goals and often work with multiple partners and phases. In such more complex project settings, being able to adapt to newer insights is essential. Developing capacities of relevant local partners in Egypt on how to deal with these sort of complexities may be needed.

Repeated interactions
One way to create sustainability is to involve the same local partners in subsequent projects and interventions. Such an approach would definitely support a more structural and thorough level of capacity building as it would be possible to monitor whether trained capacities are truly resulting in doing things

differently (and better). Such approach also guarantees continuity and capitalize on the trust and relationships already built in earlier projects (see also SIL). It would not be necessary or even undesirable to have the same group of partners in this conduit of sequential projects. At least the key partners which have shown leadership in tackling climate change should be re-involved in follow-ups. They can then form the foundation of new project teams in subsequent projects and sensitize the new partners.

Egyptian motivations
From the interviews it could be concluded that in general Egyptian farmers do not feel intrinsically inclined to work on climate adaptation and particularly on mitigation despite their awareness that extreme weather events like droughts and floods which negatively affect their yields are related to climate change. Farmers are however willing to invest (within their ability) into interventions when it directly results in positive personal benefits (increased yield, quality, reduction in labour or inputs, reduce crop failure risks). Framing projects in an abstract climate change adaptation and/or mitigation language may not appeal to these farmers and effort should be taken to relate it to direct and concrete issues that farmers deal with. Explaining how climate change affects the revenue costs ratio of their farms could be a strong motivator.

A typical development cooperation dilemma is on how to achieve continuous involvement of staff and political support from authorities. Despite that part of the project identification is done by EKNs in cooperation with Egyptian authorities, the interventions are mostly not truly co-created with these authorities. During project implementation, contributions to activities by governmental staff are normally not paid from project budgets. Instead, civil servants are often involved in workshop, training and demonstration visits and then possibly compensated with DSAs.

Dutch motivations
Parts of the CSA interventions discussed during the various interviews are being implemented by Dutch organizations who simply provide their technical services to the project. They are professional organizations often with highly trained and dedicated staff that provide services like trainings or technology demonstrations to projects. Some of these organisations also have strong commercial incentives to be involved as these projects provide opportunities to create, expand or consolidate their market.

At the same time, some of these organizations do not have a long-term nor broad vision and/or strategy on how to create CSA in Egypt. It was found that a part of the assessed projects did not have plans on how to create sustainability of project outcomes and/or how project outcomes could be scaled up. Such projects seemed to be run rather opportunistically. Such organisations should then limit their contribution to their technical services but nest their work in a clear strategic climate resilience development pathway established and coordinated by others.

4.2.3 Scaling

Silo-ed approach
In various interviews it is indicated that a holistic approach towards CSA is challenging since the cooperation between various CSA-relevant ministries, between ministries and lower-scale authorities and between research organisations like NARCs and universities is not always well developed. The decision-making structure within Egyptian governmental entities and within the bigger agri-firms do not necessarily foster a collective and reflective learning. Bottom-up requesting for an enabling environment favouring CSA (often a governmental responsibility) is challenging within the Egyptian context. This makes embedding of CSA interventions in wider governance structures a difficult endeavour.

At all scales exemplary leadership is needed that dares to challenge existing decision-making structures and shows that alternative policies, and cooperation mechanisms are needed to address complex issues such as adapting to climate change.

Practice gap of academia
Universities in Egypt have relatively limited resources and tend to stick to their core task of educating students and doing scientific research on agriculture. The NARCs are assumed to be better resourced and it is found that often academics and students do their research connected to these centres. It is mentioned

that there is a divide between the more theoretical work on the agricultural/water-focussed universities and farmers' practices and the realities on the ground. While for example the Cairo University (CU) was somehow linked to one of the projects on building capacities on use of CIS by commercial farmers, it is unlikely that CU is able and willing to provide more of these trainings themselves. The TVET centres appear to be more geared towards working with the practices and realities of the farmers.

Scaling through the private sector
It was often mentioned that the private sector might be the best "equipped" convenor of transition processes towards CSA. For example, value chain actors that are involved in international value chains are strict on international safety and quality standards. That generates the necessity for such actors to have quality and quantity control and a continuous and stable production not hampered by climate extremes or variability. Such actors also often have the financial resources to experiment with alternative approaches and technologies. During the workshops, agricultural input suppliers were suggested as providers of CSA technologies, equipment and knowledge.

Various interviewees mentioned that the most promising scaling mechanism consists of first creating interventions together with groups of commercially-oriented farmers, which through peer-learning attract some other early adopting farmers and then subsequently value chain actors. After some level of adaptation success has been reached, support from (local-scale) authorities may be generated. The key question here is how to create the right incentives that can support cooperation and peer-to-peer learning? And how to foster more solidarity and mitigate the risk of elite capture?

Scaling through community-approaches and NGOs
The World Food Program (WFP) is using Community Development Associations in their project in Southern Egypt. There they apply the principle of land consolidation: grouping six to eight smallholder farmers together in some sort of association acting as a mini-cooperative where through pooling of resources an effective economy of scale is created. This approach has large potential as an scaling mechanism to especially reach larger groups of smallholders.

On the community-scale sometimes also the Water User Associations (WUA) are active. They often play a role in local irrigation management. WUAs are governed by legislation, registered at the Ministry of Irrigation and the Ministry of Social Solidarity and the Government again by the Association Law. In none of the interviews, links with the WUAs were mentioned, which may be a missed opportunity to connect the fields of agricultural development and water resources management at the local scale.

In the workshop it was discussed that to be able to reach large groups of smallholders, inclusive finance mechanisms are needed. Since there is not always a direct interest for private sectors to invest in smallholders' adaptation because of unclear business models, governmental coordination and public finding is needed.

Governmental approaches
On the national scale, the Egypt-Netherlands Advisory Panel on Water forms a successful multi-stakeholder platform where Egyptian and Dutch water partners (Egyptian Ministry of Water Resources and Irrigation and the Dutch Ministries of Infrastructure and Water and of Foreign Affairs) have been interacting for a long time. The Netherlands Water Partnership (NWP) acts as the Secretariat for the panel. In addition, NWP coordinates the Partners for Water Country Platform. This platform unites Dutch organisations with activities in Egypt and stimulates collaboration on water between the Netherlands and Egypt. It could form an interesting mechanism to promote and scale up CSA interventions, particularly the ones that relate to water resources management.

4.2.4 Social inclusion

Land size matters!
In 2015 FAO estimated that about 90% of the Egyptian farmers are owning less than 2 hectares of land. It is thought that even when those farmers would apply advanced climate smart technologies these farms have limited profitability. Since generally speaking farmer cooperatives are not well developed in Egypt and the

Egyptian government abandoned earlier mechanisms of state-planned agricultural development, most smallholder farmers operate individually and opportunistically on small plots. They are not benefitting from a possible economy of scale, strategic crop choices and/or market development, nor from pooling of resources like information through affiliation that such cooperatives could provide. These smallholders are likely more vulnerable to climate change than the bigger farmers as they may not have the means to adapt. How to reach them and empower them such that they can start becoming more climate smart as well?

It is found that many of the Dutch-funded projects are geared towards the larger more commercially-oriented farmers most likely best explained by their willingness and ability to co-invest and to take more risks with novel technologies and practices. Land use consolidation may be a way to address limited economies of scale for smaller farmers.

Jobs
With high unemployment rates in Egypt, development of CSA should preferably also lead to job creation (CSA pillar one). Promoted CSA technologies should not replace labour needs. During the workshop it was strongly recommended that through employment, workers are also empowered. Like through creating opportunities to learn skills which improves the workers' employability or entrepreneurship.

Accessibility and affordability of services
Paid climate information services offered by some of the consultancies are often unaffordable by smallholders including the female farmers that often run either market gardens or home gardens. This may lead to unwanted distributional effects as these paid services will be adopted mostly by the bigger more commercially oriented farmers who have the possibility to invest.

Moreover, some of the CISI systems require a rather good understanding of the climate dynamics and role of information. Not all farmers have the capacity to work which such services. Some of them are illiterate or do not have the assets to access the info (like smartphones, PCs etc). Attention should be given how to reach these large groups of farmers for whom it is challenging to access and use CIS.

Gender issues
Egyptian society, especially in the more rural areas in the Southern part of Egypt, as well as the Delta, is gendered with distinct roles, rights and responsibilities for men and women. In settlement areas reclaimed from the dessert and in more urban and institutional environments this is less the case.

Agricultural universities in Egypt appear to be more gender-balanced. Special attention and care should be given to interventions to this fact and interventions should be designed such that they allow to build capacities and empowerment of women related to CSA. It was found that female trainees in many of the capacity building interventions seem to be more ambitious and willing to lead to change than the male trainees. This seems also to hold for younger trainees. However, access to the labour market, willingness and ability to go to the field and engage with farmers and businessmen form barriers to the inclusion into agri-business for this group of educated women.

Social media
Sharing and uptake of information on climate change and adaptation through social media does not reach different groups equally resulting from factors like (digital) literacy but also different perceptions on whether learning happens more traditionally across generations (father to son, senior to junior, teacher to student) or can happen more laterally between peers as well.

Summary of lessons learned from CSA interventions in Egypt

Relevance

- There is (moderate) potential for carbon farming: operating a carbon farming scheme may be challenging whilst its co-benefits of increased soil and moisture management improvements form promising incentives
- No strong market-pull for nature-inclusively farmed products and hence governmental support is needed to incentivize farmers
- Climate information services form a strong enabler for farmers but often outpace other developments in agronomic processes and water and land resources management
- Holistic salinity management based on monitoring in the delta is essential and should have a long-term vision and strategy in mind
- The Dutch-funded CSA interventions have a strong agricultural lens and would benefit from integrating a water resources management lens

Sustainability

- Contextualization through partnerships with local stakeholders is a must
- Developing capacities of relevant local partners on reflectiveness and adaptiveness is useful. Repeated interactions with same group of partners will support this
- Be aware of key incentives for Egyptian farmers not always being in line with CSA and of Dutch implementers not always working from a long-term vision on climate resilience

Scaling

- Siloed governmental departments challenge a holistic approach towards climate resilience and reduces scaling potential
- Universities often lack resources to be able to link to current farming realities and hence have limited support to climate adaptation pathways
- Private agricultural sector might be best "equipped" to convene the CSA transition and act as catalysts
- Smallholders could support scaling of CSA when they are mobilized and affiliated in groups
- Egypt-Netherlands Advisory Panel on Water forms a successful multi-stakeholder platform that should play a role in CSA

Social Inclusion

- Whilst 90% of farmers in Egypt are smallholders, CSA interventions were mostly geared towards larger-scale farmers, not automatically making CSA affordable and accessible to the bulk
- Jobs matters!
- Gender-mainstreaming in making agriculture climate resilient is essential because of unequal vulnerabilities
- Information technology like social media help to reach out more inclusively

4.3 Lessons from project implementers in Jordan

4.3.1 Relevance

Current key issues for the Jordanian agricultural sector are the disruption of the international food market and the large influx of Syrian refugees both caused by the Syrian conflict. However, the key issues is the overall water scarcity, recently becoming more severe due to climate change. From a more societal perspective, the high unemployment rates provide challenges to Jordan's development and stability.

The assessed CSA projects are mostly focussing on field level innovations and markets exploration in the horticulture sector with small and medium enterprise (SME) farmers. The promotion of nature inclusive farming is a recent initiative that is having increased attention the last years.

Horticultural sector and market

It was mentioned in multiple interviews that horticultural sector development in Jordan has been obtaining less attention over the last decennium probably resulting from governmental changes. For example, the minister of Agriculture post was re-filled four times in the last four years, with each new minister having a different agenda.

Modernizing and making this sector more efficient is important to increase the export market to United Arab Emirates (UAE) and Gulf area, which are assumed to be Jordan's most promising food export markets since the Syrian war disrupted the export towards Turkey, Lebanon and Europe. The UAE market demands food of high quality and meeting high food safety standards, which can be realised with better input products and also by lowering pesticide use. These new markets are therefore used as incentive to change the farmers activities towards more sustainable agricultural practices.

Water saving measures
Within the horticultural sector, many of the promoted and implemented innovations in the assessed projects focus on water use reduction. Water scarcity is increasing in Jordan and without changing its water use, it is assumed that agriculture may not sustain for more than some decennia. Projects mainly tend to focus on water saving possibilities on a field level, by applying water monitoring systems, soil moisture measuring and implementing hydroponic systems. With water use not being priced and mostly unmetered it is found that there is little incentive for farmers to save water. The reduction in energy costs to pump and distribute the water is an incentive for a farmer to use less water. However, it was mentioned that regulating measures and changes are needed from a governmental level to decrease water use significantly. Increasing it is argued that water saving will not solve Jordan's water scarcity issues and that the use of non-conventional water sources (wastewater re-use, desalination of seawater) in agriculture should be developed.

Policies and monitoring
Water scarcity in Jordan results in an often insufficient and sometimes considered unfair water allocation among water users. Interviewed implementers mentioned that on the field level many innovations are focussing on on-farm water saving. In the workshop, it was said that monitoring (metering) on a larger, maybe even national, scale is needed to get an understanding of the water use dynamics. Both legal and the illicit water use. This would be necessary to avoid problems related to groundwater depletion, but also to create awareness for the agricultural sector around the water scarcity issues. When such monitoring is done, policies that plan and manage groundwater and surface water use can be implemented and it can be checked whether it is being complied to. Discussed in the workshop however was whether the application of water management policy instruments like metering, licensing, rationing and paying for use water use align well with the Jordanian culture around water use. Enforcing water policies can not only be done by monitoring. What other incentives can one use in Jordan to change the water use dynamics outside of external governmentally enforced measures?

Nature inclusive farming
Nature inclusive farming (NIA) is increasingly being promoted and trialled within the Dutch funded CSA-projects. Practices within this scope are for example biological or integrated pest control and the use of compost to replace artificial fertilizers. It was mentioned that some farmers already practice composting and is not being seen as NIA by them. Like in Egypt differences in framing of concepts like NIA create room for misunderstanding when new practices are implemented. Here, a common language between all stakeholders (government, researcher, private sector and farmers) is needed to make NIA understandable for everyone.

4.3.2 Sustainability

In this study, projects are considered to be more sustainable when the project's outcomes and innovations are takeover by the farmers and/or other local food system actors after the lifetime of the project. Within the context of Jordan agricultural projects, it was found that understanding the local context, connection with private partners and creating knowledge capacity made projects more sustainable. A general finding is that in most projects a sustainability and/or scaling plan was not explicitly created (see a more elaborate description of this in the lessons learned from the Egyptian projects).

Local context
In the case of the assessed projects by RVO and/or EKN, its relevance and necessity were often predominantly defined by the donor. The interviewed project implementers had often not been part of the identification and definition phase of their interventions. It was indicated by them that identifying the local needs by having stakeholder dialogues prior to a project is a determining success factor. It is unclear how much such stakeholder dialogues take place during project identification and definition.

In such dialogues, elements like challenges and capacities should be discussed. By collectively deciding on these subjects, ownership of and support for the project is created within multiple organisations, increasing the change of implementing a sustainable innovation. It was also mentioned that along the lifetime of the project, the local context can change per (pilot) farmer. By ignoring and not adapting to these dynamics, innovations may turn out less successful. Regular dialoguing with farmers during project implementation may overcome this.

Having a Jordanian implementation partner within the project, who is being aware of the local context, was mentioned to be essential. While Dutch partners have an advanced technical understanding in for example horticultural sector development, their understanding of the cultural context was mentioned to be limited in some cases. This could lead to misunderstandings between the Dutch and local actors.

When working in partnerships, there should be clear agreement on each partner's role and responsibility in the implementation and how and what will be communicated and how one comes to decisions. Moreover, managing expectations on the possible risks of innovations not leading to the desired goals and then how accountability is arranged between the Dutch-, local- partner and the end-user (often a farmer) are essential.

Private sector in the lead
A strategy often chosen to promote CSA innovations is to make the private sector in the lead. At the point that the innovation has been incubated and is becoming more successful, the public sector (e.g. local government) is invited to trainings and demonstrations during field days with the aim to create interest for their further involvement. Private sector parties are often willing to invest in these CSA interventions as much as it helps to create more resilient businesses. It was also indicated by them that they expect that their government supports them with the further scaling of such private sector-led innovations. Private sector partners in the assessed projects also have indicated that they cannot replace the governmental role of convening and managing the more systemic approaches towards CSA like IWRM and/or large-scale ecological restorations nor the role of creating the enabling environment. The perceived challenges here are the limited financing and capacity of the government.

4.3.3 Scaling

Jordanian motivation
It was indicated that within the CSA projects, scaling of innovations has been challenging. One of the expressed reasons is the cultural context of the agricultural sector in Jordan, where farmers are individualistic and do not necessary share with each other new practices. Something similar was mentioned for the Egyptian context. Besides, farmers' incentives for change do not necessarily always directly align with the intended project outcomes. For example, adapting to climate change is at the moment not the upmost important reason for farmers to change. Their problems are related to the non-accessibility of the market and lack of skilled labour. Financing of innovative technologies and practices on their fields is often expensive which challenges most small farmers to adapt, while larger farmers still have the money to invest in a groundwater pump. During the workshop it was mentioned that by mobilizing farmers into cooperatives it may create an atmosphere of learning and knowledge sharing on how best to adapt and of approaching the market together.

Knowledge and innovations centre
One of the assessed projects in Jordan is currently building a private sector-led knowledge and innovation centre (KIC). It is assumed KIC will greatly contribute to the scaling of innovations. By setting-up such a centre, multiple projects can bring together their experiences around certain issues over a longer period and build upon each other. It can bring together different Dutch diamond stakeholders in the horticultural sector and hence provides a centre where information, expertise and resources can be pooled and dialogues held. This centre is also set up such that individual Jordanian farmers can access the centre and obtain knowledge and expertise. In that sense it can act as private sector driven extension office.

This adds up to what has been said in the workshop by many that knowledge sharing on the adaptation of agricultural systems to climate change is necessary. It was mentioned that data and information around

climate change effects, climate risks of areas and systems and the performance of various adaptation technologies and practices should be brought together in such knowledge and innovation centre.

Two questions are arising here. First of all, how much is KIC contributing to building climate resilience in Jordan? It will aim to develop and share knowledge and experience on especially rather high-end and advanced greenhouse technologies. Obviously, such technologies allow building climate resilience in this type of food production. However, greenhouse production can only limitedly replace more climate-vulnerable food production systems in Jordan. The second question is how such a private-sector driven knowledge and innovation centre (acting as an extension centre) links to public-driven ones? It was also shared that knowledge on innovative approaches like CSA within the national research centres and agricultural universities is lagging behind. Should not this KIC then be integrated in the wider Agricultural Knowledge and Innovation System (AKIS) of Jordan? By connecting universities and the research centres to this KIC, innovations will more easily flow into research and educational agendas, and become available and accessible for a broader audience of academics and students. It can create the science practice nexus which is supposed to be essential in this so-called societal learning. This nexus is being achieved by building a part of the knowledge and innovation centre on the campus of Jordan University of Science and Technology. Could this KIC then also be linked to other forms of capacity building like the extensions services system and the farmer field schools which could lead to better climate risk preparedness of the agricultural sector?

Scaling through agricultural extensionists and input suppliers
Agricultural extension officers from the Ministry of Agriculture are key actors when it comes to transferring knowledge to large groups of farmers. Training these extensions officers with the agricultural practices developed by the project has a positive effect on scaling of the innovations. Within several projects that worked with extension officers it was mentioned that they are engaged and willing to learn and participate within agricultural projects and therefore good partners for sustainability of the project. Next to the traditional extension services, agricultural input suppliers have increasingly been serving in the role of knowledge brokers, particularly when the new implemented practice is linked with supplies they provide. In addition to the direct business model/marketing incentive, input suppliers also are sharing valuable knowledge and product information to create a credible and trustworthy reputation with their client farmers.

Scaling through research institutes
Most of the assessed projects in Jordan have been developing partnerships between farmers, input suppliers and other value chain actors and agricultural extension officers. Mostly within the horticultural sector. It is assumed that such partnerships create scaling potential. It was furthermore mentioned that it is important that interventions are well connected to research institutes. Involvement of research institutes like the University of Jordan and NARC were often mentioned as being essential for scaling during the interviews. Embedding project outcome-related knowledge within these institutions would facilitate access to it after the lifetime of a project. Not only scientific and practice-level knowledge about new innovations or good agricultural practices can be transferred here, also findings about the local context and social network of farmers would be of great value. It was found that currently in many of the interventions such linkages with these institutions were not well and explicitly established.

Financing
Lack of access to finance is often considered as a key hindering factor for farmers to adapt. It is assumed that due to lack of existence of farmers cooperatives structures and the limited capacity of the government to create widely access to finance through subsidy schemes, it may be challenging for many smallholders to overcome this finance barrier.

In most of the assessed projects, a strategy of partial self-financing by farmers for the innovations was applied, assuming it creates more true incentives for project involvement and ownership over project results after project duration. In other projects, some levels of financial support was facilitated by the implementing partners for the farmers with less ability to invest themselves.

Interviewed experts mentioned that creating financial support through contract farming/outgrowing schemes may have potential. Within many of the Jordan contract farming systems there is one lead farmer contracting multiple small and medium-scale farmers. The lead farmer may be willing to pay for the smallholders'

investments required for adaptation such that productivity level remain acceptable across the scheme. However, it was also said that, that with these outgrowing schemes in contrast with cooperatives, smallholder farmers do limited decision-making power and flexibility in what and how they will farm. This may lead to lack of ownership.

Social media and online training
It was mentioned during one of the interviews that social media videos may be more successful in outreaching to farmers than trainings on location. Various interventions have been producing social media videos explaining innovations being implemented by early-adopting farmers. Social media may be a solution to overcome the limited willingness to share lessons learned among farmers resulting from this atmosphere of distrust mentioned above. And it provides ways to reach large amounts of farmers at relatively low costs. However, it was also mentioned that some web and smart phone applications are difficult to understand by farmers because of the language used. Application may not be in Arabic or the farmer may be semi-literate and/or do not understand the technical concepts and definitions. Online videos, visuals and cartoons explaining how to use a certain innovation can be an action to partly overcome this obstacle.

Moreover, online interactions were also found beneficial during project related trainings. Within one of the projects, the educational trainings could not take place anymore on location due to the COVID pandemic. Hence it changed towards being held online, with surprising outcomes. Dedication of the participants was higher than during physical trainings and the outreach has been higher as larger groups of people could attend the online trainings compared to participation in physical trainings.

4.3.4 Social inclusion

Job creation
One of the projects had as objective to create more jobs in the agricultural sector. Here the main target for these jobs were the refugees from Syrian. Other projects did not have in their objective to create jobs. A pitfall with some of the projects is that by automatising agricultural practices, less employment is needed. However, this was not found to be an issue yet.

Gender issues
Gender inclusion activities mentioned by many interviewees were often to invite women to trainings or demonstration days. Gender mainstreaming and/or transformative approaches were in most projects not a main focus. Most of the time it was mostly a positive side-effect if women were more included. In this way addressing gender issues risk remaining mere tokenism. It was found that projects need to consider social inclusion and gender equality within their proposals and implementation far more explicitly, in order to avoid a ticking the box attitude.

Positive findings during the interviews were that online trainings have the potential to create access to larger amount and more diverse group of learners than the ones which are held on location. It was found that not only more people that could attend the trainings, it was now also more accessible for women.

Another positive finding was that in hydroponics where a new type of agricultural practice is designed, including women may be easier. Because of its novelty, the cultural context within this system is not yet defined. Also working with more educated intermediaries makes inclusion of women easier, and can create role models when working with more traditional target groups. However, it should not be assumed that this is happening automatically. Strong focus on women inclusion is also needed within these innovations. Creating a safe environment for women is also found to be essential.

Summary of lessons learned from CSA interventions in Jordan

Relevance

- Efforts to access high-end markets such as in UAE stimulates horticultural development with higher sustainability standards
- For water saving to become effective governmental steering through policy instruments like metering and tariffing is needed
- Additionally the use of non-conventional water sources is strongly recommended
- A common language between all stakeholders is needed to make nature-inclusive agriculture to create awareness

Sustainability

- CSA implementation through partnerships where an (external) innovation is contextualized through local organizations is essential for success
- Private sector parties are often willing to invest in CSA interventions especially in order to create more resilient businesses however they cannot replace the government in institutionalizing and formalizing CSA

Scaling

- Farmers' direct concerns do not always include climate change adaptation while a competitive market challenges peer learning among them: these 2 factors reduce scalability through farmer interactions
- The new Knowledge and Innovation Centre may contribute to scaling of climate-resilient horticultural innovations by bringing together various stakeholders and providing a combined testing, capacity-building, learning and dialoguing space
- Next to the traditional extension services, agricultural input suppliers have increasingly been serving in the role of knowledge brokers for climate resilience and should be integrated in scaling strategies
- Involvement of research institutes like the University of Jordan and NARC are essential for scaling as it allows embedding of project outcome-related knowledge within these institutions such it remains accessible after the lifetime of a project
- Lack of access to finance hinders farmers to adapt. Adaptation funding schemes for smallholders in contract farming has potential
- Social media is widely used in Jordan and forms a channel to reach out to many individuals and can support scaling

Social Inclusion

- It was found that projects need to consider social inclusion and gender equality within their proposals and implementation far more explicitly in order to avoid tokenism

5 Recommendations

In Chapter 2, the CSA framework is described. As a reminder, CSA is supposed to preferably simultaneously work towards the three pillars 1) sustainable and inclusive food systems, 2) climate change adaptation and 3) climate mitigation by applying a mixture of technical interventions, systemic approaches and the creation of enabling conditions. With climate change vulnerabilities of Egypt and Jordan being strongly determined by the water resources availability, CSA in these countries need to have a strong focus on water resources management. Hence, this reports rather frames the desired future as climate and water-smart. CSA is also interpreted as a long-term societal change process which requires reflective learning and the cooperation of various kinds of stakeholder across sectors and scales. Considering all the above, impactful CSA interventions are supposed to have strong elements of relevance, sustainability, scaling and social inclusion in it.

The next sections provide recommendations on how the Netherlands can support the transition towards climate- and water-smart food systems in Egypt and Jordan based on the lessons learned from Chapter 4. It includes the feedback received from the interviews and workshops and more concrete steps suggested within the focus group discussions. It recommends on what is good, what can be done better and what is new.

5.1 Egypt

The recommendations in this section are resulting mostly from the lessons learned from the Egyptian interventions and the discussion during the stakeholder workshop in Cairo. However, its applicability may go beyond the Egyptian context and can somehow also be considered to be recommendations for CSA in Jordan.

1. *Keeping the mixture of different CSA interventions but with a strong focus on water*
   Overviewing the portfolio of CSA interventions in Egypt, a diverse set of CSA entry points is being covered, from promoting and building capacities for the use of technologies and practices, to contributing to systemic approaches and by building enabling conditions like (governmentally-led) climate information systems services and curricula development. It is recommended to keep this mixture of interventions working at various scales and sectors as they mutually reinforce each other and allow scaling to happen.

   At the same time acknowledging that water scarcity is the key climate issue for this region, efforts to improve food security and adapting to climate change should always include water resources management pathways. It is recommended that all CSA interventions in Egypt are related to a wider systemic approach of water resources management (WRM). With WRM mainly being a public domain task a larger involvement of governmental authorities in CSA interventions is recommended.

   When it comes to applying more holistic CSA concepts like nature-inclusive farming, landscape approaches or when using a food water energy (and environment) nexus approach, it is recommended to build capacities of the relevant authorities in these fields.

2. *Considering CSA as a long-term process and not as projects*
   Making agriculture and food systems climate resilient is assumed to be a long-term process, likely spanning tens of years. It is recommended that a Dutch vision on how Dutch assistance and innovations will help to build CSA in Egypt has this long horizon in mind. It is furthermore recommended that this vision supports the development of a Dutch long-term strategy on building food system resilience where the mix of interventions (projects) are clearly sequenced, integrated and layered (SIL). Such a strategy should be built by a group of key, committed Dutch and local development partners, being nested within the Egyptian National Adaptation Plan of Action and hence coordinated with the Egyptian authorities and preferably also checked with CSA strategies from other international donors and development partners. This may need stronger coordination mechanisms between various Dutch-funded interventions than which are currently being used and which then need to be facilitated for. It is also recommended to learn

on flexible programming and funding as being developed in one of the Netherlands Food Partnership's Communities of Practice.

3. *Contextualize and localize*
   Interventions should be defined such that they are socially and culturally contextual, addressing the needs of the people from that specific region and building on the local socio-cultural values and existing capacities. This also means that interventions need to be defined such that they meet the spatial climate and landscape context.

   It is recommended to continue implementing the CSA interventions with and through local partners that help with this contextualization. This is obviously also a necessary implementation modality that builds on the need to empower and create capacities of local partners through joined implementation, to be able to be context-sensitive and to legitimacy and credibility to the "project team". It is important to include the sustainability phase as an integral and explicit part of the intervention design and of the actual implementation, preferably as much a co-creation as possible with those local organizations in which the project outputs and outcomes are being embedded.

4. *Ensure each intervention knows it scaling pathway*
   CSA is about changing practices and behaviour of many separate individuals like farmers. Scaling processes are then needed to reach the desired large volumes of people. It seems that many of the assessed projects had remained in the first scaling wave (see Section 2.3) of demonstrating an piloting whilst they need at least to include scaling wave 2 (explicit scaling mechanism identified and used) and preferably lead to scaling wave 3 (where scaling forms the objective and where the portfolio of individual CSA interventions contribute to a encompassing scaling strategy).

   It is recommended that CSA interventions explicitly and integrally include scaling in their design and implementation. During the design phase, project teams should conduct a theory of scaling (like a theory of change but now with explicit scaling pathways included). Such a theory of scaling should also identify which scaling arena will be used to bring the original intervention outputs further like through a value chain and markets, cooperatives, innovation hubs or other structures. And it should define which enabling environment conditions would be required for it. Actors operating in such scaling arenas should somehow already be involved during the first scaling wave (testing, piloting, training etc).

5. *Building partnerships using the Dutch Diamond Approach.*
   A key scaling strategy being applied in Dutch international cooperation is the Dutch Diamond Approach. It ensures that different stakeholders like government, research, private sector and civil society organizations are gather around a common issue and that partnerships are built to (ideally) jointly define and implement shared solutions. Each of the stakeholder categories have their own complementary role to play in solving complex issues like climate change. Although that forging and nurturing such a partnership is a continuous and precarious challenge taking time and resources, it is strongly recommended to continue to work in partnership fashion. It is assumed to be a key mechanism for further scaling.

   However, working in partnerships is not necessarily a common approach in a country like Egypt and organizations may be unexperienced to operate in it. It is therefore recommended that when CSA interventions work in such partnerships, sufficient capacity is being built in the consortium to manage such partnership as one need to be able to bridge between different framings, agendas and priorities. It was found that joint reflective learning, a key component of good partnership working is often not present in many of the local partners in CSA interventions. It is therefore recommended to build capacities in the involved partners on aspects like complex problem solving, reflective learning and adaptive management.

6. *How to reach the smallholder?*
   Most of the CSA interventions implemented in Egypt did not have a specific smallholder focus (except for the project carried out by WFP in Upper Egypt) but were rather working through more commercially

oriented farmers. However, groups of smallholder farmers were involved in technical capacity building activities and in field days in some of the CSA projects.

With large number of smallholder farmers being particularly vulnerable to climate change it is recommended to explore how within the current international cooperation conditions they can be indirectly supported by creating the right set of enabling conditions (see also next points).

It is also recommendable to have a discussion whether most climate resilience potential in Egypt can be built through interventions with these larger-scale and more commercially oriented famers assuming this will spread-out to smallholders through peer exchange. Or would a more direct targeting of smallholders build resilience faster. One needs to question whose climate resilience one wants to build. Is it people's resilience, or a wider food system's resilience?

7. *What could be new?*

A possible CSA scaling mechanism is through **Climate leadership development**. Solving complex issues like climate change and creating sustainable and inclusive food systems need strong leadership. Not just at the scale of governmental organizations, but at all levels and in research, private sector and civil society organizations the like. A leadership development programme could bring leaders of these different actors and scales together and forge a cross-sectorial network of linked organisations covering water food energy, environmental and climate change issues. One could learn from the African Food Fellowship which now runs in Rwanda and Kenya and which is going in its second phase in summer of 2022. Possible candidates for such programs in Egypt could be identified from the current local implementation partners and through the alumni networks of various internationally operating education centres like Dutch Universities and of Nuffic, many of whom are active contributors to the NL-Masr Agrifood Network.

Access to climate funding: Facilitating access to funding for various types of farmer types and other actors in agricultural value chains may remove one of the key barriers to change towards more climate resilient and sustainable food systems. Different financing instruments could be developed targeting more commercially-oriented farmers, innovative farmers experimenting with novel practices like organic farming and possible also some of the smallholder farmers. The Netherlands has strong experiences in these sort of innovative finance or hybrid financing as for example carried out by IDH or by the Kenyan Innovative Finance Facility for Water (though mostly for the water sector).

Agricultural Digitalization was mentioned by a number of the interviewed experts as a key field where The Netherlands could greatly contribute to CSA. Obviously the climate information service Irriwatch and the water accounting tool WaPOR are already clear examples of this. Others were recommending to use digitalization to help modernize outdated irrigation management schemes. For example near real-time remote-sensing based information can inform automated irrigation transfers to different parts of irrigation schemes. Such developments should be seen in a wider context of overall monitoring of water system dynamics (levels and salinity) and/or water use.

It was recommended to also explore how digitalization can help to create a better regulated food production (like crop choices) and market operations. Key would be to develop information systems that bring relevant information at the right time to the right groups of farmers including also smallholders.

Set-up a **multi-annual programme on agriculture/aquaculture under saline conditions**. A key climate change impact resulting from sea level rise and reduce freshwater availability is an likely ongoing salinization of the Nile delta. There is therefore a need to define adaptive strategies both in the field of agriculture and aquaculture to secure sustainable food production under these changing conditions in the delta. Solutions in this respect can be various from salt removal techniques, improved water- and soil management to new crop varieties and mixing agriculture and aquaculture systems.

Baseline assessment of climate change and food system vulnerability are needed and can be carried out by UN organizations like by FAO and WFP who have experiences with such mappings. It needs to be decided what would be a sufficient detailed spatial scale for such assessments? Village-scale,

governate-scale. Or based on agro-ecological zones. Dutch-based humanitarian aid NGOs have gained lots of experience in developing such risk-profiles through community engagement and could support this.

5.2 Jordan

1. *Set-up a long-term program or plan on building climate resilience*
   To make Jordan and its agricultural sector more climate resilient it is important to connect this transition to long-term sustainable development program (or framework) with a lifetime of at least 10 years. In such a program, a variety of possible interventions (projects) should be sequenced, integrated and layered (SIL approach) in such a way they form building blocks for the resilience transition. Ideally such a long-term sustainable development program should be coordinated with and supported by the Jordan authorities and by a larger set of development partners and donors operating in Jordan like the EU, United States, Germany and France. The Mekong Delta Plan is an example of such a long-term sustainable development plan including a long-term commitment of development partners.

   Collaboration with the national and local governments is key to make this successful and one needs to anticipate longer time horizons to set-up and build these relationships. Potential interventions that support the resilience transition should be defined in a co-creation process and the GoNL should determine which interventions could be supported with the Dutch knowledge and expertise and which should be done by others. System thinking (including the WEF-nexus) is one of the most important skills needed to be able to properly design such an holistic program.

2. *Make sure climate-smart agriculture projects are truly climate smart*
   It was found that most assessed CSA interventions in Jordan were geared towards horticultural development, with a small focus on NIA, often working with actors from the private sector. However, Jordan's food system resilience is only partially depending on horticultural production. The assessed intervention's focus has been mainly on increasing food production, through horticultural development, and to create access to markets, and were not necessary directly climate-smart. In addition, job creation within the horticultural value chains was strong goal for the interventions as well. This is in line with the Dutch policy as described in Section 3.1. However, these projects do not necessarily have a clear direction towards climate change adaptation and it is debatable how much they are actually contributing to a wider climate resilience of Jordan agriculture.

   To make actually Jordan's agricultural system truly climate smart it is recommended to widen the sectoral scope for the CSA interventions and include other agricultural practices like open cultivation and rainfed agriculture.

3. *Water smart*
   In the (near) future, water availability will be the key limiting factor when it comes to food production. Supporting climate-smart agriculture in Jordan, projects should always focus on water resources management. Looking at resilient food systems from a water resources management perspective, it is unlikely that water saving technologies and adjusted agronomic practices may create sufficient resilience.

   It is recommended to develop a climate-smart agriculture interventions based on water resources management based by using policy instruments on water allocation and use (water monitoring, metering, licensing, pricing). The latter is the mandate of the government of Jordan whom should be leading these sorts of monitoring processes. Adoption of such top-down constraining water use measures is challenging and it is recommended to support the local government to design and progress such interventions in a collaborative manner with water use stakeholders. In the Northern highlands, rainfed agriculture can be made more climate resilient with drought-resilient rainfed crops and trees varieties. The role of NARC in creating and sharing the right knowledge for this is important and can be supported by the Dutch seed sector.

   Policy dialogues in Jordan around the water scarcity issue showed that agricultural in the valley will increasingly depend on wastewater re-use (Hellegers et al., 2022). It is recommended to develop

capacities on the use (and management) of non-conventional sources of water for agriculture such as wastewater reuse. The Netherlands have great expertise on water resources management, and its related water governance, and could support the Jordan government in in such policy processes.

4. *Focus on capacity building of various CSA stakeholders through knowledge institutes*
   One key scaling strategy identified by Kirina et al. (2022) is to build capacities of various stakeholders connected to CSA. The Knowledge Innovation Centre (KIC) for horticulture fits well within this strategy. The aim is to integrate knowledge and innovations across different scales and actors of the horticultural sector by collaborating with the Jordan University for Science and Technology. Embedding this novel knowledge within university curricula can be a successful scaling strategy. Besides, KIC can be seen as an action arena as described by Makate (2019), where different organisations and stakeholders can discuss the CSA practices within horticulture and jointly develop visions and strategies.

   It is recommended that Dutch funded projects stay connected to the KIC order to bring in additional expertise and resources, and to encourage KIC in their efforts to exchange knowledge and experiences with a wider group of smallholder farmers including women and marginalized groups.

5. *Work through and with local partners*
   Working with and through local partners is key to increase sustainability and scalability of CSA interventions. The local agricultural context in Jordan is complex. For example, agricultural labour dynamics are complex resulting from the large numbers of Egyptian workers and Syrian refugees working in the Jordan agriculture. Local partners have a clear understanding of such local complexities allowing to find ways for outputs to sustain. Repeatedly involving local organizations will build their capacities such that they can scale out successful CSA interventions with less dependence on external assistance. It is found during the interviews that even while there is repetition of the same partnerships, clear communication and agreements should be made between the partners on expectations, roles and responsibilities. Collective reflective learning after a project is found to be important to improve collaboration in the future.

6. *Contextualization and understanding farmers' incentives*
   Contextualization of interventions as already discussed in the third recommendation for Egypt is key for a successful embedding of CSA outcomes. Such contextualization entails being responsive to the needs and values of the eventual people whose climate resilience needs to be build. The highest priority for many smallholders farmers is to secure their livelihoods. For more commercially-oriented farmers, the profitability of their farming enterprises is what counts most. When reaching out to these groups of farmers with the aim of trying them to apply CSA, one would need to address these direct issues. Some of the assessed projects had started with farmer dialogues to identify their incentives, motivation and how they experienced the direct effects of climate change. Repeating this throughout the project is essential for managing expectations but also for the sustainability of a innovation.

7. *Embed scaling mechanisms and strategies within projects*
   Some of the scaling strategies identified by Kirina et al. (2022) were found in the assessed projects: field pilots had been conducted which were linked with field schools, capacity building will be carried out through the KIC which is currently set-up, various partnerships with private sector and value chains actors are being created and support to the university's curriculum development was given.

   However, it seems that promotion of novel CSA technologies is often the main focus of the assessed interventions. Technology adoption is considered to be only the first wave out of the three scaling waves (see Section 2.3). Second scaling wave mechanisms are embedded in only few of the projects such as the KIC where CSA-relevant innovation will be taking place through knowledge sharing and research. For the third type of scaling wave to take place understanding the effects of the various scaling mechanisms within the Jordan context is essential.

   Therefore, it is recommended that withing the project proposal writing, a theory of scaling including scaling strategies and arenas (as described in recommendation 2. for Egypt) is defined. The focus in the

theory of scaling should be on the enabling environment which allows the necessary scaling up and involvement of relevant scaling actors to enable the scaling deep.

8. *How to finance CSA?*
   As recommended for Egypt, to support CSA in Jordan creating access to various sources of climate funding is important. Especially for smallholder farmers unable to invest resources in new innovations this can be beneficial. The strategies that were mentioned during the interviews were the outgrowing scheme and financing support for farmers relatively to their income. These are financing strategies that can be further explored.

9. *Develop knowledge on how to include women in climate-smart agriculture*
   Most of the assessed projects had a gender mainstreaming element in it. However, in many cases this element had become a ticking the box exercise where only the bare minimum of gender mainstreaming activities were performed such as ensuring sufficient female representation in trainings and meetings. Monitoring the effect of gender mainstreaming activities was often not included within the assessed CSA projects.

   It is recommended that having separate projects on gender transformation within agriculture may have more impact than including it as a small (cross-cutting) part of an intervention. Another option, is to include gender mainstreaming or transformation as one of the key objectives in a project (next to objectives that are more CSA related) and to work together with (local) organisations specialised on gender roles in the Jordanian context. Using a SIL approach could then support to coordinate these gender mainstreaming efforts between standard projects and the ones dedicated to gender transformation.

6 Conclusion

This report documents lessons learned from implementers of Dutch-funded CSA interventions. Based on these lessons learned and discussions with stakeholders in Egypt and Jordan and Wageningen University & Research experts, we recommend the Dutch government to include the building blocks below in their vision on how to support Egypt and Jordan in their transitions towards climate- and water-smart agriculture in the next 10 years. The recommendations are related to what should be kept, to what can be done better and what is new.

Combining climate resilience building with other environmental sustainability goals, such as ecological and biodiversity restoration and conservation, is recommendable. However it may be challenging in the Egyptian and Jordanian context as it seems not to have priority yet. It is recommended to build awareness and capacities on sustainable agricultural practices such as agro-ecology, nature-inclusive and regenerative agriculture and circular food systems (as part of a wider circular economy).

The limited water availability in both countries and with climate change going to exacerbate this, a key CSA focus in Egypt and Jordan should be on water resources management. It should include multiple elements like water saving measures, demand management through policy instruments like pricing, licensing, and a monitoring-based understanding of the water system dynamics and water use. With future fresh water resources availability being challenging, it is recommended that the Netherlands support the development of the use and management of non-conventional water sources like wastewater.

All project interventions should continue to be implemented through partnerships consisting of various organizations representing the Dutch Diamond Approach stakeholders (private sector, government, civil society and research organizations and universities). These partnerships should have a balanced mix of local organizations allowing the building up of necessary local capacities and sustainability of project outcomes. Such a mix of different stakeholder also allows for building climate-smartness at different scales and sectors and for cross-learning across those which is key for scaling of successful interventions. Currently, there seems a strong focus on working with larger-scale and commercially-oriented farmers as they are often early adopters and seen as effective catalysts for scaling. It is recommended to also increasingly include authorities such that more systemic approaches on climate- and water smartness as well as enabling environment creation can be worked on. Especially including the authorities responsible for climate adaptation and mitigation is key next to obviously the ones on agriculture and water resources management.

All interventions should continue to be contextualized. It is recommended to identify and design projects that could support transitions as much as possible as a co-creation with the local stakeholders. This will enhance sustainability of project outcomes and their scaling potential.

Climate- and water-smart interventions should be based on a wide and joint vision and strategy towards climate resilient food systems. Such a vision should be developed in close cooperation with the Egyptian and/or Jordanian governments together with other key development partners including donors and climate funds. Within such a long-term strategy, the various proposed interventions are smartly sequenced, integrated with other development goals and layered by building them on earlier successes and created capacities such that together they form an effective pathway towards resilience.

It is recommended to align building climate- and water-smart agriculture with wider national climate resilience strategies. Synergies could be found by integrating CSA within value chains, in a wider food system approach or by zooming out from farm level to landscape levels. Synergies could also be found by simultaneously trying to create climate resilience in various agricultural sectors like rainfed and irrigated agriculture, horticulture, livestock, aquaculture and others. A food-water-energy nexus approach may form another appropriate basis for such more integrated climate resilience building.

It is recommended to better determine how successful CSA interventions can be scaled. While scaling is already implicitly taking place in Dutch-based interventions through partnerships, capacity building and information and knowledge sharing, it is often not explicitly planned for. Hence it is assumed that still much scaling potential exist and that this potential can be used by better sequencing, integrating and layering of the mix of potential CSA interventions and by ensuring that each individual intervention has a theory of scaling (as part of a wider theory of change) include in the design phase.

The Netherlands often promote more holistic and systemic approaches to tackle complex societal challenges which often require multi-stakeholder interactions. Climate adaptation and mitigation and making agriculture more sustainable and inclusive are seen as such complex transition processes. Such processes often come with uncertainties and diverging needs and interests. Managing such complex transitions are assumed to benefit from the ability of being reflective and adaptive. It is recommended that the Netherlands supports Egypt and Jordan in building capacities on reflectiveness and adaptiveness at the right levels and within the right organisations.

Lastly, it is recommended that the Dutch support on climate resilience benefits a wide group of farmer types and that future interventions make very explicit how the various farmer types are being addressed directly and indirectly. With large parts of food production in both Egypt and Jordan being dependent on smallholder farmers with high vulnerability and limited adaptive capacities, accessibility and affordability of possible resilience building technologies are key. This recommendation also includes to ensure gender and social inclusion approaches in CSA interventions with explicit project goals, strategies and effective monitoring of its achievements.

Multiple times during the workshops and focus group discussions related to this project, people acknowledged the usefulness of bringing stakeholders together and having interactions. Supporting such cross-stakeholder dialogues is another "low-hanging" building block which the Netherlands can support with lots of experience. The focus group discussion showed us that WUR colleagues already have and will continue to develop a wide array of knowledge and experience which can support building resilient food system in countries like Egypt and Jordan.

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Annex 1 List of assessed projects

Country	Project
Egypt	Strengthening climate resilience and food security through livelihood enhancement and rural innovation in Southern Egypt
	DESALT
	A Practical Farmers Toolkit - Geodata for Climate Smart Agriculture in Egypt
	Future-Proof Horticulture
	Water Matters in Egyptian Agriculture
	Enhanced Weathering of Basalt in Agriculture
	ERM Research Project (not funded by Dutch Government)
Jordan	Holland Horti Support
	Head-Jo
	JordanHortifuture
	Nature Inclusive Farming
	Strengthening knowledge and innovation in agriculture (horticulture) value chains with a focus on skills development and improving agricultural TVET governance / institutional structures in Jordan
Both	WaPOR

Annex 2 Questionnaire for interviewees

Climate-Smart Agriculture in Jordan and Egypt
With this questionnaire we would like to collect information on the climate-smart agricultural (CSA) project that you are working on or have worked on in Egypt or Jordan. This first information is then used as input for the semi-structured interviews in which more detailed questions are asked.

The work is carried out under WUR's privacy policy. The privacy statement can be found here: https://drive.google.com/file/d/1AfRwx6sSeab3vGrDMbVw-gPZaodHfFms/view?usp=sharing.

If there are any questions please email: marijn.gulpen@wur.nl.

0. Do you agree with the privacy statement? Yes/No

Introduction questions

1. What is the name of the CSA project?
2. Who are the other partners and direct stakeholders contributing to this project and to which Dutch Diamond Approach category do they belong: Governmental Organisation, Business, Knowledge Institute and/or Civil Society Organization?
3. When did the project start and when did/will it end?
4. What is/was the main objective of the CSA intervention?
5. How would you categorize the farming system that is made more climate smart (ranging from smallholder-based subsistence farming to full commercial farming supplying international commodity chains)?
6. What is the name of the person and its affiliation filling the questionnaire?
7. What is your role within the project?

CSA entry points and pillars
Climate-smart agriculture may be defined as an approach for transforming and reorienting agricultural development under the new realities of climate change (Lipper et al. 2014). The most commonly used definition is provided by the Food and Agricultural Organisation of the United Nations (FAO), which defines CSA as "agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes GHGs (mitigation) where possible, and enhances achievement of national food security and development goals".

Entry points
There are numerous entry points for initiating or enhancing CSA activities. These entry points are developed by CCAFS & CGIAR (https://csa.guide/) and are grouped in three thematic areas: i) Practices, ii) System approaches and iii) Enabling environments.
In general, the Practices tend to work on plot and/or field scale. Systemic Approaches zoom out and often work on the scales of landscapes, catchments or value chains and normally would require a cooperation among different stakeholders. The Enabling environment are assumed to support the interventions on plot and landscape scales. Often they are considered as public services where there is a responsibility for governments to help organize them

The definition of each entry point is briefly described and can be found here: https://drive.google.com/file/d/1e9B0qYvzRsUTcQOJ46Rh9Mxi9YaSDas6/view?usp=sharing

8. Which of the following practices are applicable for the project
9. Which of the following system approaches are applicable for the project
10. Which of the following enabling environments are applicable for the project

11. Per selected entry point, please elaborate how the project is creating technical, financial and institutional changes
12. If there are entry points missing for the project write them down and explain how the project is working on it.

CSA Pillars
CSA works towards: i) Food security/Food production; ii) Climate adaptation and iii) Climate mitigation. Ideally, CSA-related activities have an positive impact on all three pillars. However, in reality CSA interventions often contribute to only two or even less pillars.

An example: a project focusing on soil management increases the fertility of soil resulting in higher crop production (food security). At the same time, there is a lower risk on run-off and soil erosion leading to higher adaptation to extreme events (adaptation capacity). Soils can be seen as a ground sink for carbon sequestration and therefore increase the mitigation capacity. In some cases, it may only have impact on one of the pillars, for example an infrastructure related project does increase food security and adaptation capacity but may negatively influence the mitigation potential.

13. Per selected entry point (question 2.1, 2.2, 2.3 and 2.5) indicate if your project had an positive, negative or zero impact on Food security, Adaptation and Mitigation
14. Are there other pillars, beside food security, adaptation capacity and mitigation potential, that the project has an effect? Please write them down.

Annex 3 Interview guidelines

Goal: Collect your insights on best practices and challenges from CSA projects in order to develop a vision on how NL can help Egypt and Jordan to become more climate smart.

Part 0: Introduction CSA COP27 Project | 5 minutes

We are working with three people on this project. The goal of the project is to develop a vision for Climate-smart agriculture in Jordan and Egypt based on Dutch funded projects in these countries. We asked you to fill a questionnaire so that we already have a general idea about the project that you are working on. This interview contains two parts. In the first part we want to get a better understanding of the project, focussing on the policies, motivation and impact of the project. Moreover, here we would like to discuss the challenges and best practices that are experienced during the project. In the second part we want to know from your side what you think should be the vision for Climate-smart agriculture.

Remarks:
- Are we allowed to record this interview?
- If there is anything unclear in the questions please indicate that?
- If you have the idea that we ask the same question as before please indicate that. We may have asked the question in the wrong way?
- Are there any questions already from your side regarding the questionnaire?

Part 1: Introduction questions

1. From the questionnaire we understood that the project is mostly focussing on ... and having impact on .... Is this also how you see it?

2. In case of new answers on question 2c and 3c, elaborate on this and ask why they include those new entry points or extra CSA pillars.

Part 2: Project relevance

3. How does the project meet the demands and needs of local actors and how was this defined?

4. Is the project in line with the Dutch policies around CSA (food security, adaptation capacity and mitigation potential)?

5. Is the project in line with the local policies around CSA?

Part 3: Questions related to meeting multiple pillars and using entry points

6. Are the CSA interventions trying to reach all pillars or is there a focus on one. How? Why?

7. Meeting multiple pillars and working on larger spatial scales needs partnerships across scales and sectors. What are the possibilities and challenges of working multi-sectorial and multi-scalar in Jordan and Egypt?

Part 4: Questions related to ownership and sustainability

8. What are the incentives of the farmers, value chain actors, research institutes and governmental agencies to implement CSA? How have you identified that?

9. How do you ensure the ownership of the interventions in your project?

10. Which actors and factors favour the sustainability of the outputs and outcomes of your interventions after project closure?

11. Which actors and factors challenge the sustainability of the outputs and outcomes of your interventions after project closure?

12. Does your project feed into larger CSA programs or will it be embedded in governmental or entrepreneurial processes of doing things?

Part 5: Questions related to scaling possibility

13. Which actors and factors favour the scaling of the CSA interventions after project closure?

14. Which actors and factors challenge the scaling of the CSA interventions after project closure?

15. How is the knowledge collection and transfer arranged?

16. How is the capacity building arranged?

17. Do you coordinate your project with other projects?

18. Which opportunities do you foresee for Dutch organizations to help Egypt and/or Jordan with making their agriculture more climate-smart?

Part 6: Questions related distributional effects of intervention

19. Have you assessed how the proposed CSA outcomes affect different actors, social groups including marginalized groups?

20. Are the proposed CSA interventions requiring different institutional mandates, responsibilities and arrangements? If so, how is that perceived by the institutional actors and what do you do to create this change?

21. How have you addressed conflict-sensitivity of your project interventions? What are the conflict-sensitivities?

Part 7: Questions related to best practices to be included in vision

22. What unexpected positive and/or negative effects were experienced during the project?

23. What practices could be useful for future projects or scaling?

24. Do you feel that the CSA project like the one you discuss are the optimal bilateral cooperation instrument for the Dutch government to help implement CSA in Egypt and or Jordan? Why yes or no?

25. What do you think is missing in the current CSA approach in the region of the project?

Part 8: Closing

26. Do you have any documents that can be of value that give more information about your project?

27. If we have any further questions, can we contact you?

28. Would you be willing to participate in the workshop that we want to set-up with all partners in Jordan and/or Egypt? Will you be available in September?

29. Which local stakeholders would be valuable to invite?

30. Can we send you an email if we have any further questions?

31. Do you have any further questions?

Annex 4 Pitches

Country	Pitch	By
Egypt	Revisit our policies apply the water footprint approach and principles to check whether Egypt is exporting the scarce water. Instead of that focus on the import of water. The water footprint can be expressed in $/m3.	IFAD
	The people that will suffer the most of climate change are the smallholders that live in fragile areas. How can they be involved better?	ARC
	At the moment people are fleeing their village to go to the city. Through schools, farms should be established and model farms should be created to show young people agriculture. To do this, we should include agricultural communities.	WFP
	There is a problem with organic matter in the soils of Egyptian land and there is a surplus of (organic) waste in Cairo and other cities. How to close this urban-rural loop: Collect urban (organic) waste and create (industry-scale) compost to help create more organic rich soils (risk of contamination).	WUR
	Farms of the future (PP fund). Farms of the future can create connection between different farms and make community based solution possible. This is also a platform were knowledge can be shared, as knowledge is power. Requirement: there should be partnerships without monopolies.	Delphy
	Digital tool to identify the feasibility of various CSA technologies	Nectaerra
Jordan	Do we really need to produce? Or shall we reflect on reducing our consumption and looking into our waste. Loss of production is lost. We are buying a lot of food without consuming the food. Trigger the way of thinking and include everybody (the whole chain from consumer to producer). It is an assessment but also a reflection. Focus: post-harvesting.	ECO consult
	Barley in Jordan – in suitable areas. Implement intensified barley. Working together with downstream areas. 90% has 200 mm of rainfall. Focus: barley for animal production (this is eroding the soil??)	ICARDA
	Why are the youth so disconnected to what they eat and are not interested in agriculture. National youth campaign, where CSA and NIA will play a significant role. Goal: overall movement of youth, farmers and civilizations. From the local level on small scale initiatives. With the use of social media. We have to speak their language and the idea will be to create over 1 or 2 years to work with a group of champions.	Advance Consulting
	Who is responsible? We are young people. Ministry of education by bringing in the schools but also the mosques to take into account. Religion, education and media should support. Awareness needs to be everywhere!	Farmer representative
	What are the challenges of Jordan – scarcity of water. Awareness is in school. --> post-harvest techniques on all scales and all levels of technique. Creating here a training centre in the Jordan valley.	University of Jordan
	Salinity project	NARC
	Animal feeding is import. For some families people feed their animals before themselves. Including cattle in the field is important	ICARDA
	Shifting mentalities. Workshops on the farm on the educational centre. We need a data centre that shows about the development. To create a guideline for future farmers.	Farmer representative
	More meetings and workshops to share ideas between institutions. Academia has lack of financing.	Farmer representative

Annex 5 Enabling and hindering factors affecting scaling of CSA

These enabling and hindering factors are based on Kirina et al., (2022)

- CSA technologies are often offered as bundles with often an anchor technology and then complementary ones. cost of adopting technologies is often increased when bundled, and combined with other bottlenecks, including time, labour, existing supply, and value chains, creating a barrier to adoption.
- Practices that are accessible and/or carry multiple benefits, and thus are easy to scale.
- Staff stability, internal decision-making mechanisms, and behavioural aspects strongly affect the performance of stakeholder platforms and could potentially dictate the pace of scaling.
- to incentivise the private sector, interventions must be technically feasible and commercially viable to allow scaling through business models.
- The amount of time and effort needed to develop bills and pass them into policy.
- No certainty for innovators and early adopters that later their risks will be removed because of enabling policies.
- The expectation of direct financial benefit kills innovation in itself because there is a lot of dependencies syndrome even for us as project Implementor.
- Building infrastructure for successful scaling takes time, especially where policy issues are involved. There is generally pressure to deliver scaling in a project mode, yet successful scaling is a long-term affair.
- How often are climate change data and projections used to guide CSA projects and scaling?
- Scaling new innovations favours piloting, e.g., through farmer field schools.
- Strategies aiming to create a conducive environment work best through policy dialogues and stakeholder engagement in networks and partnerships.
- Scaling demands a contextual understanding of the niche, both biophysical and socio-ecological, and processes' interactions.
- The importance of having a scaling strategy in CSA interventions from the start, exposing the strategy to real field contexts allowing for the evolution of the scaling process to adapt to the local dynamics.
- Pilots are often small not allowing regime scale stakeholder interactions.
- Importance of networks: MSP, policy dialogues, innovation hubs etc, cooperatives, informal village level networks.
- The SIL model is hinged on partnerships where each successive project intervention is built systematically on the preceding project to create a cumulative impact to reach the scaling goal.
- Better market systems catalyse new technologies' adoption, replication, and dissemination. However, the private sector focuses on interventions that can be monetised, where the market is guaranteed, such as certified seeds and fertilisers, unlike intercropping or planting on time or many other nature based solutions!!!!!
- Monitoring, evaluation and learning(MEL), and publicity have been proven effective in scaling.
- many scholars have stressed the importance of addressing the non-technical aspects of scaling, including financial resources, social networks, political contexts, and institutional aspects.
- Many cases favour pilots; however, they tend to treat scaling as a sequential process, limiting their ability to transition to scale. Ideally, the scaling strategy should be developed upfront; therefore, scaling should form part of the implementation rather than be treated as an independent phase.
- Often bundles of innovations are promoted. However not all innovative technologies are available the market or affordable.
- Production pillar of CSA tends to overshadow the other pillars due to the short-term benefits associated with such efforts. In some cases, an overemphasis on production has resulted in better yields, but farmers have halted adoption when faced with the challenges of the market dynamic and institutional failure.
- Scaling demands a contextual understanding of the niche, both biophysical and socio-ecological, and processes' interactions.
- Technology-driven scaling undergoes testing through pilots set up and managed in very controlled environments, thus facing unforeseen bottlenecks when scaled to actual field conditions. For example, subsidies act as incentives for adoption but can create an environment of dependency on donor funding that negatively impacts scaling.

- Farmers jumping from 1 to next project just to acquire subsidies!!!
- The pressure for pilots to succeed leads to an exclusivity in scaling, where the project tends to select households that are likely to adopt. These are the most progressive farmers who may not represent the potential target group [52]. This bias means that the innovations are not subject to realistic field conditions for their scalability to be assessed.
- Staffing instability in partner organisations negatively affects the positives derived from capacity building and institutionalisation processes.
- Market-led scaling: business champions working in the same value chain were expected to work together to benefit from value chain transformation, which meant sharing a scaling strategy. However, businesses see each other as competitors and achieving a collective impact is challenging.
- Scaling takes time (10-15) often much longer than average donor driven project.
- As the levels of scale increase, there is more need for vertical collaboration, requiring prolonged investment in forging stakeholder coalitions, market development, and policy advocacy [11,39]. Apart from finding the right strategic partners, coordination between them, and synchronising their separate activities becomes challenging and resource demanding.
- Policy advocacy is a long process. It may take years before such a process actually leads to increased budget allocation and supporting services to support the scaling of CSA.
- In most cases, a poor understanding of the context of smallholder farmers by donors and development organisations leads to the well-intended but blind promotion of CSA packages. In the context of developing countries, smallholder farming, crops, and livestock production are mutually inclusive, and decisions often see a cross-flow of resources which seems often overlooked and lead to reduced effectivity of CSA or even trade-offs.
- Spatial diversity requires often spatially explicit CSA options not always fit to be fit in business models as costs of providing all specific options are reducing profitability.
- Climate projections are hardly used to guide CSA. Often multiple climate change issues may affect productivity (drought, floods, wind, temp, bushfires. Diseases). It is however often the drought/water scarcity issues that gets the attention.
- Mismatches between the scales of ecological processes and their management have implications for scaling. Bio-physical heterogeneity, gender roles, and equity issues tend to be blurred at larger spatial scales.

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