Triple Helix going abroad: The case of Dutch-Moroccan network collaboration in horticulture

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Triple Helix going abroad: The case of Dutch-Moroccan network collaboration in horticulture

by

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"The international cooperation in the twenty-first century, today, it needs to move away from the old colonial framework that we had, 'I am here, do you want that I exploit you or bother you?' No, that's over. People have evolved, and the system has evolved. It is essential to understand that on the other side of the Mediterranean, there are also knowledgeable individuals."

Executive Summary

The United Nations (UN) have set the objective to eradicate global hunger by 2030 and in doing so strengthen local agriculture's resilience. Many initiatives are initiated to reach this goal. The Impact Cluster (IC) Agadir, in which stakeholders from the Dutch horticulture industry try to transfer knowledge and technology on sustainable and efficient horticulture to the Moroccan sector, is a promising initiative for this, facilitated by a Dutch state-subsidy called the Impact Cluster-subsidy. This study examined whether specific barriers hamper the collaboration and goal achievement of the project by answering the following research question:

How can the Impact Cluster Agadir-network overcome the network-structural barriers towards its common goal?

It has been found that insufficiently established ties between the Dutch side of the collaboration and the Moroccan industry and government are hampering the successful outcome of the project, being the improvement of the sustainability of the Moroccan horticulture industry. Especially, it seems that the Dutch do not completely understand the current needs of the Moroccan industry. In turn, the Moroccan stakeholders in the project do not sufficiently cooperate together towards establishing a shared vision for this specific project. Furthermore, some vital Moroccan stakeholders seem not included in the project. The current structure of the collaboration results in several collaborative barriers, such as a lack of common ground among the involved stakeholders, mainly on the short- versus long-term purpose of the collaboration. In turn, this leads to lacking financing for technology adoption, inadequate facilitating policies of both the Dutch (European) and Moroccan government. Finally, a business model between the Dutch and Moroccan industry that would ensure a fair distribution of financial benefits between those two stakeholders is still absent, whereas the Moroccan industry sees this as a prerequisite for fair cooperation.

To overcome those problems, several measures should be taken by the involved stakeholders. The Dutch government should create a subsidy for co-creation of Dutch-Moroccan technologies that meet the needs of both Moroccan and Dutch stakeholders instead of only the Dutch perspective. In turn, year-round export for Moroccan tomatoes should be made possible if high-tech greenhouse technologies are to be adopted by the Moroccan industry, accompanied by an increase in the price of Moroccan industrial water, to be installed by the local government. The stakeholders involved in the project should prioritize the project by having multiple employees work on the matter. In this way, the main stakeholders will be able to establish the long-term contact between the Moroccan and Dutch industries, knowledge institutes, and governments that is needed for a successful transformation of the Moroccan industry.

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1 Introduction

According to the United Nations (UN), the world should shift to sustainable food production systems and resilient agricultural practices, especially when those improve productivity and production and strengthen a developing region's adaptive capacity to climate-related risks (United Nations, 2022). In this thesis, a network that is engaged in bringing sustainable horticulture to Morocco is researched. The study provides policy advice on how to strengthen goal alignment and overcoming barriers when a network of actors engage in knowledge and/or technology transfer towards another country in a so-called *international Triple Helix collaboration*.

1.1 Moroccan horticulture in Souss-Massa

Some key figures on Moroccan regional horticulture

One agricultural region that is enormously impacted by climate change is the Souss-Massa region in Morocco, at the southern West-coast of the country. The picture below clarifies the location of the region.

Figure 1: Geographical Position of Agadir within Morocco

Although water scarcity is an intrinsic and structural characteristic of the climate in the region, the droughts became longer and more frequent during the last decades (Bouchaou et al., 2017). Despite this increasing drought, about 5500 hectares of tomatoes are cultivated in greenhouses around the city of Agadir (Collaboration Agreement, 2023). Those tomatoes are mainly destined

for export (Van Berkum, 2013). In general, Morocco is getting more and more important as an exporter of tomatoes, in particular towards Europe (EU, 2022). The table below shows the European Union (EU) tomato imports from 2012 to 2021, showing a growing absolute dependency for the EU on Morocco to fulfill its demand for tomatoes.

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Tomatoes	317.285	325.856	345.416	341.080	344.094	356.926	394.371	413.850	435.042	474.549

Table 1: Amount of Moroccan tomatoes imported by the EU in tonnes per year (taken from EU (2022))

The country's tomato production benefits from the decrease of production in countries like the Netherlands (EU, 2022). This decrease is triggered by the increase in European natural gas prices and labour costs (Smit & van der Meer, 2022). The region of Souss-Massa produces 80% of the country's horticultural production (Elomari, 2023). Agriculture makes up 14% of Morocco's GDP and 40% of the country's labor force (Wifaya, 2023). There are 120.000 growers in Souss-Massa and an additional 200.000 workers on the farms (ORMVA/SM, 2023). However, the Moroccan sector has to deal with increasing production costs while the production rate does not increase sufficiently to cover this increase (Elame et al., 2019). In Morocco, the predominant type of greenhouse is the low-tech plastic "Canarian greenhouse", shown in Figure 2a, as opposed to a Dutch high-tech greenhouse in Figure 2b.

(a) Canarian greenhouse (Romojaro Pérez, 2023)

(b) Dutch Venlo-type greenhouse (Huijing Greenhouse, n.d.)

Figure 2: Inside difference between Moroccan and Dutch greenhouse

These greenhouses lack climate control, resulting in the interior temperature being the same as the external environment. This limits the crop yield to natural conditions, preventing optimal production, especially when it is too hot (Stanghellini et al., 2017). The production in high-tech greenhouses can be twice as high as in Canarian ones (Kasych & Medvedeva, 2019).

Ecological issues

Moreover, the region has to deal with several ecological challenges if it wants to sustain its position as a main producer of fruits and vegetables. For instance, pests, such as leaf miner (El Aimani et al., 2021) and white fly (Afechtal, 2020) but also a lack of knowledge on production hinder the development of the sector (El Khinifri, 2017). However, the main challenge that the country's horticulture sector faces is an enormous water deficit. The Souss water basin, for example, has a water deficit of 292 million m^3. Due to an annual average supply of 263 million m^3 and and extraction of 521 million m^3, the groundwater level is said to have decreased by 2.2 meter per year in the last 40 years (Fatiha, 2023; Elomari, 2023).

This is first of all due to the excessive irrigation of its horticultural lands. Crop cultivation in Morocco often still takes place in the open ground, leading to water and synthetic fertilizers used for irrigation seeping into the environment. Therefore, the increase in Moroccan horticultural production currently indicates a disproportional usage of water compared to countries as the Netherlands. In a high-tech Dutch greenhouse, water usage for tomato production can be as low as 5L/kg and in a Canarian greenhouse, it can be as high as 80-100L/kg (Nederhoff & Stanghellini, 2010).

Furthermore, the water shortage stems from the already mentioned drought from which the region suffers. Rainfall in Souss-Massa is often less than 170mm per year (Elomari, 2023). Since 1975, the region's dams have only been full for 4 times (Fatiha, 2023). For example, one dam with a capacity of 300 million m^3 at the moment only has an intake of 95 million m^3 (Fatiha, 2023). In turn, due to sediment and evaporation, 3 dams will have become unusable by 2040. The reliance on rainwater and groundwater during dry periods is known to be ecologically harmful, but it became the way to sustain the country's agricultural production.

Measures

Fortunately, Morocco has taken initiatives to address these challenges. For instance, certain areas, like the Souss perimeter, have implemented pressurized irrigation systems, including sprinklers and drip irrigation, to decrease water demand. The widespread use of drip irrigation made Moroccan growers use up to 70% less water (Hillel, 2012). Also, the Moroccan state offers subsidies for certain greenhouse innovations (Fonds de Développement Agricole, 2023). On the demand side, the government has also taken measures such as the installation of water counters at nurseries and a water police to control their uptake. Morocco has also revised its water production and storage systems to improve efficiency and reduce losses. Additional measures include the construction of more dams to increase water reserves. Another supply solution the government has implemented is water desalination. The government has also implemented policies for watershed management, has set standards and regulations for water usage, and there are

plans to introduce stricter rainwater management systems and water metering (Tsakok, 2023).

However, it is questionable whether those measures are sufficient to combat the problem. The current deficit would mean that 2 desalination plants providing 146 million m^3 water for irrigation each would be needed. Currently, the first desalination plant is not even working at full capacity yet. The capacity is 103 million m^3 at the moment, and full capacity is expected to be reached only by 2026. Also, new dams will probably not constantly be filled entirely, as is the case with the current dams. Often, the Moroccan industry already has the innovative technologies, such as climate control and water sensors, proven in the local context and the amount of expertise is deemed to be sufficient as well (Wifaya, 2023). But although as stated, there are also subsidies for some new technologies, and consultants from various countries advise Moroccan growers to improve their operations, it still seems that Moroccan growers stick to their low-cost low-tech model instead of adopting new technologies on a large scale.

Solution: demonstration greenhouse

To encourage the Moroccan industry to change to growing methods and technologies that require less inputs and yield more output, Dutch governmental, academic and horticulture industry actors have partnered up with each other and their Moroccan counterparts. The idea is that a high-tech demonstration greenhouse in Morocco will encourage Moroccan growers to adopt new technologies. This greenhouse has been constructed at the Moroccan knowledge institute under research. Additionally, a program for knowledge and technology transfer is deemed needed. To get the latter done, the involved stakeholders have successfully requested a Dutch state-subsidy: the Impact Cluster-subsidy. This study examines the barriers that arise towards the successful outcome of the project. In doing so, it specifically focuses on barriers that relate to the structure and dynamics of the stakeholder network that partnered up around this subsidy. Finally, it provides actions for specific stakeholders to overcome the identified barriers. The network under research is referred to as the Impact Cluster (IC) Agadir in this thesis. The study also derives success factors from the IC Agadir case for other projects. It provides its insights by testing whether goals and barriers in collaborations with similar actors also prove to be of influence in this specific setting of *international Triple Helix collaboration* by conducting interviews and doing additional document and literature research. In doing so, the study provides a societal contribution towards sustainable and resilient food production.

1.2 Thesis structure

This thesis is built up as follows. The goals and barriers that can possibly play a role in the IC Agadir are provided in section 2, where a scientific literature review on *policy, knowledge* and *technology transfer* is performed to create a framework with the goals and barriers to research for

the IC Agadir case. Moreover, this section provides the knowledge gaps, and research questions adressed in this study, and explains the scientific relevance of it. Section 3, then, provides insight in the research methodology. Section 4 explains the IC-subsidy and its specific usage in the Agadir-case. In turn, Sections 5-7 contain the results of the study, followed by the study's conclusion and discussion in Sections 8 and 9.

2 Literature review

In this chapter, the academic body of literature on the reasons why governmental, academic and private actors engage in transfer are presented. In the subsequent section, barriers to success when engaging in collaborations with other actor types are outlined per factor. Both sections start with a table that outlines the outcomes of the literature review. The final section describes the knowledge gaps in academic literature that follow from this review, followed by an introduction of the questions that will be answered in this thesis in order to elucidate some of these gaps. But first, the search strategy on how this state of the art was established is described.

2.1 Search strategy

As the previous paragraph indicated, multiple branches of scientific research deal with collaboration between different types of actors. Thus, currently identified barriers and enabling conditions in collaborations with at least two actors that also play a role in the IC Agadir have been assessed. The enabling conditions were then rephrased to be included in the barriers if possible. To collect scientific literature, several terms have been entered in Google Scholar. For policy transfer, this has been, for example, "policy transfer" AND (barriers OR enablers)). The like has been done for knowledge transfer and technology transfer, which are all branches that describe transfer within the same type of actor internationally. To find collaboration enablers and barriers across actor types, keywords such as "industry-academia" AND collaboration AND (enablers OR barriers) and the like for other combinations have been used. The articles with the most citations (with a minimum of 10) have then been assessed on their reference list and those reference literature was used if the article turned out of interest after thorough evaluation. In total, 45 articles have been used in the literature review.

2.2 The purpose of engaging in transfer

In the IC Agadir network, the knowledge that has to be mobilized comes from 3 different types of actors: governmental organizations, industry players and academia. When cooperating, actors always need a *common goal* (Wegner & Verschoore, 2022; Dankbaar, 2019; Ansell & Gash, 2008; Emerson et al., 2012; Provan & Kenis, 2008). There is ample literature on the possible goal within networks that consist of the actor types that also play a role in the IC Agadir network. If all 3 actor types engage in transfer together, this is called *Triple Helix* collaboration (Etzkowitz, 1993).

The table on the next page indicates which goals the different actor types have, that engage in Triple Helix collaborations. Note that the actor type represents that type in both the home and receiving countries. As can be perceived, the goals of the different actor types seem to be

non-overlapping in almost every case. This is not necessarily problematic, however, as the goals of the three domains can often co-exist alongside each-other (Etzkowitz, 1993). Nevertheless, this should be assessed for every case individually. After the table, the concept of Triple Helix collaboration is explained more elaborately. Then, the results of the literature review on goals of the mentioned actor types when engaging in any kind of collaboration with another actor type are outlined per type of collaboration. For this, literature on *policy, knowledge* and *technology transfer* has been examined, as those all cover different dynamics between actors in Triple Helix collaboration, which is explained in the following paragraph.

Goals	**Government**	**Academia**	**Industry**
Exporting policies	X		
Policy dissatisfaction	X		
Knowledge generation		X	
Research education		X	
Knowledge sharing		X	
Overcoming brain drain		X	
Solutions to development problems		X	
Improving GS research		X	
Reform economy	X		X
Improve welfare	X		X
Cheaper than self-development			X
Financial survival			X
Extending network			X
Commercialization of knowledge			X
Additional funding		X	
New research directions		X	

Table 2: Actors' goals in Triple Helix Collaborations

Triple Helix collaboration

Innovation systems in which academia, industry and government cooperate are brought together by Etzkowitz (1993) in the Triple Helix (TH) framework of innovation. This model aims to "foster regional economic growth and promote entrepreneurship, through understanding the dynamics of interactions between three institutional spheres of university, industry, and government." (Cai & Etzkowitz, 2020). They also describe the 3 forms of TH that were proposed in the initial 1993 article of Etzkowitz. The cooperation schemes in TH stretch from government-driven innovation controlling universities and industry to a laissez-faire model in which the three

are independent and only interact modestly. In reality, there is often some kind of balance between the two, in the extreme case of which the three cooperate, all equally balanced. However, real equal balance is hardly ever perceived (Cai & Etzkowitz, 2020). As the TH-model is an innovation model, the reason to engage in it would be to foster innovation. However, the underlying goals of Triple Helix partners seem not widely known, especially compared to dual-axis collaborations. It is though assumed that this kind of collaboration is "of key importance to technological and economic progress" (Dankbaar, 2019). However, as actors can have other goals, for example ecological, it can be of added value to find out if they conflict and what this means for the success of projects. Figure 2 below shows the three forms of Triple Helix collaboration as coined by Etzkowitz (1993).

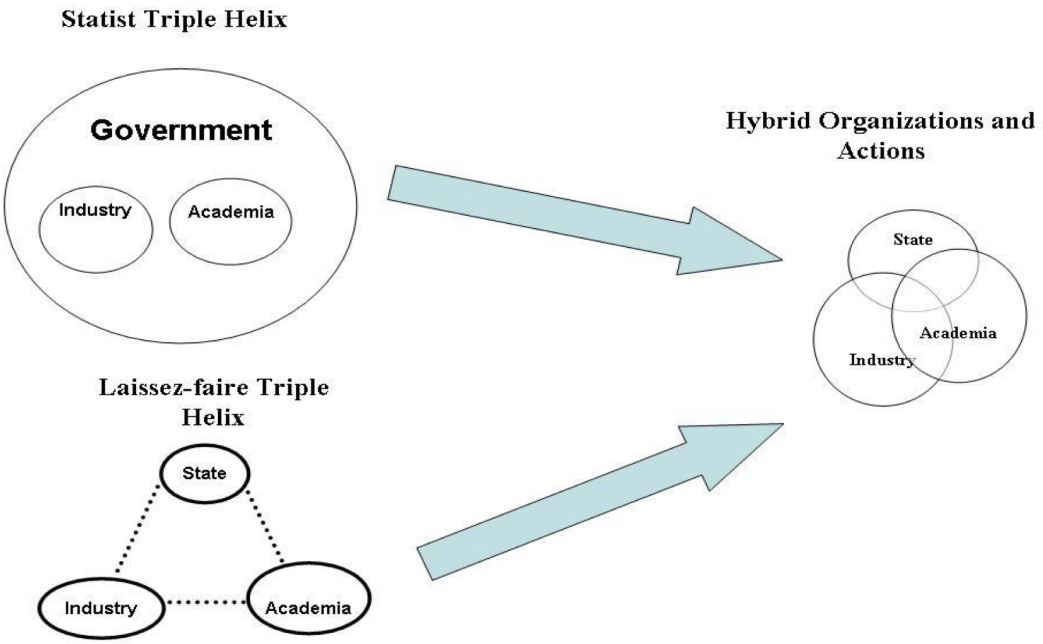

Figure 3: The three triple Helix models of Etzkowitz (1993), adapted figure by Razak & White (2015).

However, the IC Agadir seems to include a Triple Helix in both Morocco and the Netherlands. Such an *international* Triple Helix collaboration has not received a lot of attention in the academic literature yet. Jull Sørensen & Hu (2014) described the process of the formation of an international Triple Helix collaboration. They came up with a first sketch of the international Triple Helix and its collaborative dynamics, which is depicted below in Figure 3.

As the underlying goals for engaging in Triple Helix collaborations seem not widely known, this thesis reviews literature on collaboration forms that only contain two actor types of the international Triple Helix. The goals, barriers and enablers for collaboration between those stakeholder types have been used to create a framework that could approach the dynamics in an international TH collaboration network. Policy, technology and knowledge transfer usually have collaboration between different instances of the same actor type as their subject, often in

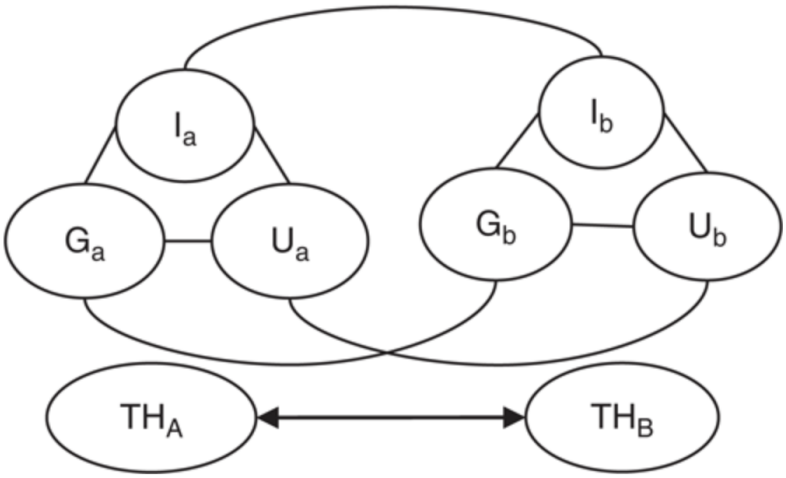

Figure 4: *International* Triple Helix collaboration according to Jull Sørensen & Hu (2014). I = industry, G = government, U = knowledge institute, a/A;b/B = country A/B respectively.

an international setting (such as I_a to I_b in Figure 3). As far as they have been found, goals of all of those inter- and intra-Triple Helix collaboration forms have been outlined in the following paragraphs.

Government-to-government transfer

To start, in public policy literature, the work of Dolowitz and Marsh (1996;2000) has been influential for, among others, identifying reasons for governmental organizations to engage in what they call *policy transfer*. They found that policy transfer can be a voluntary or coercive process. *policy transfer*, according to them, is "the process in which knowledge about policies, administrative arrangements, institutions etc. in one time and/or place is used in the development of policies, administrative arrangements and institutions in another time and/or place" (1996). Another reason for engaging in policy transfer is described by Minkman (2021), who describes that senders could propagate their own policies through *policy branding*: "the process whereby an identity ("brand") is created for a policy object such as a concept, a strategy, or a paradigm." Policies can, in that case, be seen as a good that can be exported, which could have implications in the transfer process. They find resonance in the need for new policies due to mostly dissatisfaction on current policies by recipients (Nedley, 2017).

Academia-to-academia transfer

In turn, researchers engage in international *knowledge transfer* with other researchers for several other reasons. According to Currie et al. (2005), those are mainly knowledge generation, research education and training, and knowledge sharing. The transfer of knowledge often takes place from the global North to the global South. The benefits of such a North-South research

cooperation are described by Michel et al. (2013) and include overcoming brain drain, finding solutions for development problems, and improving Southern research.

Industry-to-industry transfer

International knowledge transfer has also been researched in the inter-industry domain. For this thesis, the focus should be on intra-industrial international cooperation. There, technology transfer, as it is called, entails the transfer of technologies and knowledge on how to use these technologies. There are multiple reasons for engaging in technology transfer. First of all, recipient countries industries need technology to sustain improvement in living standards and to reform their economies, i.e. attaining higher output with comparable inputs. Furthermore, developing countries find it easier and cheaper to acquire technologies instead of developing them themselves (Maskus et al., 2004). Donor companies engage in technology transfer simply as a means of financial survival (Keller & Chinta, 1990). In an international context, the situation of interest is almost always the transfer from an industry actor to its (sometimes to be founded) equivalent in the recipient country (Wang & Blomström, 1992), often through foreign direct investment (FDI) (He, 2019). Current literature does not specify why industry actors would line up in a non-profit technology transfer situation. Hypothetically, the reason behind it are immaterial benefits such as extending their professional network.

Industry-academia transfer

Furthermore, academia and industry often cooperate as well. Reasons for this are twofold, as sketched by De Wit-de Vries et al. (2019). On the one hand, firms can benefit from the easier commercialization of new scientific knowledge. On the other hand, researchers can be inspired into new research directions and can have access to additional funding through firms.

Industry-government and government-academia transfer

Contrary to the attention for those forms of cooperation, current scientific research seems to have a lacking interest into cooperation between the other two axes of government-industry-academia. First of all, knowledge transfer between government and industry seems to have received few interest among scholars. Presumably, this is the case because it is associated with industrial lobbying and industry policy, both concepts that have decreased in popularity to pursue with the coming of neoliberal globalisation in the global North (Free & Hecimovic, 2021).

In addition, research into cooperation between government and knowledge institutes does not really take a knowledge transfer perspective. The interest is more in the benefits of publicly-funded research (for example, see Martin et al. (2007)), sometimes in comparison to industry-driven research (Fleming et al., 2019). Supposedly, industry-funded research is more focusing

on the industrial needs, and government-funded research more on problems that a governmental actor faces.

2.3 Potential barriers to successful transfer

Across the three different actor types and their different ways of collaboration, a lot of barriers to successful collaboration have been identified by scholars. The table below gives an integrated overview of those as identified by literature in all kinds of collaborations containing government agencies, knowledge institutes, and private actors. The subsequent text in this section explains the barriers mentioned in the table one by one, clustered by five main categories.

Theme	Barriers	Specifications
Common ground	Common goal	Lack of mutual interests Divergence in shared beliefs Disagreement on definitions
	Will	Limited knowledge sharing Absence of political will Uncertain feasibility
Policies	Government support	Inadequate infrastructure Insufficient regulation Weak governmental enforcement Lack of business support High administrative burden Insufficient resource coordination Insufficient entry/exit coordination Unsuitable financing policy
	Institutional context	Inadequate governance-level structure Insufficient governance-level involvement Hardware/software imbalance Limited democratic policy-making Lacking IP-facilitation
	Bureaucracy	Challenging administrative characteristics Complex administrative-political nexus Limited access to implementing agencies
Culture	Individual	Challenges in interaction with groups Difficulties in interaction with hierarchy Resistance to change

Table 3: Identified barriers to successful international Triple Helix collaboration

Theme	Barriers	Specifications
Culture	Organizational	Power asymmetry Differing time management Differing timespan perceptions Secrecy of outcomes Lack of trust-receptiveness Inadequate absorptive capacity Insufficient market orientation
	Professional	Insufficient project evaluation Lacking relationship-building Challenges in implementation Insufficient site visits/face to face interaction
Coordination	Communication	Absence of boundary spanner Inadequate training Insufficient tools/objects
	Enforcement	Inadequate contracts Inadequate agreements Lack of trust Limited sanctioning mechanisms Unsustainable process Inadequate process management
Finance	Funding	Lack of financial means

Table 3: Identified barriers to successful international Triple Helix collaboration

Common ground

First, to tie back to section 2.2, *lacking a mutual interests in the aim of the collaboration* or a *common goal* has, not surprisingly, been identified as a barrier to success (Källman, 2014; Adholla & Warner, 2005; Dankbaar, 2019). Also, disagreement on definitions among actors can pose problems when collaborating. For example, actors should share their definition of *capacity building* when engaging in transfer (Adholla & Warner, 2005). With capacity building, "the process of developing and strengthening the skills, instincts, abilities, processes, and resources that organizations and communities need to survive, adapt, and thrive in the fast-changing world" (Kanter, 1984) is meant in this thesis. In turn, stakeholders have to find individuals (negotiators) within other actors' organisations that pursue the *shared belief* that exists within the collaboration. Common goals are closely aligned to the concept of *will*, of which a lacking presence has

also been identified by multiple scholars as an barrier for successful collaboration. For example, Hassan & Jamalluddin (2016) found that willingness and capability to share knowledge by the donor industry plays a role. Dolowitz & Marsh (1996) as well as Ertugal (2018) state that political will is of importance, thus indicating that this is a factor of influence for multiple actor types. The concept is obviously tied with feasibility, i.e. the (perceived) need for the measure in the adopting country ("Learning from abroad: The role of policy transfer in contemporary policy-making"; "A comparison of policy transfer processes: different sustainable transport concepts transferred to and from different countries"), which has also been identified to be a factor of importance.

Policies

Furthermore, past policies play a role, or more broadly, lacking a supportive *policy environment* hampers transfer (Dolowitz & Marsh, 2000; Ertugal, 2018; Kugelberg, 2012). Actors should be aware of path-dependency in policy selection, which tightens the solution space for a collaboration due to lock-in or resistance to change (Marsden & Stead, 2011). In line with this, Källman (2014) found that *including government actors* is often a challenge for knowledge transfer. In addition, Hassan & Jamalludin (2016) found that lacking government support in infrastructure, regulation and enforcement are key barriers to policy transfer. The latter is integrated in the final table under "Weak government enforcement" to mark the difference between the enforcement on state-level and that on network-coordination-level. Governments could, according to Osemeke (2012), aid to "a positive perception of entrepreneurial activity; reduce the administrative burden on entrepreneurs, and coordinate among their agencies to ensure that the necessary resources are directed to where they are mostly needed". Thus, if this does not happen, this is a barrier to success. Almahdi (2020) adds to this by stating that education, legislative [...] and regulatory barriers to entry and exit, [...] financing, business support" are ways in which governments can hamper industry.

Adjacent to this, Liu (2021) found that *hardware* (real products, infrastructure) have to come with *software* (such as policies), and she stresses the importance of localization (political and socio-economic context, notably governance level-structure) and the fact that *local as well as high-level government* should be involved (included in the table as Insufficient governance-level involvement). This is because different levels of governance structures have their own authorities and interests, which may lead to conflicts of interests among different ministries, cities, and even between central government and local authorities. Therefore, localization is necessary to adapt and adjust the process and content of policy transfer in accordance with the recipient's specific socio-economic and political environments. Finally, *bureaucracy* (identified by Dolowitz & Marsh (2000) is another factor that falls under the policy/government role in cooperation.

Marsden & Stead (2011) explain this by focusing on the administrative characteristics, e.g. the extent of hierarchy, responsibility division and formal communication strategies. Also they point out the and the "administrative-political nexus" should be assessed, i.e. assessing to what extent the administrative decisions and actions are also shaped by political factors, such as policy objectives, political agendas, and power dynamics instead of solely by technical considerations. For example, Mladenovic et al. (2016) found that *Limited access to implementing agencies* must be prevented to foster knowledge transfer.

Culture

Culture is another important factor as identified by Dolowitz and Marsh (2000). Li (2021) has identified cultural barriers that influence policy transfer, being *challenges in the individual's manner to interrelate to groups, hierarchy, and changes*.

Beside an individual's regard towards hierarchy, the macro-level *power asymmetry* between countries and within organizations can play a role as well. It is important to assess whether there are certain stakeholders that particularly set the research or political agenda, or technology to be transferred. It is what Hasan (2020) calls *power to steer the agenda*. The importance of power-asymmetry in North-South collaboration is also perceived by researchers that focused on knowledge transfer (e.g. Kontinen & Nguyahambi, 2020; Cely, 2022). Other differences in organizational cultures should be bridged as well. Källman (2014) mentions differences in time management as such a factor, and according to Constantine & Shankland (2017), this is of importance in policy transfer from a donor from the Global North to a recipient in the Global South. Van Wijk et al. (2008) identified that *the difference in long-term versus shorter-term thinking and secrecy of outcomes* (De Wit-de Vries et al., 2019) are of importance to assess as well. Adholla & Warner (2005) found that *lacking sustainability in time span is disadvantageous* for collaborations. Furthermore, Van Wijk et al. (2008) point to *trust* and "tie-strength" as important facilitators in knowledge transfer between firms and academia. Trust is often linked to power-asymmetry (Ran & Qi, 2019) and the lack of it also has been identified by Marsden & Stead (2011) and Liu (2021) as an important barrier to policy adoption. The factor is included in the final framework table under "Lack of trust-receptiveness" to differentiate between the cultural concept of trust and the contractual implications for trust under the "Coordination" factor. Finally, Hassan & Jamalludin (2016) state that the absorptive capacity of the recipient country's industry to use the introduced technology, is vital. Van Wijk et al. (2008) identified that a specific organizational culture can be a barrier to *absorptive capacity* between academia and industry. In turn, Mladenovic et al. (2016) found that *professional/working cultures*, for example the tradition of project evaluation and appraisal, building sound relationships over speedy implementation, and face to face contact and site visits are cultural aspects of importance.

Coordination

Another point of interest is *coordination* of the network. First of all, *communication* has been found to be of influence (Dolowitz & Marsh, 2000; Ouma, 2019) considering coordination. Kallman (2014) advises that a communicator can help facilitate knowledge transfer and network transparency. This is similar to the internal broker proposed by Adholla & Warner (2005) and the *boundary spanner* as mentioned by de Wit-de Vries et al. (2019). A boundary spanner can best be identified as someone that facilitates knowledge transfer between different axes (Ferreira & Ramos, 2015). Kugelberg et al. (2012) also stress the presence of skilled and dedicated individuals who assume roles as leaders and change agents. Esther De Wit-de Vries et al. (2019) found that communication is important in overcoming cognitive differences and that in this, beside boundary spanners, *Inadequate training* and *Insufficient tools or objects* are barriers. They state that contact trough training and workshops is useful in university-industry research partnerships because they facilitate the transfer of tacit, complex knowledge, build skills, provide a space for feedback and deliberation, and help to integrate knowledge by reducing ambiguity. With *tools and objects*, they mean being in contact by working in the facilities of the industrial partner, which can help to integrate knowledge, learn about implementation challenges, see connections between different aspects of knowledge, and identify interesting questions for future research.

Furthermore, Källman (2014) comes with recommendations for enforcement, being *contracts* and material transfer *agreements*. Van Wijk et al. (2019), however, found that high trust levels result in less formal contractual agreements and control mechanisms (De Wit-de Vries et al., 2019). This might pose problems when *trust* breaks down during the process. For example, the use of (in)formal contracts can help enforcement in a network (Hansson & Longva, 2014). Finally, they state that responsibilities and perceptions of industry within these collaborations is underexposed (De Wit-de Vries et al., 2019) and could be specified in agreements and contracts. Scholars also identified the importance of institutions in collaborations (for example, see Dolowitz & Marsh, 2000; Marsden & Stead, 2011; Liu & Wang, 2021; Mladenovic et al., 2016), which is closely linked to that of contracts and enforcement, since this entails sufficiently *formal processes for consultation, the transfer itself and the process*. The institutions-factor is under "process management" in the framework table to distinguish between government- and network-level institutions. Dankbaar (2019) has outlined that *Limited sanctioning mechanisms* of (contractual) agreements and lack of coordination by some individual as hampering factors for success in Triple Helix collaborations. Winkler (2006), states that a network-coordinator should help form joint goals and that rules and sanctions when those goals are not pursued by all, although hardly ever sufficiently established, are of importance.

Financing

Dolowitz & Marsh (2000) also state that *financing* can be a barrier towards cooperation. In turn, Adholla & Warner 2005) found that sustainability in terms of finance should be pursued. To mark the difference between the pure financial barrier and the barrier of lacking government-financing policy, the latter is called "Unsuitable financing policy" in the framework table.

Triple Helix-specific barriers and enablers

Cai & Etzkowitz (2015) have identified enablers and barriers for facilitation of Triple Helix co-operation specifically. First of all, they identify specific roles for each actor type, which mostly overlap with already mentioned barriers. Universities should have competencies in knowledge and technology generation and diffusion; industries should have the absorptive capacity (see, e.g, the article of Kugelberg et al. (2012) on cohesive workforce) and demand of industry and innovator for knowledge and technology; government should ensure supportive infrastructures, including policy and fiscal measures for formation and development of high-tech start-ups, university spin-offs, and other kinds of organizations for university technology transfer and facilitate engagement of civil society . Also, there should be some kind of institutional entrepreneurs that enunciate a vision for knowledge-based development and bring leadership of the three spheres together." (Cai & Etzkowitz, 2015).

Finally, they stress several barriers that have not been mentioned yet, in particular *Insufficient market orientation*, effective intellectual property (IP) protection system (*Lacking IP-facilitation*), and *Limited democratic policymaking*, which have been added to their respective factor in the framework. (Cai & Etzkowitz, 2015).

2.4 Knowledge gaps and corresponding research questions

The previous sections have outlined goals and barriers as identified in literature that could play a role in a collaboration in which governmental, industrial and academic organizations engage. As indicated, such collaborations usually entail links between one actor type in two countries (e.g. government-to-government collaboration) or multiple actors of different types within one country (e.g. Triple Helix or government-industry collaboration). Literature on interaction between two networks within two countries that both have, to a greater or lesser extent, established Triple Helix collaboration, however, has not yet come under attention a lot. As indicated, Jull Sørensen & Hu (2014) tried to describe the *process* of the formation of international Triple Helix collaboration. Nevertheless, no research has been conducted on which factors play a role in hampering such a collaboration. In turn, in reality, the established links within the international TH could be different from what they proposed in other cases. In Figure 4, the possible other

links between actor types are represented by dashed lines. Moreover, links that Jull Sørensen & Hu (2014) perceived could also be non-existent in the IC Agadir. On the other hand, as the figure indicates, there should at least be ties between the 3 actor types within both countries to be able to speak of a TH (represented by the solid lines).

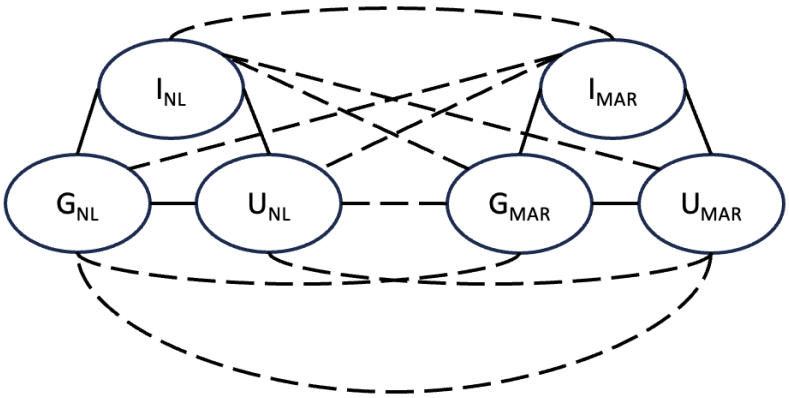

Figure 5: Potential links between international TH-actor types. Model adapted from Jull Sørensen & Hu (2014).

This research will add to existing literature by researching whether such other actor-links can and should exist within an international TH and what barriers play a role in an international Triple Helix collaboration with those dynamics. The practical need in the IC Agadir-case lies in identifying barriers to successful collaboration in order to overcome those and point out success factors that can be pursued in future collaborations (such as new Impact Cluster-subsidy projects) between the same types of actors. Preliminary research on the project region has been done by el Khinifri (2017), who has identified the challenges that greenhouse growers face in becoming a more productive grower. He has researched the overlap in challenges and solutions promoted by the demonstration greenhouse. The same goes for Stanghellini et al. (2017), who focused on finding the most suitable research greenhouse for Agadir, and on developing an additional education program that should optimize knowledge transfer between the Dutch and Moroccan horticulturists. As has been identified in literature, however, there is a lot more that is of importance to realize knowledge transfer than mere hardware (infrastructure).

Furthermore, el Khinifri (2017) ends with some recommendations on how cooperation between actor types could solve some problems faced by the growers. However, the specific actors that interact or are to be interacting with the Moroccan grower were not identified. By now, as described in the introduction , a network of actors has formed that will engage in the knowledge transfer. This thesis therefore takes the point of view that, before recommendations on cooperation between actors in the network can be given, as yet done by el Khinifri (2017), one must first identify the interdependencies between all actors that participate in the IC-Agadir network. Therefore, the first sub-question in this thesis is:

What are the interdependencies between actor types in the IC Agadir?

As soon as this has become clear, the existence of a common goal within the network will be researched, since this has been identified as a key feature for collaborations. Moreover, as one can see in Table 1, the individual goals in the researched proxy-collaboration barely show overlap and therefore raise the question of actors' goals apart from the IC are compatible with the collaborative goal. The next two sub-questions in this thesis deal with this subject:

What is the common goal of the IC Agadir?

However, as identified in the literature review, there are more factors that can form barriers to collaborations. Also, additional barriers can be found in this case, which would be another contribution to the scientific literature. Hence, the last sub-question in this thesis will be:

What are perceived barriers towards the common goal of the IC Agadir network?

As the case has also provided some enabling conditions for project management of international Triple Helix collaborations, those are added to the chapter treating this sub-question.

These questions will add up to form an answer to the main research question, reading:

How can the Impact Cluster Agadir-network overcome the network-structural barriers towards its common goal?

3 Research design

By answering the questions as drawn up in chapter 2, this research aims to provide insight in the success factors and pitfalls of a collaboration in which all Triple Helix actor types in two countries cooperate. This can help in making future collaborations of this kind function more smoothly.

This chapter will give insight in how those questions will be answered by consecutively presenting the research methodology, the research and data collection methods, indicating how rigor is safeguarded in this research and finally providing insight in how the results of this research will be presented.

3.1 Methodology

As chapter 2 has highlighted, general goals for collaborating actors and factors influencing collaborations that in actor type partly overlap the IC-Agadir case have already been identified. However, the IC-Agadir is an international triple helix cooperation, which is a relatively new and uncovered collaboration context in literature. Therefore, the common goal and the barriers and enablers towards it are still poorly understood concepts in such a situation and "not amenable to measurement and quantification", which, together with the focus on "what the experience is like", is a reason to perform the research with a qualitative methodology instead of a quantitative one (Cypress, 2019). A qualitative research methodology focuses on collecting and analysing words and textual data, as opposed to a quantitative methodology that collects and analyses numerical data. Since all research questions have as a purpose to explore the current situation within the network as perceived by the involved actors, a qualitative research design has been used for this research. However, by drawing up the framework of factors and goals based on adjacent types of collaborations, the conducted study has been largely *confirmatory* in nature (Jaeger & Halliday 1998). However, since open questions on actor goals, barriers enablers and even network connections have been posed, the research was also exploratory in nature.

3.2 Research method

For multiple reasons, the analysis method that has been most suitable for this research methodology is the case study method. To start, case studies are appropriate when examining the uniqueness of a case, for example when finding interactions, explanations, and cause-and effect connections is the purpose of the research, as opposed to generalization (Hays, 2003). The purpose of this research has been to assess whether the ICA-case is a unique form of cooperation

that brings different barriers and enablers to table, due to the specific interactions in a previously uncovered kind of collaborative network, and thus aligns with these purposes.

According to Yin (1981), a case study is also preferred in research on contemporary events where the relevant actors cannot be manipulated. The Agadir-case is an ongoing cooperation. Furthermore, before the research had taken place, actors could not have been influenced by the scientist.

Moreover, case study research question(s) are suitable for both confirmatory and exploratory research (Leitner, 2008; Jaeger & Halliday 1998), i.e., identifying the main aspects of an under-researched problem.

3.3 Data collection

3.3.1 Method

The data in this thesis were mainly collected by conducting interviews. According to Easwaramoorthy & Zarinpoush (2006), "interviews are an appropriate method when there is a need to collect in-depth information on people's opinions, thoughts, experiences, and feelings". This ties in with the questions addressed by this research, that aim to discern the perceptions of actors on the IC network relations, goals, and the barriers and enablers for the proper functioning of the collaboration. Considering the content of the interviews, the questions have been based on the literature review on collaboration for policy, knowledge and technology transfer that has been performed. Thus, the starting point of the interviews is transposition of those theoretical insights into the international Triple Helix setting. To avoid that latent goals, barriers, enablers and even network connections were missed, open questions were always posed first so that new factors could still be identified.

The interviews in this research have been semi-structured. By using semi-structured interviews, there has been enough structure for assessing the factors found in the current state of the art, as well as room for unexpected aspects that might emerge during the interviews itself (Cypress, 2018). Between 6 April and 25 May, 16 of the 27 actors in the IC-network have actually been consulted, of which 14 in official, recorded interviews. The interviewees are a good representation of the network for the current phase of the collaboration process. However, the Moroccan industry was represented by only the local growers association. This actor is deemed sufficient for showing the Moroccan industry perspective in this research, but it is unfortunate that no cross-validation with other Moroccan industry actors was possible.

In addition, whenever possible, the interview results have been triangulated by observations during an 11-day field trip to Morocco and been substantiated by organizational reports and presentations. The observations have in essence only been informal interviews. The field-trip was initiated by a Dutch knowledge institute and consisted of 10 students and 3 supervisors.

All of those students had thesis subjects around the theme of Moroccan horticulture. I was the only one that directly was interested in the IC goal and collaboration dynamics. Some subjects had some overlap, for example in researching the dynamics between Moroccans and Dutch in general and one that assessed the technological needs of local growers. Other subjects were less compatible with my subject. The field trip consisted of presentations by and site visits at local horticulture actors in and around Agadir, most of which are part of the IC. Furthermore, a 2-day mini conference was held in Rabat hosted by a knowledge institute. During the visit to Agadir, local government actors gave presentations about their policies and the implementation thereof. After all presentations, a question round was held, where they answered questions on, among others, their collaboration with other actors. Although their focus was often not in particular on the IC collaboration, their answers still aid in sketching an image of how collaboration between the Moroccan government and other Triple Helix actors are approached or the lack of vision for it. Presentations of an incubator with a similar question round and round table discussions with growers and students of a knowledge institute, and site visits to the Moroccan growers association and one local bean grower provided similar insights as well as contextual information. In Rabat, the content of the presentations during the mini conference was not very relevant to this study, but the subjects, and questions in between the presentations, gave some general indication about the research paradigm of (non-Cluster) academic Moroccan actors, also concerning collaboration with others. In general, apart from the question rounds during the presentations, some actual presentations and policy documents have also been used for triangulation (for more elaboration on this, see the subsection on construct validity).

3.3.2 Respondents

The interview respondents have been governmental, industrial and academic stakeholders on both the Dutch and Moroccan side, so that all actor types of the international Triple Helix were consulted. Up front, access to all actors was expected because a relationship between the coordinator of the LDE Thesis Circle and other actor representatives was assumed. Nevertheless, some potential respondents did not wish to participate, nor has it been possible to get into contact with the representatives of Moroccan horticulture companies within the IC. Interviews with 2 representatives of growing companies outside of the IC have been used to fill in contextual voids that existed because of this. Moreover, the Moroccan growers association (part of the IC) provided the Moroccan industry perspective for this research. Hence, at least one representative of every actor type has been interviewed. Apart from one respondent, who did not react at all, all actors that have been sent an interview request replied to it.

To mitigate ethical risks when reporting on and storing results of interviews, each respondent was beforehand provided with information about the research design and signed an informed

consent form. The interview has been refused by 2 actors beforehand. The first actor representative indicated that the questions of the research were "*directed at a currently ongoing project/process which is complicated enough*" (personal correspondence, 17 April 2023). Nevertheless, an informal (and very short) interview has been conducted during a presentation break in Rabat with another representative of this organisation. The other actor refused because they stated to have not taken actions within the Cluster yet (personal correspondence, 8 May 2023).

Furthermore, during two interviews, actors stated that some information should not be included in the results of this research. Although the exact reason why has not been become clear, the questions that triggered this response was "why do you need actor ... in the IC/to achieve the common goal" and "why do they need you in the IC", which could render the results on goal alignment between actors a bit brighter than really is the case.

In turn, actor perspectives on some topics have been gathered during informal interviews in between presentations. Informal interviews can be described as "the spontaneous generation of questions in a natural interaction, typically one that occurs as part of ongoing participant observation fieldwork" (Gall et al., 2003). Those informal interviews were mostly questions I asked during round table discussions or private conversations in between presentations or during lunch time. Moreover, some actors that are not (yet) in the IC collaboration have been met during the field-trip to Morocco and have provided interesting contextual information in the same way. Those informal interviews were also mostly conducted in between or after presentations during a question round.

The idea was to interview as many respondents as possible until data saturation took place. In the discussion, a reflection on the extent of data saturation is given. Furthermore, 11 experts in various domains have been interviewed (of which 5 informal small interviews) to be able to steer questions for the IC-actors in the right direction and to provide context for the theoretical framework. Table 3 provides an overview of the specific respondents used as sources in this research.

Interviewee	**Classification**	**Amount**	*of which informal interviews*
Dutch government actor	Network participant	2	1
Dutch industry actor		8	0
Dutch academic actor		2	0
Dutch NGO		1	0
Moroccan government actor		2	2
Moroccan industry actor		1	0
Moroccan academic actor		1	0
Type total		*17*	*3*
Greenhouse operator	Expert	1	0

Table 4: Overview of interviewees

Interviewee	Classification	Amount	*of which informal interviews*
Horti-cluster expert	Expert	2	0
Agri-development financier		1	0
Moroccan grower		3	1
Dutch non-IC industry actor		2	2
Moroccan non-IC academic actor		1	1
Moroccan start-up incubator		1	1
Type total		*11*	*5*
Total	**All**	**28**	**8**

Table 4: Overview of interviewees

3.4 Data analysis

Another important aspect for the research methodology is the the way in which the collected data has been analysed. As can be seen in Table 5 below, the main factor categories from the framework, being common ground, policies, culture, coordination and finance have been included in the initial codes and interview questions, as well as an open question to identify other possible barriers and enablers for collaboration.

Code	Factor group	Factor	Example Questions	Purpose
NET_IDE	Network	Identification	To what extent do you cooperate with (boundary spanner, industry/academic/governmental partner)?	Network identification
GOA_IDE	Goal	Identification	What is the goal of the Impact Cluster?	Goal identification
NET_REL	Network	Relations	What can your organization mean for other actors in achieving your goal or in the ICA?	Network Relations
NET_REL	Network	Relations	What can other actors mean for you in achieving this goal and why?	Network Relations
BAR_IDE	Barrier	Identification	What have been the barriers to achieve your goal?	Barrier identification
BAR_CGR	Barrier	Common ground	To what extent do you feel these parties feel the need and will to achieve the goal?	Info on specific barrier
BAR_POL	Barrier	Policy	Which policies/laws help/disable you at the moment?	Info on specific barrier
BAR_CUL	Barrier	Culture	To what extent do you perceive a problematic difference between some stakeholders and your organization in culture?	Info on specific barrier
BAR_COM	Barrier	Communication	What are aspects in the communication of the project that are going well/not so well and why?	Info on specific barrier
BAR_ORE	Barrier	Enforcement	What are the rules in the collaboration? How are they formalized (contract)? How do you trust others? What are the consequences of non-compliance with agreements??	Info on specific barrier
BAR_FIN	Barrier	Finance	To what extent is there enough financing to achieve the common goal? What should be financed and how to achieve the goal? Who should be in charge of this?	Info on specific barrier
BAR_OVE	Barrier	Overcoming	To what extent do you feel (barrier) is a problem and how would you try to overcome it (with stakeholder X)?	Overcoming barrier

Table 5: Codes and example questions for interviews

The factor "coordination" has been split up already in two sub-subjects, because the term seemed not very clear instantaneously for respondents. Also, questions to clarify network relations

content-wise and and goal and network identification, as well as a question to help form recommendations at the end of this thesis have been coded. In the end, the results for of the interviews could be divided into categories that mostly corresponded with the predefined codes or sub-categories of them.

Then, the spoken interviews have been processed into analyzable data. First, the interviews have been recorded with a computer or smartphone microphone and their format was video-audio (mp4) or solely audio (mp3). Manual transcription, or the "transcribe" option in Microsoft Word and manually correction thereof, have lead to one text-file of transcription per interview. This text-file was processed into analyzable data by coding it. Then, the interview transcriptions have been read through and where possible, texts have been matched to a conceptual code (Marks, 2015). Whenever necessary, new codes were added to pieces of data if new themes emerged in the data. The software of ATLAS.ti allowed for linking codes to specific texts in all interviews and presenting them categorically at a glance.

The other data needed a different analysis method. The informal interviews have been paraphrased on a notepad due to the sudden and unpredictable nature of the conversations. The policy documents and one presentation have been provided by the responsible interviewees and speakers and findings have been paraphrased if used. For the presentations that were not send, reading notepad notes and using them in paraphrases was the only possible option.

3.5 Rigor: a prerequisite for scientific research

To ensure that the results of this study will have a confidence level that is as high as possible, several conditions have to be met or transparently covered in the research design section. The article of Gibbert & Ruijgrok (2010) is used as a guideline. It identifies *construct validity, internal validity, generalizability/external validity*, and *reliability* as factors that ensure rigor in case study research.

3.5.1 Construct validity

In short, *construct validity* means that the procedure as followed by the researcher leads to an *accurate* observation. Triangulation and a clearly described chain of evidence are ways to ensure construct validity. A chain of evidence has been outlined in the previous subsections. On the other hand, achieving triangulation has been a challenge in this research, since interviews mostly were the only data source available. However, as indicated, some additional documentation and observation have been used. Nevertheless, the amount of them is sparse. Only two policy documents (BHOS-nota, 2022; Collaboration Agreement, 2023) on the Dutch side, and three policy presentations on the Moroccan side could be used. In turn, the Moroccan presentations

were not shared afterwards, except for one, hampering the usage of that data in the research. Whenever possible, the documents have been used to validate statements about in particular the goals and operational barriers/enablers of actors in the collaboration and to provide case context (see chapter 4: Case description). For the network identification and collaboration enablers and barriers, it turned out that those documents were not very useful.

3.5.2 Internal validity

Internal validity refers to the extent to which there is causality between researched variables and the results. Gibbert & Ruijgrok (2010) identify 3 ways in which internal validity can be ensured, which have been used in this research as well. First, a clear *research framework* has been made which links identified factors in literature and gathered data to success or failure of the ICA-network. Then, *pattern-matching*, i.e. comparing observed patterns with previous studies, was only partially possible since the exact case of a collaboration between all actor types of the Triple Helix in both countries seemed not to have had academic attention yet. On beforehand, the IC-Agadir case seemed to be ideal for such a research because all those actor types are presented on the collaboration agreement. The Results and Discussion sections of this thesis will provide more insight on whether this was indeed the case. Finally, *theory triangulation* was possible, as multiple strands of literature, being that of *knowledge, policy and technology transfer* have covered the goals, barriers and enablers for collaboration.

3.5.3 Reliability

Reliability is present in research when the same research steps lead to the same results. One of the factors affecting reliability is *positionality*. Positionality means that one has to assess its own degrees of privilege in relation to criteria such as race, class, income, ability, educational attainment, gender, etc. for the purpose of analyzing and acting from one's social position in an non-egalitarian world (Duarte, 2017). During the field research, it became evident that I had an unconscious bias in my questioning approach, which concerned the superiority of Dutch technology and solutions. The first (and sometimes the only, due to time constraints) question I often asked was, "How can Dutch parties help you achieve your goals?" Although I perceived it as a neutral question, it appears that in the Moroccan mindset, there was sometimes an association made with a post-colonial relationship of which I was unaware.

Furthermore, as suggested by Silverman (2021) tape recording and careful transcription of interviews, presentation of long extracts of data in the thesis report and reliability checks (with the thesis supervisor) of the coded answers have been done to ensure reliability.

Finally, some questions were asked in simpler but less precise vocabulary due to the sometimes mediocre level of English of respondents during joint meetings. Although sometimes, I

translated the question in French to be more precise, this was not always possible, and if the research would be replicated with questions that cover the entire load of what was intended to find out, this researcher will have other results.

3.5.4 External validity and generalizability

External validity (generalizability of the research) is the most difficult rigor condition to meet when performing case study research (Gibbert & Ruigrok, 2010). Also, in the ICA-case, it has been a challenge. Not many studies into international Triple Helix cooperation networks have been performed. However, as Flyvbjerg (2006) states, case studies can provide rich, detailed, and context-specific information that is not available through other research methods and challenge existing theories and generate new hypotheses. Therefore, very specifically this research adds to how to achieve success in this particular network. Later, when more research into the topic is done, it might be used to substantiate findings towards generalizability in international Triple Helix cooperation.

4 Case description

This chapter explains why the Netherlands and Morocco engaged in the plan to carry out the demonstration greenhouse project and how this is facilitated through the Impact Cluster-subsidy.

4.1 The Netherlands: a potential source of sustainable innovation for Moroccan horticulture

Dutch horticulture has a global leading position in the greenhouse horticulture. Although only about 9000 ha (WUR, 2018) of greenhouses are present, the Dutch gross output was about 12.2 billion Euro in 2022 (Agrimatie) and takes about a quarter of the global horticulture market (Les Éco, 2016). Dutch greenhouses have a high quality, using among others data driven growing technology, biological pest control, gutters, and screens, which all could provide solutions to the problems faced in Souss-Massa. Dutch horticulture companies are attracted to shift their production to the South because of the abundant sunshine, inexpensive labor, and relatively easy transportation towards Europe in the region (Interviewee #3). The strong ties between Morocco and the Netherlands are an attracting feature as well (Interviewee #3). This is first of all evidenced by the over 400.000 inhabitants of the Netherlands with a (partial) Moroccan background (CBS, 2023). Moreover, the two countries have strong political ties, of which the 2021 Action Plan, signed by both countries, can be seen as a recent example (Dutch Ministry of Foreign Affairs, 2022). However, on the Moroccan side, still many barriers towards the adoption of Dutch horticulture technologies exist (el Khinifri, 2017).

To overcome those barriers, the Dutch Ministry of Agriculture, Nature, and Fisheries (LNV) initiated the construction of a demonstration greenhouse, a so-called Centre of Excellence (COE) in Agadir in 2016, in collaboration with the Moroccan government. Initially, the Netherlands committed to investing 0.75 million euros in the project, but it eventually became clear that additional funding would need to be sourced from Morocco. The project's total cost amounted to around 3 million euros, with Morocco contributing approximately 2.2 million euros (Interviewee #13).

Subsequently, the Dutch Agricultural Council in Rabat recognized the importance of transferring the technology and knowledge tested and demonstrated in the greenhouse to local growers. To accomplish this, they utilized a subsidy called the "Impact Cluster," which falls under the PSD (Private Sector Development)-toolkit of a Dutch government agency, adhering to the policy of the Dutch Ministry of International Trade and Development cooperation, which nowadays emphasizes a strong focus on the combination of aid and trade in a dozen of countries, including Morocco (Dutch Foreign Affairs Ministry, 2022). The Impact Cluster (IC) subsidy is a tool specifically created to facilitate the transfer of knowledge and technology through collabora-

tion between Dutch and local businesses and institutions. The "clusters" include representation from both countries, with participation from knowledge institutions and businesses, ensuring a partnership-based approach to knowledge sharing and technology transfer.

In the context of the IC, there are four levels of farmers: notech, lowtech, midtech, and hightech. Concerning the Moroccan context, the notech farmers grow tomatoes directly in open fields, while lowtech farmers use basic plastic-covered greenhouses without much control over water usage. Midtech farmers are more advanced, and hightech farmers employ advanced technologies such as hydroponics (growing produce in water).

Most growers in Morocco are considered notech and lowtech growers, and some midtech growers. The goal is to provide intensive support, training, and demonstrations to around 500 midtech farmers, helping them make the transition towards hightech practices, such as precision water usage and measurement. Additionally, around 1000 lowtech farmers will benefit from activities, demonstrations, and training to move them towards midtech practices.

The focus of the IC-subsidy is primarily on midtech farmers who can readily adopt the technologies offered by the Netherlands. For the lowtech farmers, local suppliers should assist in meeting their needs. It's important to note that the categorization of farmers into these levels represents a sliding scale of technological adoption, and there is a range of practices between each level. However, a still to be conducted *baseline study* should clarify how many farmers have which technologies (Interviewee #13).

The training and demonstration activities in the greenhouse project serve different purposes. Training sessions aim to provide growers with insights and skills related to specific topics, such as virus control or water recycling, to make their greenhouse processes more efficient. On the other hand, demonstrations involve showcasing the technology or techniques being developed or researched in the greenhouse. These demonstrations allow stakeholders to observe and evaluate the effectiveness of new technologies or methods. For example, they may explore ways to save water or improve resource management in high-tech greenhouses (Interviewee #1).

5 Network Relations

This chapter consecutively describes the demarcation of the IC-Agadir network and visualizes and the interdependencies between the actors that are part of it. In doing so, it answers the first sub-question of this research, being "*What are the interdependencies between actor types in the IC Agadir?*".

5.1 Network demarcation

The following table schematically clarifies the IC Agadir-network and its boundaries.

	Actor type	**Signed Collaboration Agreement**	**Associated**	**Arbitrary inclusion**	***Total***
	Dutch Industry	4	6	0	**10**
	Dutch KI	1	1	0	**2**
	Dutch Government	0	0	2	**2**
	Dutch NGO	1	0	0	**1**
	Dutch Media	0	1	0	**1**
Total	***Dutch***	6	8	2	***16***
	Moroccan Industry	1	7	0	**8**
	Moroccan KI	1	0	0	**1**
	Moroccan Government	0	0	2	**2**
	Moroccan Bank	0	1	0	**1**
Total	***Moroccan***	2	8	2	***12***
Total	***All***	8	16	4	***28***

Table 6: Overview of IC Agadir-network and its boundaries. KI = knowledge institute.

The network under research comprises 28 actors of which 8 of them have signed the Impact Cluster cooperation agreement. This can be considered the 'inner circle' of the network. 16 of the actors are mentioned in the cooperation agreement as "associated parties", of which the 8 Moroccan ones are even "*outside the partnership*" (Collaboration Agreement, 2023). Furthermore, the 4 government actors can be seen as important context setters for the network and thus are considered part of it.

Of the 28 actors, 16 are Dutch entities, 10 of which are Dutch horticulture industry companies. Furthermore, 2 Dutch knowledge institutes, a Dutch Agrifood media channel and a Dutch NGO make up the Dutch side of the network. Since the Impact Cluster comprises a subsidy, however, two Dutch government agencies also play a role in initiating and monitoring the network.

On the Moroccan side, 12 entities are involved. A knowledge institute and a sector association play the largest role. 8 other parties involved are "associated parties" just like the Dutch

ones mentioned in the IC cooperation agreement. 2 Regional Moroccan government agencies can be seen as important context setters.

The Impact Cluster agreement has been signed by 4 Dutch industry companies, the Dutch and Moroccan knowledge institutes, the Dutch NGO, and the Moroccan sector association. All of these have been interviewed and a clear image can be sketched about the contact that exists between them. The group of associated stakeholders consists of 8 Dutch stakeholders and 8 Moroccan ones. The vast majority (6) of the Dutch associated actors are industrial partners and the others are a media channel and a knowledge institute. Of those, 4 Dutch companies and the knowledge institute have been interviewed. 7 of the affiliated Moroccan parties to the Cluster are industry actors, the other is a bank. Unfortunately, none of the affiliated Moroccan parties were interviewed due to circumstances. The 2 Moroccan government agencies, however, were interviewed in a round-table setting, during a visit to Morocco.

The network obviously has its boundaries. During the research visit to Agadir and Rabat, it has been observed that at least 3 Moroccan knowledge institutes, some Dutch companies, and a Moroccan start-up incubator were not in the Impact Cluster, whereas some role could have been possible for them. A reason for Moroccan growers not to join could be their focus on operational excellence over adjacent activities (Respondent #1). Also, some Dutch companies gave a few reasons for their absence. For example, there are many of those initiatives, it costs money and you are never sure what the result will be (Respondent #19). Secondly, there are companies that just stepped in too late. Finally they stated that you can never be in every cooperation (Respondent #20). The latter is true, considering the fact that no direct competitors are in this IC either.

Some doubt remains about the extent to which the Dutch knowledge institute is in contact with the Dutch and Moroccan government. Mainly, the fact that contact with the latter was only established during the field trip to Morocco that I was present at as well, indicates that this connection might not be good enough to extract the resources they need from them. Their seeming lack of connection with the Dutch government, should not have consequences, as the actors all acknowledge their merely facilitating role. However, the potential of the Dutch knowledge institute as the "Academic lead" of the project is high. Already, the institute has shown this in their efforts in extending the network, for example during the field trip. It can be expected that they will have an important role in scientific agenda-setting concerning the project and coordinating between new entrants in the future phase of the project, especially with their Moroccan counterparts. On the other hand, it is not deemed problematic that this actor does not have contact with every industry partner in the Cluster.

First of all, this is because not every industry actor fulfills an equally large role in the IC. Secondly, it seems that the system in which every "lead" brings the agenda of its actor type together, is beneficial for the course of the project. For example, the Dutch industry perceives

their Dutch lead already as-such, which indicates that an industry boundary spanner is needed to keep them informed and steer a common agenda. However, basically the whole industry does not have extensive contact with their Moroccan counterparts, especially concerning the IC. As I deem Dutch acquaintance with the Moroccan needs and resources necessary, contact between the two actor types seems a vital - but missing - element of the IC Agadir. With no other Moroccan knowledge institutes in the Cluster and no Moroccan industry partners reached for an interview, it seems that this "lead" role is in the hands of the Moroccan growers association (Industry) and the Moroccan knowledge institute.

5.2 Research consortium

Within the IC, 2 Moroccan companies, 2 Dutch companies and the Cooperation Agreement knowledge institutes from Morocco and The Netherlands are also part of another network which thus overlaps in components with the Impact Cluster network. Its goal, however, is to link industry solutions to research goals, so that they could both serve the industry market and research agenda in a way that local growers will not be "*kicked out of the market*" (Respondent #9). For the Dutch research institute, this means specifically shaping PhDs.

5.3 Network interdependencies

The following table outlines the different reasons for which actor types engage in the collaboration with others in the IC Agadir. Every cell in the table outlines the reasons for the actor type in the row of the first column to engage in collaboration with the actor type in the columns of the first row. Thus, the cell of the third row and second column can be read as *the Moroccan industry needs the Moroccan government in the IC Agadir for advocacy and operational issues*.

Actor Type	Moroccan government	Moroccan industry	Moroccan academia	Dutch government	Dutch industry	Dutch NGO	Dutch academia
Moroccan government	–	Increase acceptance	Using research	X	X	X	X
Moroccan industry	Advocacy	–	Recruitment	X	Knowledge	–	–
	Operational issues	–	Using research	X	Technology	–	–
Moroccan academia	Transition of horticulture	Scale	X	–	–	–	Extend curriculum
	–	Financial input	X	–	–	–	–
	–	Incorporating local context	X	–	–	–	–
Dutch government	Scalable market entry	Scalable market entry	Scalable market entry	Scalable market entry	Technology	–	–
	Funding	–	–	–	Knowledge	–	–
	–	–	–	–	–	–	–
Dutch industry	Advocacy	Research agenda	Industry entry	Advocacy	Local value chain	Compliance	Research
	Funding	–	–	Subsidies	–	–	Recruitment
	Subsidies	–	–	–	–	–	Education
Dutch NGO	Extend IC-network	Extend IC-network	Extend IC-network	Extend IC-network	Extend IC-network	Extend IC-network	Extend IC-network
Dutch academia	Information	–	Paradigm change	Funding	Practice locations	Governance	–
	Implementation	–	Mutual understanding	Policy	Market information	–	–
	Funding	–	–	Pressure	–	–	–

Table 7: Interdependencies between the actor types in the IC Agadir

The examination of the interdependencies in the IC in the table above, together with the findings on the indicated connections by actors, lead to the following conceptual model of existant relations within the IC Agadir network:

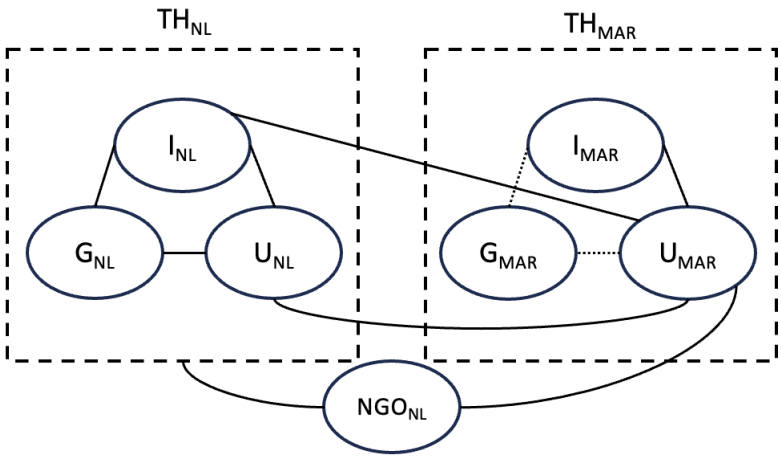

Figure 6: Conceptual model of the interrelations in the IC Agadir

It can be concluded that the Dutch NGO performs as a project manager that connects both Triple Helices and that both Triple Helices actually exist. Side note to this is that the Moroccan actors do interact, but not mainly for the IC-Agadir project. Therefore, the lines between them are dotted. In turn, the line between the NGO and Dutch TH-square means that it has contact with that TH as a whole, whereas on the Moroccan side, its contact is mainly with the Moroccan knowledge institute, since the Moroccan industry in the network is not sufficiently connected apart from the growers association.

The following subsection provides an interpretation of the consequences of this network structure for the functioning of the IC Agadir.

5.4 Interpretation of findings

The need for collaboration is not clear for every pair of actor types within the network. To start, for the Moroccan local government, it is not very clear what the Dutch actors can provide to overcome the water scarcity or to make sure the industry remains profitable. This could mean that the own Moroccan solutions are regarded as sufficient. If this remains the case, it will be unlikely that they will provide the Dutch side of the IC with subsidies, information, or advocacy for the diffusion of Dutch technologies, which nevertheless is vital for the success of the IC. As the main need of the Moroccan partners lies in financial sustainability, The Dutch should thus create solutions that are financially feasible. Inherently, many of the Dutch solutions have a beneficial effect on the Moroccan water issue, which could be perceived as an additional benefit by the Moroccan partners.

This image is reinforced by the fact that the Moroccan industry seems to welcome every possible input for improvement of the situation, in which no special position for the Dutch industry exists. In turn, if the Moroccan government cannot provide its industry with enough research funding, Dutch actors such as government and industry could try to provide them with it, creating an equitable base for cooperation in which they could integrate their sustainable solutions. This is something that is not yet experienced as a potential benefit of collaboration by the Moroccan industry with the Dutch partners. Although the growers association is in narrow contact with the Dutch industry and knowledge institute, the real concretization of needs seems not to have taken place. This is something that presumably will be done in the future of the project. However, clarifying the need and intention for collaboration to the operational level, i.e. the hinterland of the growers association, is something that underpins the potential of collaboration, and therefore, Moroccan companies should have been involved as early as possible. Especially, because the specific characteristics of the different growers in Morocco have not been clarified yet, one can not simply presume that the growers association can represent the whole industry.

The lack of collaboration with their local academic counterparts could be an obstacle for the Moroccan knowledge institute for attaining the ecological sustainability of the country. This is because problems will less likely be solved from a *systems perspective*. This could mean that solving the water shortage could lead to other problems, such as salinization of regional waters. With the other Moroccan counterparts, there seems to be sufficient collaboration but evidently, the problems are not solved. On the other hand, it did not become clear what their benefits of collaboration with the Dutch partners are. As the Dutch government is a facilitator, this is not strange. The Dutch industry, however, could provide them with information about currently used technologies, and the Dutch academia with knowledge. It seems that this benefit should be clarified more to the Moroccan academia in order to have a meaningful collaboration between those actors. As the contact between those 3 actors is good, elucidating intentions should not pose problems.

It can be concluded that this collaboration is very much driven from the Dutch perspective. First of all, this is the case because the Dutch actors know better what they need from other actors than the Moroccan counterparts. One thing that remained unclear, however, is why the Dutch knowledge institutes would need the Moroccan industry. Although the other way around, it did become clear that there was some need in this collaboration for the Moroccan industry, it is not clear what that need is. This could imply a dependency of the Moroccan industry on the Dutch academia, whereas it is not clear why this would be the case. Possibly, the Dutch academia can make their research funding bigger by involving more actors. This could mean that funding is prevailing over what should be achieved with it.

Secondly, the need for the Dutch NGO is not mentioned at all by the Moroccan partners in the IC. This implies that they do not directly think out of the perspective of the demonstration

greenhouse, although the involved Moroccan industry partner and knowledge institute know about the role of this actor and value it. Not mentioning the NGO could also have resulted from the fact that there was a time constraint in interviewing the Moroccan growers association and that the representative of the Moroccan knowledge institute was not abreast of all details of the collaboration. The NGO's role for project coordination, however, is still deemed very important.

5.5 Interdependencies

5.5.1 The Moroccan government

According to the Moroccan government officials that were interviewed, it is necessary to closely involve their industry in policy-making and implementation, from individual growers (Respondent #17) to the industry association (Respondent #16). This may avoid resistance and malfunctioning of measures. Moreover, it has been observed that contact between the Moroccan government and Dutch partners just started to establish and was mainly initiated by the Dutch. In turn, the local government agencies indicated that no specific dependency on the Dutch exists. Therefore, it can be concluded that the Moroccan government does not sufficiently depend on the Dutch actor of the IC to adopt their perspective. Contrarily, the local government is found to depend on the local knowledge institute for information, which, due to its close ties with the industry, might focus on research into financially sustainable over ecologically sustainable technologies. As a consequence, actual focus on the IC-Agadir lacks, which might well cause an immobility towards changing policies for establishing joint solution finding.

5.5.2 The Moroccan industry

The only Moroccan industry partner that plays a role yet in the IC is the Moroccan growers association for fruit and vegetables (Respondent #3;5;15). Among the industry partners in the IC are some members of the organization, but also some foreign companies (Respondent #2;15). The whole local supply chain, being either growers, packaging- or warehousing companies, is represented in the Cluster. It seems that the association does not yet take up a role as "Industry lead" as the Dutch have on their side, and the role of the association seems more in operational project management. As the operational phase of the project did not start, it is not possible to make statements about their functioning there. However, their current lack of involving other Moroccan actors might imply that they do not have the organizing capacity to do this in the future. Nevertheless, the strong relation between the growers association and the Moroccan knowledge institute seems important in the collaboration as it provides the potential access to the Moroccan needs. The Moroccan industry needs the local knowledge institute for recruitment and aid in research, and this project seems an eminent consequence of this, which amplifies the

idea that the two will remain closely aligned over the course of the project and are also eager to carry on, which in turn opens possibilities for the Dutch stakeholders to collaborate with them.

Furthermore, the local industry only seems to have contact with the Moroccan government through the association (Expert #5;6), mainly for operational problems (Expert #5;6), advocacy and regulation (Respondent #9) and not so much for research collaboration. However, the latter seems wished (Respondent #15;23). Lack of funding, as it has been identified as a barrier in the next chapter, certainly affects collaborations. However, the project itself seems to be sufficiently funded. Nevertheless, this might pose problems for the more long-term goals.

Considering the Dutch industry, the Moroccan industry already sees some contribution to the advancement of Moroccan agricultural practices by collaborating on trials and sharing technologies and expertise related to water management and optimization. According to the growers' association, there is room for such cooperation when counterparts can act on equal terms. As most Dutch industry actors have trouble establishing connections with the Moroccan industry, it seems that either their networking skills are not sufficient, or finding those equal terms is too difficult up until now, which might complicate operational collaboration.

The intensive contact within the Impact Cluster between the Dutch university and the growers association indicates that the association can also benefit from a collaboration with the Dutch knowledge institutes, however, no information has been gathered concerning the exact reasons to cooperate from the Moroccan side of this link. It might just be beneficial for the stature of the project, which could render attention that could incentivize governments to connect to the project even more long-term than is the case nowadays.

5.5.3 The Moroccan knowledge institutes

As discussed, it has been observed that the ties between the knowledge institute and the government are quite tight. Although the Moroccan knowledge institute in the IC indeed sees that the government helps them with the transition of horticulture, broad academia-government collaboration seems to be lacking (Expert #9). This may have led to a prevalence of financial incentives for government policy stances, as the Moroccan knowledge institute and industry are closely related. Understanding this dynamic might enable Dutch actors to adapt their solutions to the Moroccan situation by interacting with the Moroccan government as well as knowledge institute.

As to Cluster cooperation with the Dutch industry, one respondent claims that the Dutch industry knowledge can be used to extend the Moroccan curriculum (Respondent #9). As one Dutch actor is already providing courses to Moroccan students, this seems a realistic way in which the Moroccan industry can be enthused to work with Dutch technologies and thus is a beneficial connection for the network collaboration.

5.5.4 The Dutch NGO

The Dutch NGO is generally important for project management, including social pressure and joint-agenda setting (Respondent #3;5;13;14;15). Although the Moroccan actors did not reflect on the actor's role, it functions as a guardian of the project prerequisites given by the Dutch government. The NGO states that other actors mainly can help towards this goal in extending the network, so that the project can grow bigger. The actor is thus mainly a facilitator, and its influence is mainly in governance, as opposed to the operation. Its presence in the network and established connections with the partners definitely helps the project to be executed well.

5.5.5 The Dutch government

A Dutch government agency is the initiator of the formation of the IC Agadir. Their only contact is with the Dutch NGO as the representative of the Cluster, because they leave the operational deployment to the IC partners themselves. This means that the government agency only takes up a facilitating role in the project, which corresponds to the general stance on Triple Helices that the government should mainly facilitate innovation, mainly through funds, creating a beneficial juridical landscape, and for international pressure on the local counterparts ((Respondent #5;7;13)).

According to the agency, the project's scalability and acceptability depend on the involvement of local industry and a sound academic collaboration between Dutch and Moroccan knowledge institutes. Finally, it stresses that the Moroccan government was important in providing the demonstration greenhouse as an in-kind contribution. The lack of actual interaction with the Moroccan industry in the IC thus implicates that the project might not be appropriate to be scalable.

As the Dutch agency has no resources to add and merely wants to monitor the effectivity of their subsidy, their role in the collaboration seems marginal from now on. However, they should put certain issues on the agenda towards the Dutch embassy if needed, or adapt their subsidies to the needs of this specific project. If they do not do this, the project might get stuck in merely being an offer of Dutch technology for which there is no actual need.

5.5.6 The Dutch industry

A Dutch horticulture knowledge transfer company fulfills the role of "Industry lead" in the governing layer of the network. It selected and informs other Dutch industry companies to be part of the Cluster (Respondent #3;10) and ensured that the whole Dutch supply chain was represented. This supply chain further concerns a seed company, a greenhouse constructor and some of his subcontractors. Furthermore, a pest control company, data solutions company, a

substrate company and a growers cooperation form the Dutch industrial side of the network. Many of them indicated that coordination of the scientific and industrial goals within the IC is well organized through the Industry lead (Respondent #1;3;10;11). This is an indication that the structure of a network with lead partners that further coordinate towards their hinterland is beneficial for the course of such projects. The Dutch industry needs its own government for advocacy and subsidies that help boost their plans (Respondent #1;4;8;10;11), without being regarded as exploiters (Respondent #4). The Dutch government seems active merely from a facilitating role, which means that real advocacy seems to be lacking a bit, affecting the effectivity of the project.

It became clear that many Dutch industry stakeholders are already active in Morocco. However, gaining a real foothold and even establishing connections remains difficult (Respondent #1;9;11), mainly because the local actors have a short-term mindset (Respondent 4;11). They consider the IC as a way to achieve more foothold. In turn, the Dutch industry needs the Moroccan industry, including, but not solely (Respondent #11), the growers association (Respondent #9), to clarify which techniques could have the highest potential and which topics should be researched, since they will be the end-users (Respondent #3;9;12). Inherently, because this contact is mostly absent up until now, only partial indication of the Moroccan industry's needs has been possible, potentially complicating the course of the project due to unclear goals or insufficient goal alignment between those two actors.

The Dutch companies underline the importance of being in a cluster together with the rest of the supply chain, because the individual exporting companies need capacity, steering, or mandate to establish a local value chain, which they can not provide with only their specific expertise, such as knowledge transfer (Respondent #11). Also, to succeed in these kind of projects, the result of their own product depends to a large extent on the other parts (and innovations) within the chain. (Expert #2, Respondent #8;9). The existence of this kind of cluster within the Dutch industry side of the project thus seems beneficial for the course of the project.

The industry also deems collaboration with the Moroccan government to be of importance, for advocacy (Respondent #1;4), funding and subsidies (Respondent #1;9;11). However, contact between most Dutch actors and the government seems lacking. In turn, the Dutch horticulture is generally bad at organizing themselves towards its own government so that it can transfer their interests to other governments (Expert #3). This will surely negatively affect the extent to which the Dutch can exert political influence on the Moroccan horticulture industry.

In addition, the Moroccan knowledge institute is important for the Dutch industry because of its strong ties with the Moroccan horticulture industry, since lots of engineers in the sector's big companies have been educated at the institute (Respondents #3;9;14). Almost all Dutch companies state to be in contact with the institute. It is therefore likely that this connection will

open up Moroccan growers to Dutch technologies, and the existence of this connection seems beneficial for the project outcome.

In turn, Dutch knowledge institutes can increase recruitment (Respondent #1;4) in the industry, and are needed for education of those new employees and for applied research (Respondent #9), also on financial matters (Respondent #8). In this way, their presence in the IC does not directly aid in the Moroccan setting, but merely seems to serve a domestic purpose. Such an interest might not be directly conclicting, but it certainly does not contribute to the achievement of the collaboration goal.

Finally, the Dutch NGO as rewgarded by the Dutch industry is in coordinating the IC network so that every actor follows the rules of the agreement (Respondent #1;3;10;11). Every industry actor interviewed thinks that this role is performed well, which thus does not seem a bottleneck for project success.

5.5.7 The Dutch knowledge institutes

One of the Dutch knowledge institutes acts as the "academic lead" in the collaboration, meaning that they connect other academic actors to the IC if deemed complementary. It will be hard for them to attach to the Moroccan actors in the IC, as it seems that they do not depend on the Dutch institute to accomplish their goals. Contrarily, the institute stated to depend on the Moroccan government as an information provider, policy implementer, and as a funder of the joint research activities (Respondent #5). Moreover, the institute wants to transmit the idea of *systems view* towards Morocco: creating a sustainable regional *system*, whereas at the moment they seem think of the Water-Food-Energy Nexus within a small system like a greenhouse. Again, the need for this among the Moroccan academia is not clear, which implies that another reason for collaboration should be sought if this relation in the network is to be advantageous for its outcome. As the Dutch industry needs the Moroccan academia for research, recruitment and educational purposes, the market information and practice locations for the Dutch knowledge institutes are deemed accessible to them. This again reinforces the feeling that the Dutch Triple Helix is performing as it should, whereas too little dependency exists yet between them and the Moroccan actors to move the collaboration from knowledge to technology transfer.

6 Network goals

This chapter outlines the goals of the different actor types within the Cluster network per subsection. This corresponds to the interview questions belonging to the factor "Goal identification" in Figure 1 in section 3. Hence, this section provides an answer to the following sub-question: "*What is the common goal of the IC Agadir?*". The table below summarizes the findings prior to their in-depth interpretation and description.

Actor Type	**Goal**
Impact Cluster	*Promote sustainable horticulture development in Morocco*
Moroccan government	Protect agricultural industry Combat water scarcity
Moroccan industry	Make profit Meet commercial, social and ecological requirements
Moroccan academia	Designing profitable mid-tech greenhouses Decrease water usage Improve food quality Improve food quantity Year-round production
Dutch government	Facilitate aid and trade
Dutch industry	Market-entry Improve sustainability of Moroccan horticulture Recruitment
Dutch NGO	Promote sustainable horticulture development in Morocco
Dutch academia	Improve sustainability of Moroccan horticulture Raise research funding Recruitment

Table 8: Goal overview of actor types in the IC Agadir

6.1 Interpretation of findings

First of all, the definition of *sustainable* in the IC is problematic. The IC focuses on both ecological and financial sustainability of the industry (Collaboration Agreement, 2023), whereas these two definitions inherently conflict in the short term. This implies that problems might occur in prioritizing or balancing the two aspects of the concept. First of all, the Moroccan government has agencies that focus on different aspects of sustainability. The agency protecting the agricul-

tural industry seems to have more influence in steering policies than the agency that aims to combat the water scarcity. Therefore, the water scarcity might be insufficiently addressed and thus only be solved partially or slowly. The Moroccan industry aligns to the financial side of the common goal, trying to steer commercial, social and ecological requirements in such way that it does not harm their profits. The Moroccan knowledge institute also deals with the contradiction in the meaning of sustainability, but first and mostly mentioned economic interests for engaging in the IC.

Therefore, it seems that the Moroccan partners of the IC could mainly be convinced by the financial contribution of Dutch technologies to their industry. To include the ecological need in the financial need for sustainability, the Moroccan side of the IC should increase the cost of water, being ground water as well as desalinated water. Mainly, the Moroccan government has a say in this.

Also, it should be clear to the Dutch side of the IC that the financial interest of the Moroccan actors prevails in their adoption of new technologies. This means that the Dutch should try to decrease the cost of their technologies, for example by developing suitable adaptations to them for the Moroccan market. All actor types in the IC Agadir have specific knowledge that could help in developing these.

With those two measures, the long-term ecological sustainability is more likely to be compatible with the short-term financial sustainability.

6.2 Goals per actor type

6.2.1 Network goal

Only 5 respondents related to an overarching goal, when they discussed the goal of the IC network. This indicates that either the IC does not have the full priority among activities of the other actors, or that they take a more individual interest in engaging in it.

The grantor of the subsidy stressed that the subsidy tool falls into the combi-approach framework (*combi-aanpak*) of the Dutch Minister of Development and International Trade, aiming at combining aid and trade. The Dutch NGO states that the overarching goal of the IC is to promote sustainable horticulture development in Morocco in its broadest sense, which is exactly the purpose described in the Collaboration Agreement signed by 8 actors. To do so, the Moroccan industry has to be brought on a mid- or high-tech level, which in turn has as its goals to reduce water usage, increase quantity and quality and getting their society on a higher level (Respondent #3). The latter perspective on the IC goal, being already more industry-related, is substantiated by other Dutch industry partners. In their description, they focus on the faster development and acceptance of Dutch technology and knowledge transfer, towards a clearer applicability on the Moroccan situation, by locals (Respondent #9;11). The network goal seems

driven by the Dutch side of the network, and it remains unclear what the Moroccan side of the network thinks of this, which might hamper the mutual understanding and thus the collaboration.

6.2.2 Moroccan government

Although not directly involved in the knowledge transfer subsidy that is the IC, the Moroccan government has been included in the network, because they funded the physical greenhouse. The government has multiple goals around the subject.

The Moroccan government has put in place the Green Morocco Plan from 2008-2018. This policy modernized the local agriculture, but intensified the country's water scarcity (Elomari, 2023; Asedrem, 2021). It can be no surprise that the current program, Green Generation 2020-2030, aims to make the country's agricultural sector more sustainable and resilient through optimized irrigation water management and soil preservation (Bahbah & Touhami, 2023).

First of all, one of the local government agencies states that they aim to do this by both reducing the demand and increasing the supply of water. They promote regrouping of small farmers to tackle the problem of them not being able to shift towards more sustainable practices. Also, this aggregation can help smallholder farmers with advice on water usage (Elomari, 2023). In turn, another local government agency has said to be aware of the water shortage since 2007, indicating that solving this issue is one of their main goals. Some Dutch companies address the interest of the local government too. They indicate that the government is aware of the increasing water shortage in the country. They see it as a challenge for the coming years. Also, they question the production of water-intensive production destined for export. They want to be more frugal with water. They do not want to let go of tomato production because they can earn a lot with it, but they see that they should use less water for it, preferably even while increasing the yield (Respondent #4;11). This project is to provide the government with arguments to substantiate their rules and laws concerning water for growers (Respondent #4). The Moroccan government's wish to focus on both optimizing the economic and ecological situation seems to hamper the collaboration goal, as the Moroccan and Dutch perspective is different on the definition of sustainable Moroccan horticulture.

6.2.3 Moroccan industry

As the main objective of growers is to produce a qualitatively good product at a reasonable cost to sell it at a profit, while respecting the requirements regarding sustainability, commercial agreements, social issues, and ecology (Expert #5;#6, Respondent #9), it becomes clear that the Moroccan industry also has a different perspective on the definition of sustainability than the Dutch. During a round table discussion, one grower stated that sustainability was about "staying

alive" for Moroccan growers. However, in an interview afterwards, he defined sustainability as "not making manoeuvres that could put at stake our production of the coming years". Those manoeuvres are in particular the excessive use of water, notably destined for export, and of chemicals that are dangerous to their cultures. Considering commercial requirements, it is about following the specifications of their buyer, such as the size of a tomato. This buyer is often the EU, and the requirements thus those of that market. For ecology, they have three requirements: the use of chemicals that are not harmful to the environment, using integrated pest management (IPM), and having proper waste management. Also, conforming to new employee requirements, such as minimum wages and insurance, are goals (Respondent #9, Expert #6). The issues to be solved by the IC are to be delineated by a base line study that is to take place in the first year of the IC (Respondent #3). The local industry wants to see Dutch techniques that work and are feasible, in order to invest in them (Respondent #3, Respondent #9). This means that the urge to invest in ecological sustainable technologies will only exist when the Dutch industry can provide the Moroccan industry with affordable technologies. Indeed, two Dutch respondents do not recognise the indicated intrinsic motivation amongst growers to save water (Respondent #11, Respondent #4). They state that a grower does not think of the big question that a country has to deal with, but mostly thinks about what he should earn the next year. However, the Dutch industry also seems to forget about the Moroccan need for mainly financially feasible solutions over ecologically feasible ones. For example, asked for the general goal of a grower, one Dutch industry company indicates that insect mesh would be its top priority because disease pressure is increasing in Morocco, as well as the demand for clean material that can be exported. Then, he stressed that they also need a more sustainable way of growing, which meant, according to him, optimizing irrigation and finally a screen. As this product is sold by his company, it seems that they take a perspective that is too much Dutch driven, which definitely hampers the achievement of the common goal of the IC.

6.2.4 Moroccan knowledge institutes

Since the focus of the Moroccan university lies in making profitable mid-tech greenhouses, increasing yield per square meter, sustainable water consumption, improving food quality and increasing the production during winter (Respondent #14), it became clear that again, financial sustainability is predominantly important for the Moroccans. The Moroccan knowledge institute in the IC sees that Dutch organisations can bring the needed technology and knowledge. The Moroccan institute thinks that managing production using less water and better climate management are to be adopted first by their growers. The representative of the Moroccan knowledge institute is indeed said to see the long-term effects of Morocco's current policies (Respondent #11). This is a promising condition for bridging the gap between the Dutch and Moroccan per-

spective. Other universities have shown during the conference in Rabat that they try to design their own, locally adapted initiatives for glass greenhouses, also in terms of costs. This is clearly a different approach than the Moroccan institute in the IC has. Such initiatives may be supported by the Dutch actors, so that the Moroccans do not reinvent the wheel. In this way, the Moroccan and Dutch actors can collaboratively create solutions that are both ecologically and financially sustainable. It seems that a lack of collaboration between the IC's Moroccan knowledge institute and other Moroccan institutes exists. This may hamper the joint creation of solutions.

6.2.5 Dutch government

The goal of one Dutch government agency is to facilitate aid and trade. The other Dutch government agency has specific interests, which have made them initiate this IC. However, their opinion on the current design and execution could not be clarified. The facilitating role of the Dutch government seems to be well executed considering the financial aid for the project. However, it could still improve in this role by fostering contact between the Dutch and Moroccan actors so that joint solution finding can be started. If not, it seems hard to create such an environment for the others in the IC.

6.2.6 Dutch industry

The major reason to join the IC for Dutch companies is to obtain (better) access to the Moroccan market, which has a huge efficiency potential for Dutch horticulture products (Respondent #4;10;11). There are a lot of technologies that could even be applicable in a low-tech greenhouse, claims one industry stakeholder. It is up to the industry to show local entrepreneurs what those advanced growing techniques can mean for their income (Respondent #11), by the means of the demo greenhouse. A sustainable and developing world is also a side-goal for the industry (Respondent #10). The IC offers a pre-competitive manner to develop Dutch business in the Moroccan market by developing the Moroccan knowledge base. After all, it is either their product or that of a competitor that a grower will use (Respondent #1). Being visible can be done by visualizing the potential of technologies and facilitate their adoption (Respondent #3;8), thus for example in a demonstration greenhouse. Moreover, one actor indicates that the IC can also help them in finding new employees, thus recruitment purposes.

Another reason to enter the Moroccan market are the changing circumstances in the Netherlands, particularly concerning energy costs. In general, Moroccan greenhouses demand less energy, whereas energy in The Netherlands is scarce. Dutch growers should grow either locally for the local market, or there where it is cheap. In The Netherlands, nobody wants to work in greenhouses anymore, and labour migration creates tension. On the long term, this could transform The Netherlands into a technology provider rather than one of production (Respondent

#3).

Furthermore, the presence that Dutch companies currently have, does not fully satisfy them. Examples of current presence are collaborations with local distributors and partners (Respondent #1;4;9). The IC is seen as a means to generate closer contact to their possible Moroccan customers.

Finally, the goal of the Dutch industry depends on the company size. The bigger the company, the more idealistic the vision. But it always goes hand in hand with the commercial interest (Respondent #3). An example of such an idealistic vision is that of a company, which states that they want to "*make our knowledge available to the Moroccan market*" (Respondent #9).

It is not strange that the Dutch industrial interests are mainly financial. However, the way in which they push to sell their solutions seems to lack understanding of the Moroccan situation. It is important to understand that the Dutch incentives to increase activities Morocco are less simply met than merely offering their solutions in another context. Actually, the products and service might well have to change, and the local market situation should be mapped. For example, labour costs are also rising in Morocco, thus meaning that this would not be a suitable country to export to for specifically this reason.

6.2.7 Dutch NGO

The Dutch NGO has as its goal to promote sustainable horticulture development in Morocco in its broadest sense (Respondent #6). The NGO has as a purpose to improve horticulture in Africa to improve food security in Africa. The presence of this actor, that focuses mainly on project management, is important for connecting the perspectives on financial and ecological sustainability. It may be the only actor that is able to do so, as it has no other objective. Therefore, its presence is of vital importance for the network collaboration.

6.2.8 Dutch knowledge institutes

The goal of one of the Dutch knowledge institutes is to share knowledge on sustainable and circular horticulture to foster a transition in Morocco towards such a system over there, where Morocco could be the gateway to Africa for these practices (Respondent #7). They add to the other knowledge institute in providing applied and management knowledge rather than theoretical knowledge (Respondent #7) and they also add their network around the more practical Dutch education level. They need the other institute because of their differing knowledge. Finally, the applied university wants to help increasing the number of agriculture students with a Moroccan background. Their presence in the IC might help to overcome practical horticulture issues in the project. However, if it focuses to much on exploiting the recruitment potential, their goal would not align enough to contribute to the collaboration and may thus be unnecessary.

The other institute wants to have impact and get research funding, in short. They want to create a network between Dutch and Moroccan industry as a means to help creating sustainable horticulture in Morocco and to realise research funding by having joint PhD students. Besides research, they also want to facilitate interesting student projects and maybe improve the international reputation of the university for student from abroad (Respondent #6). By working with local partners, they can unite their two main goals. Even subjects for PhDs can be generated by presence in the IC (Respondent #5). The mini-conference in Rabat has partly been organised to foster Moroccan inter-university cooperation (Respondent #5), because this seems to happen rather sparingly (Respondent #5;21;22). One industry actor stated that, for a university, it could be very important that other regions in the world develop knowledge and improve the local research system. Also, it stated that the applied institute could have an interest in exploring the possibilities for their agricultural education abroad because more and more Dutch companies will go to Morocco. Then, having connections and knowing the market will be important for the applied institute. (Respondent #3). These statements could, unfortunately, not be confirmed.

In general, it seems that the knowledge institutes mainly play a role in facilitating long term sustainability for Moroccan horticulture. This implies that their goal is not to make a success of the demonstration greenhouse-project. As they are found to be a connector between the Dutch and Moroccan industry and academia, their role is mainly in establishing good relations and fostering a good knowledge transfer program between the actors, but without engaging in the actual content of it. That is to be left to the Dutch industry, which has the needed expertise for it.

7 Barriers

This chapter reports on the barriers that have found to play a role in the IC Agadir network and interprets their implications for the collaboration. Therefore, it treats the sub-question "*What are perceived barriers towards the common goal of the IC Agadir network?*". The following table summarizes the factors that were found to play a role in the network, indicates whether it is a barrier or enabler in this case, and categorizes them per goal. They all relate to the structure that the network was found to have in chapter 5. Then, an interpretation of the results follows, after which every factor is described extensively per specification. Mostly, the unnumbered bold headers in the text align with the "Specification" column in the table. However, in some cases, they align with the "For Goal" column, because the content of the text lent itself better for that.

Theme	Factor	Barrier	For Goal
Common ground	Common goal	Lack of mutual interests	All goals of IC-actors
		Divergence in shared beliefs	Adoption of technology Water crisis
		Disagreement on definitions	Adoption of technology
Finance	Funding	Lack of financial means	High-tech greenhouse adoption Individual technology adoption
Lack of absorptive capacity		Technology	Individual technology adoption
Moroccan policy	Government support	Inadequate infrastructure	Water crisis
		Insufficient regulation	Water crisis
		Weak governmental enforcement	Water crisis
		Lack of business support	Individual technology adoption
	Institutional context	Limited democratic policy-making	Water crisis
Dutch policy	Government support	Insufficient regulation	High-tech greenhouse adoption
Culture	Organizational	Differing time management	Knowledge transfer
		Lack of trust-receptiveness	Knowledge transfer
		Power-asymmetry	Knowledge transfer
Coordination	Communication	Lack of engagement	Knowledge transfer
		Insufficient tools/objects	Knowledge transfer

Table 9: Identified Barriers in the IC Agadir categorised per goal

7.1 Interpretation of findings

The barriers within the cluster have various implications for its functioning. First of all, the lack of understanding for the needs of the Moroccan industry or the impossibility to adapt to those needs can be very problematic for the diffusion of Dutch technologies towards Morocco. This attitude stems from a too narrow focus on exporting the Dutch as-is technologies by the Dutch industry. The Moroccan industry should be provided with technologies that have a positive ROI, do not require too much equity for investing, and deliver on their promises. The current Dutch

propositions are apparently too expensive and unfamiliar to be adopted and steer Morocco towards decreasing demand over increasing supply. The demonstration greenhouse could solve the problem of unfamiliarity. However, it is not carved in stone that the current demonstration greenhouse will convince local growers of the utility of the Dutch technologies, due to its characteristics that are substantially different from the local Canary greenhouses. The IC actors should take into account that the tests in the demonstration greenhouse should be reproducible by the local nurseries. Especially, the governance of the project could slow down or hamper this reproduction. Therefore, the governance agreements should prevent to limit the scope of the project to the demo greenhouse only.

Furthermore, it seems that the Dutch and Moroccan actors do not share the belief on what is needed to combat the water scarcity. The Dutch technologies mainly are compatible to decrease the water demand, whereas the Moroccans focus on a balance between solutions that both decrease demand and increase supply. Additionally, in contrast to the Moroccan primarily intra-disciplinary focus, the Dutch embrace interdisciplinary scientific collaboration, which considers the broader implications of enhancing the water supply over decreasing its demand, including the impact on the Moroccan environment. This is reflected in the Moroccan emphasis on measures like desalination. This means that all Moroccan partners seem to prefer financially sustainable over ecologically sustainable solutions, and it seems a bridge too far to change the Moroccan perspective over the course of the project, especially that of the Moroccan government.

For example, the Moroccan government should realise that only showing the technology in a demonstration greenhouse will not lead to their adoption. Other actions are needed from them. Among others, they should share contextual knowledge to make adaptation of Dutch technologies possible. Also, they should create subsidies for the Dutch technologies and knowledge transfer, or create a financial incentive to use less water. In turn, they could ease foreign land acquisitions, which should be accompanied by a mutually coordinated plan of the Dutch and Moroccan industry for joint-venture-like shared organizations. This could minimize power-asymmetry, and therefore the possibility that the Dutch can exploit the Moroccan industry. However, as the Moroccan fruit and vegetable industry states not to have strong enough ties with the government, it might still be hard for them to influence the Moroccan policies. Maybe, the Moroccan knowledge institute, who seems to have stronger ties with the government, can steer the local government towards adoption of those solutions. Another solution could be that the Dutch government includes the aforementioned points in their horticulture policy agenda when discussing a high-level diplomatic exchange of resources between them and the Moroccan government.

On the Dutch governmental side, it is important to note that without year-round access to export for the Moroccan market, entire high-tech greenhouses will not be largely diffused, which

would mean that the knowledge transfer would be for only incremental changes. The Dutch government should thus vow for more lenient export rules in the European Union if it wants to ensure large-scale high-tech greenhouse diffusion.

Time management and prioritization issues pose another challenge for the project's success. It seems that the step of the Moroccan knowledge institute to include more individuals in the project facilitates the course of the project. Thus, it seems time and prioritization issues be overcome if every organization puts several people on the project, instead of only one individual.

The presence of actors in the IC that are not involved enough does not seem to harm the collaboration. However, when those are to be involved due to the need of their specific knowledge, it should be assessed beforehand whether their intention for engaging in the IC is to create collaboration on equal terms, or that their intention is too much exploitatively-driven, especially when those companies are not Moroccan-owned.

7.2 Common ground

7.2.1 Common goal

Mutual interests

The Dutch NGO feels that everyone adheres to the same goal. However, some problems might hinder its realisation. For example, in a short conversation, a Dutch government agency representative stated that it is a barrier that the Dutch industry does not always see the exact need of the Moroccan industry (Respondent #12). The Dutch knowledge institute shares this opinion. Its representative also doubts whether all Dutch companies are willing or capable to provide the Moroccan market with an intermediary product if necessary (Respondent #5). Besides, a feasible business model for the Dutch techniques, the reason to adopt them and the trajectory towards glass greenhouse adoption lack up until now (Respondent #5). One Dutch company claims to know the needs of the Moroccan growers by their experience in other countries. They derive the needs mainly by to what extent growers can steer their greenhouses' climate (Respondent #10). It is, however, questionable whether this provides the exact needs of the Moroccan growers. Another company states that having on-site visits helps in mapping the local situation (Respondent #8). Yet another company stated that "*Low-tech Morocco will not become high-tech*" (Respondent #1;5). "*However, mid-tech will be interesting*" (Respondent #1). This is consistent with the opinion of the Dutch Embassy representative, however, since a clear trajectory is said to be absent (Respondent #5), providing mid-tech solutions might be difficult, which may hamper the successful outcome of the project.

In turn, the Dutch industry seems to engage in the project in a too commercial way (Respondent #13). This is an important barrier for the success of the project. The presence of the

government in the IC may be vital to show the Moroccan tripartite its interest is in also their development instead of rather commerce (Respondent #4). Indeed, it may be problematic if the Dutch industry remains to apply the exploiting model of the past towards their Moroccan counterparts (Respondent #15). Companies that adhere to this model could be part of the Cluster, but only if not influencing the daily operation (Respondent #5). In this respect, on the Moroccan side, it can be seen that there are at least two companies from abroad (Respondent #2;5). However, they have not been interviewed and thus, their interest in the IC can only be found indirectly. The local private sector must be included (Respondent #13), because this might show that the Dutch did not initiate this plan to take over the whole Moroccan industry.

Shared beliefs

The Dutch knowledge institute thinks that it should create a *systems view* in the network to make collaboration work. If Dutch solutions are not economically feasible, they should still be presented as solutions to societal problems, if applicable (Respondent #5). However, multiple stakeholders do not observe this vision on the whole Moroccan side yet (Respondent #4;5;11), which means that the Moroccans seem to only have the collaborative capacity to tackle the problems their industry faces one by one as opposed to integrated. At the moment, if they adopt a new technology, then mostly from a short-term economic instead of a long-term ecologic perspective, whereas this long-term perspective is a big threat to a grower's company (the possible absence of water in the future). In turn, there are still growers that are not aware that the water crisis is the biggest threat to Morocco and its agriculture and thus do not actively try to solve the issue (Expert #5). Also, the current desalination plant is not sufficient to combat the water shortage, however, the Dutch knowledge institute feels that it is viewed yet as a sufficient solution on its own already (Respondent #5). This means that the shared beliefs differ and thus pose a barrier to the collaboration.

A last general remark on government programs like the IC, is that a local government often seems to think that showing how well a technology works will simply lead to adoption. In the Agadir case, this vision may pose problems as well, as the government does not seem to specifically view the current Dutch solutions as the solution to their problems.

Agreement on definitions

Not a lot concerning this factor has been found. However, one grower indicated that *sustainability* meant staying alive (business-wise) in Morocco and thus has a financial-economic perspective there, whereas the European definition of sustainability is ecological. In the previous chapters, we have seen that this causes problems in the goal-setting and mutual understanding within the Cluster.

7.3 Financing

High-tech greenhouse adoption

Due to the fact that high-tech greenhouses are 5 times as expensive as Canarian greenhouses, growers don't invest in them (Expert #5). In Morocco, if an investment does not pay off in 1 or 2 years, the entrepreneur refuses, because he does not know the prices of the coming year (Respondent #8). This is not strange, since changing one part of the system could have enormous consequences.Therefore, horticulture is a pretty secure, not to say conservative, market and decision-making takes time (Respondent #4). This may mean that changes will come too slow to make a timely impact that ensures the continuation of the project.

In turn, local financial institutions often hesitate financing glass greenhouses because they have never done such a project with a maturity of 10 to 15 years (Expert #1; Respondent #2;15). In addition, they do not view the agricultural sector as one of the secure markets considering investments. The Moroccan growers association states that, in Morocco, it is far less common than in Europe for people to be able to invest 5.000.000€ for such a project, with all the guarantees that are needed for this. The circumstances for growers to have a probability of paying off that is close to certainty are not present yet in Morocco, however, that is what financing institutes want (Respondent #6). In the Netherlands, for example, investments can be payed off in 5, 10, or, in case of a greenhouse even 20 years. Also, if your business plan is good, you will get financed, still is the leading perspective of financial institutions in The Netherlands. In Morocco, this idea is less extant, which means growers have to come with relatively more equity (Respondent #4). Moreover, the Moroccan government neither supports the purchase of high-tech greenhouses (Respondent #15). There thus exists a financial barrier for the adoption of high-tech greenhouses.

Therefore, Moroccan farmers to engage in partnerships with foreign trade companies (Respondent #4), which may have its implications for the shared belief of the IC, because some might not adhere to such a model, whereas others follow it. For example, it has been found out that at least 2 "Moroccan" companies in the IC are actually owned by foreign companies.

In general, financial institutes view the limited access of local entrepreneurs to technological developments as an issue. Furthermore, qualified accounting reports, scale, management capacity and a sound business plan are important (Expert #4). For the demonstration greenhouse, those factors have not posed problems. They will render the large-scale diffusion of glass greenhouses problematic, however.

Individual technology adoption

Considering individual technologies, farmers are said to be open-minded, but only if they see the benefit of the technology to their income. The only barrier that may play a role is a psychological

one: growers want to see that the technology works and that it is a good investment (Respondent #16). Growers have to be convinced of the return on investment, since they make most of their costs at the beginning and have to wait for up to 12 weeks before earning something, which means a long period of pre-financing (Respondent #4). If those costs go up because of new technologies, they might not be able to afford such investments. Although investments differ in costs (Respondent #10), and thus low-cost investments should always be possible depending on the sophistication, investments for water management and irrigation are still very costly. In turn, costs of labor and water are increasing (Respondent #9). Also, the production sites are often fragmented which means there are no scale advantages for the deployment of installations at the moment (Respondent #1). The Dutch should thus try to adapt their technologies to an affordable alternative to make the export of their technologies possible.

7.4 Absorptive capacity

Technology

The biggest difference in operating Dutch and Moroccan greenhouses is the extent of climate regulation that is possible (Expert #6, Respondent #10). Furthermore, some Dutch companies indicated that the climate is different when growing in Morocco (Respondent #1;2;3;8). Moroccan growers also face difficulties in applying water recycling, being the costs, technicity, and possible spread of diseases (Expert #6). Pollution of fertilisers in agriculture is seen as irreversible because there is little recirculation of used water yet. Therefore, the Moroccan government uses laws to set limits on use of certain fertilisers. Moreover, it is said to be quite difficult to buy land in Morocco (Respondent #3). Because of those reasons, the full adoption of Dutch technologies is said to need a lot of project planning with local executors, to guide them in knowledge transfer. This takes a very long time. (Respondent #6). It will therefore be challenging for the IC to achieve enough in the time that is set for the project.

Although some actors find Morocco a country in which water-intensive crops should not be cultivated (Respondent #5;15), the investments in the sector and the export have been safeguarded by the desalination plant. It is difficult to stop with the whole sector of this because of the water issue (Respondent #16).

Some Moroccan companies are already expressing their doubt on the transferability of the research setting in a glass greenhouse (Respondent #2), since Moroccans grow in plastic greenhouses that are completely different. Therefore, this specific demonstration greenhouse may not lead to technology adoption. Another plastic greenhouse, to be constructed next to the current one, might be useful to overcome this problem. However, a plastic cover might hinder the research validity of the greenhouse (Respondent #3). Within the current greenhouse setting,

the experiments' results found can be related to one specific variable, even if there are multiple experiments in the same compartment (Respondent #2;9). Measuring variables is possible in canary greenhouses but comparing not (Respondent #2) because one cannot alter the situation enough. Therefore, the only alternative to the glass demo greenhouse might be a plastic one and it can be a barrier for the project that such a greenhouse is not constructed yet.

7.5 Moroccan policy

7.5.1 Government support

It is hoped that the demonstration greenhouse project will change the regard with respect to the feasibility in Morocco of these technologies, because long-term investment guarantees are not yet provided by Moroccan financial institutes. The government and banks seem to have investment payoff times that are too short (Respondent #8). This might hinder the feasibility of technology transfer.

Water crisis

First of all, the research has provided a lot of insight into Moroccan policy that is beneficial for the country' water shortage.

To start, the Moroccan government is said to be very willing to improve the situation, which also appears from the Green Morocco and Generation Green plans (Respondent #13). Multiple actors (Respondent #15; Expert #5;6) state that the Moroccan government has already taken lots of measures to combat the water shortage, such as implementing drip irrigation almost throughout the entire country (Expert #5; Respondent #15).

Furthermore, it has revised all water production and storage systems in terms of efficiency by eliminating losses, expanding reserve volumes (building dams). Also, the construction of the desalination plant is regarded by the Moroccan government actors as a solution to the problem (Respondent #16;17)). The government has also identified specific areas that can be irrigated with ground water. Areas other than those must renounce from the usage of groundwater and turn to the desalinated water instead.

However, desalination of seawater is not sustainable, which mainly the Dutch see as a problem (such as Respondent #5;11). Indeed, full commitment to desalination plants would mean the deployment of multiple desalination plants to combat the region's water deficit. The currently constructed plant will only be fully operational in 2026 (Respondent #17). Moreover, the division of the country into different "*watersheds*" has helped the population and cattle water provision. Every Moroccan region has their own Water Agency, with its own plan (Elomari, 2023).

It has stopped the unrestrained drilling of boreholes and soon, there will be water counters and rainwater management as well. Nowadays, the government tries to link all hydro basins to each other. According to the local government agencies, there is a repressive law that makes growers exceeding a quota pay 3 times the price per exceeded cubic metre, and further pursuance will lead to shutdown.

In turn, the government can prohibit the harvest of water-intensive crops, which happened to the watermelon in depleted areas. Also, they can demand information on their use to consumers. Furthermore, they can simply restrict the water use (Expert #5). One local government agency has indicated that to save water at parcel level, the installation of sensors has been implemented to provide farmers representing 30,000 hectares with daily SMS notifications about the required water allocation for their operations. This has resulted in saving 2,000 m^3 per hectare, being in total 60,000,000 cubic m^3, which is comparable to a small dam. The issue of water pollution has been tackled with the distribution and development of a guide of good practices to farmers on the use of pesticides, while also being cautious about nitrates as they pose irreversible dangers, and some regulation on the matter (Respondent #17). In contrast, there appears to be no regulation for pesticide emission reduction (Respondent #5), which may hinder the adoption of biological pest control products.

However, it seems that Dutch actors view the current measures as insufficient (Respondent #5;11). Indeed, if the government does not raise the price of water, limiting its usage seems not to happen. This is a huge barrier for technology transfer.

Technology transfer

Moreover, subsidies of the government are of vital importance for technology transfer, according to growers (Expert #5;6 ; Respondent #16). Every year, a booklet with all subsidies in horticulture, up to 100%, is provided. The Moroccan government does not extensively provide subsidies for Dutch technologies yet, however. This thus is a barrier for Moroccans to adopt Dutch technologies.

In turn, the Moroccan state does not spend enough money on research in the fruit and vegetable domain of the agricultural sector, not applied nor fundamental (Respondent #15;23). For technology transfer, it may be needed to have more programs with universities and the government, and most importantly, to finance them. The money invested in the agricultural sector goes to other parts of the sector. The local growers association's relationship with the government is said to be not good enough to change this. To change the stance of the government, the research facility of the growers association has to show results, because these results could give the growers association ground to convince the government to invest in large-scale diffusion of their technologies. To solve market problems, the Moroccan government focuses on modernising the production chain, improving the traceability of production, modernising the prices,

and aggregation (Respondent #16).

Agricultural economy

With the Green Morocco Plan, the Moroccan government has focused on 2 pillars. The first one is solidary agriculture combating poverty and helps stakeholders down- as well as upstream to be able to produce. The second pillar was to modernize agriculture. This had to be done with private investments and government subsidies. One of the ways to involve smallholder farmers in the programme has been aggregation. A so-called aggregator is in close contact with the smallholder farmers and collects their produce. The aggregator is responsible for the processing of the produce (transport, packaging, etc). However, "only" 40% of the smallholder farmers is estimated to be connected to an aggregator up until now. Aggregators can also advice smallholder farmers on their water usage. (Respondent #14 pres). The aggregators help private investors and small farmers. Private investors are helped in finding markets and packaging, and mobilizing inputs such as fertilizer. Then, the state subsidizes the use of new techniques and materials, such as fridges. The idea is that the aggregator is in close contact with the smallholder and can form some kind of middle man between them and the government/investor (Elomari, 2023).

In general, the Moroccan government is said to do something to create the circumstances for Dutch technology adoption, but not enough. This is a serious barrier for such technologies.

7.5.2 Institutional context

Democratic policy-making

In the Netherlands, scientists are closely linked to and heared by politicians. In Morocco, there is some kind of "inertia" from the Moroccan government (Expert #9), which does not have a systems view and only shows the positive outcomes of its policies. In turn, many Moroccan knowledge institutes can only propose advice and not give binding advice (Expert #9). In turn, during the decision-making process, farmers' cooperatives and the growers association are involved, but the real farmer seems to be forgotten (Respondent #21). Those examples show that real Triple Helix collaboration is only marginally present in Morocco, especially considering the Impact Cluster collaboration.

7.6 Dutch policy

Regulation

The European market for Moroccan tomatoes is not open for Moroccan growers, which makes an investment in a glass greenhouse unfeasible (Respondent #2;9;15). The Moroccan export

quota imposed by the EU is said to be not problematic at the moment, but will be so for the transmission of full-fledged glass greenhouses towards Morocco (Respondent #3;9;11;15; Expert #5). The quota only concerns the genuine round tomato, whereas many growers produce cherry tomatoes and other specialties (Respondent #9; Expert #6). At an assured price, which is already provided for Europe's internal market, Moroccan growers will be guaranteed to pay back their investment in 15 to 20 years. However, the lack of such policies seems to hamper the full engagement of Moroccan actors in this collaboration.

In general, according to the Moroccan growers association, the cooperation system between Morocco and The EU is said to be not very well (Respondent #15), which is being aggravated by some political influence nowadays as well:

"*The international cooperation in the twenty-first century, today, it needs to move away from the old colonial framework that we had, 'I am here, and I want to either benefit from or bother you?' No, that's over. People have evolved, and the system has evolved. It is essential to understand that on the other side of the Mediterranean, there are also knowledgeable individuals.*" (Respondent #15)

Also for chemicals, Moroccan growers entirely depend on other countries, being the formulating countries which they import those chemicals from, and they have to follow the same regulatory requirements as every country (Expert #5). European policies could facilitate produce quality demands which drive Moroccans into Dutch technologies. On the other hand, they could also lower the export quota (Respondent #8). The current policy environment of the EU can thus be regarded as a barrier to the adoption of Dutch technologies.

7.7 Culture

During the research, some cultural aspects concerning either the Dutch or Moroccans have emerged that could be of interest for IC success.

Interaction with hierarchy

In The Netherlands, there is a culture in which learning from mistakes is encouraged into problem-solving (Expert #1; Respondent #3). A lot of other cultures are very directive and guideline driven, which works well most often, but in some cultures it is hard to talk about mistakes and improve together (Expert #1): "One of my projects, one of the first questions asked to me is 'and what will be my punishment, boss'?" It might take longer than the scope of the project to alter the way of learning of a country, and thus the knowledge transfer in the project will be adapted to the Moroccans and be more instructive (Respondent #3). It also seems that the Moroccan actor types are not sufficiently focused on collaboration out of their honour-based nature (Respondent #1). This forms a barrier to the knowledge sharing within the IC.

Time management

According to the Dutch NGO, effective communication, continuous monitoring, and maintaining a clear focus on the necessary steps are crucial for achieving shared goals, as individuals need to recognize their role in preventing delays and taking timely responsibility for timely deliverables. Indeed, in some cultures, there is no work ethic nor dedication to working (Expert #3). This marks a difference with the disciplined and well-structured Dutch approach opposing the African way of working, which is said to be more opportune (Respondent #6).

During the conception phase, the effect of delegating decision-making, monitoring and execution could not become clear, but this will become clear during the execution phase (Respondent #6). The pace at which the network fulfilled all requirements for the consortium agreement and corresponding subsidy is, up until now, the first governance issue that some participants perceive (Respondent #6;9).

The second one is that the expansion of the teams within an organization that work on the matter is done at differing pace, such as happened with the Moroccan knowledge institute. The conscious or unconscious choices made during this process can significantly impact the efficiency and pace of work, highlighting the influence of organizational culture on individual workload and performance. Time constraints (Respondent #1) and an insufficient amount of people invested in the matter (Respondent #5) seem to be an important limiting factor for actors in the IC to keep pace. Also, some actors (Respondent #6;13) attribute the discrepancy in meeting the formal requirements within the consortium to a lack of prioritization and discipline, which may have affected the overall pace of progress in fulfilling those obligations:

"*With some individuals, you notice that as soon as you send an email, by the end of the afternoon, they have delivered 120% of what was requested. However, with others, you have to follow up three, four, or even five times before eventually receiving 80% of the requested outcome.*"

A possible lack of prioritization among all actors involved is thus a main barrier to the success of the project.

Trust-receptiveness

There already is one example of a quite troubled cooperation within the Cluster. The Moroccan subcontractor of the greenhouse constructor took credit for the work of the greenhouse constructor (Respondent #11). The Dutch company finds they lack a collaboration-oriented mindset, which was demonstrated when they were paid too late and stopped working, whereas Dutch companies would never do that cold turkey (Respondent #11). This kind of problems will hinder the sound course of the IC-project.

Power-asymmetry

Furthermore, one expert states that the Dutch could be humbler sometimes in their approach

during a knowledge transfer project (Expert #2): the Dutch tend to tell what other should do in a quite intrusive way, whereas having a tight relationship with counterparts is deemed extremely important in approaching Moroccan counterparts (Respondent #8;13). Moroccans said to be open and generous in communication, which is a difference with this Dutch straightforwardness. This definitively is a gap to close, because intentions have to be clear bidirectionally (Respondent #15). Also, The Netherlands is far more flat considering hierarchy than Morocco (Respondent #1;3). The opinion that collaboration should nowadays be more on equal terms thus also indicates that power-asymmetry could be very disturbing in the process.

7.8 Coordination

7.8.1 Communication

Engagement

Considering the communication within the network, some remarks can be made. First of all, many cluster partners do not have contact in the IC with the applied university. At least one stakeholder thinks that that should be created (Respondent #9). Moreover, some ambiguity exists about the actually involved actors in the IC (Respondent #2). This actor also indicated that there was no contact between them and some other actors, whereas they would like so. Furthermore, this stakeholder was slightly surprised that a non-Moroccan company which ended operations in Morocco was on the Moroccan industry side of the IC. Also, according to another stakeholder, one of the local government agencies is nowadays part of the other government agency in the network, (Respondent #2). This has not become clear during the conducted research visit. Finally, Moroccan universities do not cooperate extensively (Respondent #5;21;22; own observation). Those examples indicate that partially, the actors in the IC are not up to date considering the actual involvement of certain Cluster-partners, and that some partners that should be included, are not yet involved. It may pose problems if those actors are not involved soon, for example in finding out the needs of the Moroccan actors and how to meet them with the Dutch technologies.

Tools/objects

Moroccan technology companies are said to be lacking in the Cluster, but neither do they really exist (Respondent #2). In turn, it is strange that a seed company is involved, but one actor wanted to involve them, which meant no IC contact was there yet (Respondent #2). This actor also indicated that potentially, the governance could slow down reproduction of experiments in a more low-tech situation, because the governance agreement is deployed around the high-tech greenhouse and might not be flexible enough to do this (Respondent #2). The inflexibility of the governance agreement might hinder the implementation of a suitable program for technology

and knowledge transfer.

7.9 Enablers

Despite the fact that the knowledge transfer project might only partially lead to adoption of Dutch technologies, the organization of the IC-network provides several enabling conditions for carrying out such projects. If goals are realigned and corresponding measures are taken by the cluster, those characteristics are valuable for the further success of the project.

First of all, it helps that the IC Agadir is a non-competitive cluster (Respondent #2;9), as it does not contain competitors on both sides. This implies that the three parts of both Triple Helices may very well complement each other in the collaboration. In turn, the current extent of knowledge sharing in the IC is positively influencing the collaboration (Respondent #5).

Secondly, the project has sufficient financial means to achieve some results, since the project is backed-up by the subsidy, the in-kind contribution of the Moroccan government and the commitment of the Dutch industry partners to allocate extra financial resources if needed (Respondent #6). Without this combination of financial means, the project could not have taken off.

Thirdly, the knowledge base of the Moroccan industry is getting more and more ready for knowledge transfer. Morocco is said to increasingly have the human capital (Respondent #14;15;21;22), understanding of new technologies (Wifaya, 2023) and results thereof (Respondent #23) to adopt the Dutch technologies, if only they will be trained daily and step by step (Respondent #1;3;7;8;14). It is promising that the project will indeed lead to knowledge transfer, as the IC-subsidy focuses on deploying such a knowledge program.

Last of all, the sound coordination of the project is an enabler for the project as well, due to several characteristics. For example, working groups have been created for implementing specific parts of the knowledge transfer program, which ensures that every actor operates in their field of expertise. In turn, the use of social pressure over sanctions is regarded as appropriate in this case (Respondent #3;6;9;13). The project is also managed in a sound way by the independent NGO, which outlines, monitors and reports activities and leads to process of joint-goal setting (Respondent #1;3;4;5;9;13). Finally, relation-building in the network is suitably divided, because the NGO takes up the governmental relations, and the academic and industry leads of the project serve their hinterland of academia and industry respectively.

8 Conclusion

8.1 Summary of the research objectives and methods

This thesis aimed to find ways to overcome barriers for a collaboration in which the actors of an international Triple Helix in two countries are all present. To answer this question, research that was largely confirmatory and partially exploratory in nature was conducted on the relations between actors and the goals and perceived barriers of actors within such a collaboration, being the Impact Cluster Agadir. Based on a literature review in the fields of *policy, knowledge and technology transfer*, those actors have been interviewed and their statements corroborated with policy documents and scientific literature whenever possible.

8.2 Answer to the sub-research questions

8.2.1 What are the interdependencies between actor types in the IC Agadir?

Considering the relational structure of the network, it seems that within the IC, there is a division between partners that are mostly operational in nature and have less to do with governance activities, and those that also fulfill a governance role. With respect to this, a small group with representatives of nearly all actor types needed in an international Triple Helix is steering the agenda and redirecting the program towards the operational actors. This system seems to work well, because these governing actors fulfill the role of 'connector' towards a hinterland of actors that are of the same actor type. A major remark is that the Moroccan knowledge institute is found to be the connector to the Moroccan industry, a role that is partially also taken by the Moroccan growers association. However, apparently, those two actors do not manage to involve the industry sufficiently. In turn, the institute did not have established a network of fellow knowledge institutes. This role was found to be taken up by the Dutch knowledge institute. It is, however, not sure how open the Moroccan institute is to other Moroccan knowledge institutes entering the collaboration.

Moreover, it can be concluded that the network under research can not completely be considered an international Triple Helix, for two reasons. Primarily, the Moroccan industry is not yet sufficiently enough involved in the project to speak of an international Triple Helix. Furthermore, the contact of the included Moroccan actors with the Moroccan government is not specifically on the demonstration greenhouse project. Therefore, the facilitating role of the Moroccan government is not taken up to the extent that it is required in a Triple Helix.

In turn, the interdependencies within the stakeholder field depend on the scope of the network. For merely succeeding the knowledge transfer towards the Moroccan growers, the network partners largely depend on the extent of interaction of the Moroccan industry in the

demonstration greenhouse. The Moroccan industry can hopefully be activated both by the Moroccan knowledge institute and the Moroccan growers association. The Dutch knowledge institute and NGO are needed in pushing those two towards prioritizing the project.

Moreover, the adoption of new technologies requires the engagement of the Moroccan government, as it is in charge of matching its policies regarding industrial water usage to the proposition of the Dutch industry. In turn, the Dutch industry depends on the Moroccan industry that has to be open-minded and constructive towards Dutch solutions and has to be involved in adapting or applying them to the Moroccan situation.

To make water demand decrease to its full potential, too little interdependency between the concerned actor types currently exists, as there exists a paradigm difference between the Moroccans and the Dutch. The Moroccans view increasing the water supply as an option beside reducing its demand, whereas the Dutch merely push their solutions for reducing water input. As the Moroccan government does not feel itself completely dependent on the Dutch for solving their problem, the Dutch cannot influence the Moroccan government sufficiently.

8.2.2 What is the common goal of the IC Agadir?

It can be concluded that a common goal within the network does not completely exists, since it is not clear whether the Moroccan industry perceives the need to participate in the demonstration greenhouse project. In turn, the mission statement of the IC is to make the Moroccan horticulture industry more sustainable. All actors, even the Moroccan government, which is not part of the Collaboration Agreement, seem to adhere to this mission. However, the problem is in how to achieve this sustainability, and this closely depends on how the concept is defined by the involved actors.

The Moroccan government clearly wants to focus on both reducing demand *and* increasing supply of water for horticulture purposes. This means their goal is to make the Moroccan horticulture industry resilient, however, not per se more ecologically sustainable. Moreover, all Moroccan actors think that any intervention in the industry's structure should not come at the expense of the local growers. Thus, the economic sustainability of the Moroccan industry is priority for them over its ecological sustainability.

The Dutch want to transfer Dutch knowledge and technology in the demonstration greenhouse to make the Moroccan horticulture industry more sustainable. They do seem to understand that the need of the Moroccan industry is largely financially driven. However, they do not seem to adapt their propositions accordingly. This means that the first part of their goal, transferring knowledge, might succeed, whereas this might not lead to the improvement of both economic and ecological sustainability of the local industry, as their solutions are not transferred. Thus, the policy instrument of the IC, being the ***Impact Cluster subsidy***, might not lead to the

operational goal of the ***Impact Cluster network***.

8.2.3 What are perceived barriers towards the common goal of the IC Agadir network?

At the governance level, there are two main bariers to success for the IC Agadir. The first one is lacking goal alignment among the concerned actors. The IC has to decide whether they want to focus on creating an economically or ecologically sustainable local industry, or to combine the two aspects. Both Dutch and Moroccan policies must be adapted to enable the latter, and Moroccan implementation is also going too slow to succeed up until now. Also, the Moroccan industry and government are not involved sufficiently in the network, whereas they are of key importance in shaping adaptive solutions (industry) and the necessary policy measures (government) to foster adaptation.

Operationally, three interdependent main barriers play a role in hindering the goal of the IC. To start, the local growers' equity needed for investments is increasingly under pressure. In turn, the demonstration greenhouse might not convince growers of the functionality of Dutch technologies due to differing growing circumstances and the mentioned equity problems. Finally, there is a lack of sound business structures for integrating foreign with local companies to operate on equal terms. Nowadays, the lacking equity to invest and difficulty in convincing independent local growers drive both the Moroccan and Dutch industry towards unequal collaboration schemes, undermining the potential for reliable cooperation.

8.3 Answer to the main research question

The answers to the sub-questions provide a sound basis to answer the main-research question of this research:

How can the Impact Cluster Agadir-network overcome the network-structural barriers towards its common goal?

To increase goal alignment in the IC Agadir, it seems inevitable for the Dutch and Moroccan actors in the IC to start co-creating solutions adapted to the Moroccan context and thus involve the Moroccan industry more in the project. The Moroccan knowledge institute and growers association are key in establishing contact between the Dutch partners and the Moroccan industry. This will hopefully lead to less expensive solutions. Furthermore, the Moroccan government should change its policies regarding subsidies and the cost of water to further steer Moroccan growers towards Dutch solutions. It is not likely that the actors in the IC Agadir can influence state-level implemented Moroccan policies at the moment. Therefore, they should discuss with the Dutch state whether a change of the Moroccan horticulture policies can be integrated in the diplomatic

agenda between the two countries. The aforementioned political and financial measures can also remove the operational barriers to the IC-success.

The demonstration greenhouse can play an important role in enthusing local growers for Dutch technologies and will improve their ability to implement those. It might be very well possible, due to its sound governance, that the knowledge transfer project will become a success. However, without the aforementioned measures, the results of the IC Agadir will mostly be limited to knowledge transfer, and not lead to the actual adoption of the Dutch horticulture technologies. The network should become an actual international Triple Helix with a structure as proposed in Figure 7 below.

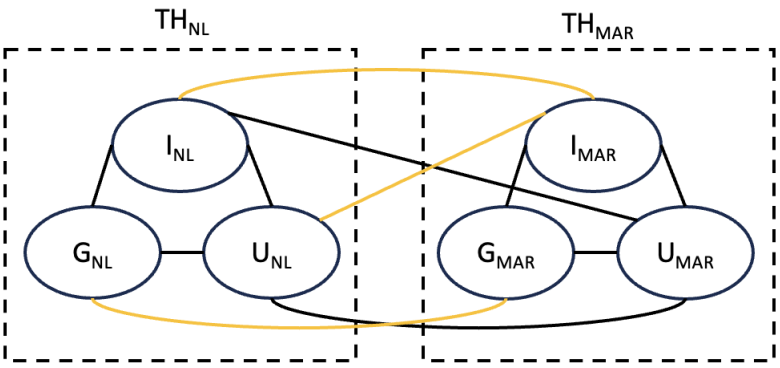

Figure 7: Proposed model for optimal functioning of the IC Agadir

The orange lines indicate the connections that are not yet sufficiently present in the network, but should be established for proper functioning of the network. Furthermore, the dotted lines between the Moroccan government and industry and knowledge institutes are gone, as more communication about horticulture and Dutch technologies and knowledge would be needed for sound collaboration between these actor types. It is noteworthy that more Moroccan academic actors should be involved in order to enable long term collaboration. Finally, it can be observed that the NGO has been left out. This is because in the long term, enough interdependency should exist for such collaborations to function without the intervention of a boundary spanner.

8.4 Policy recommendations

In order to improve the potential for success of the IC-Agadir network, several steps should be taken simultaneously:

- The Moroccan government should increase the industrial cost of all water sources as soon as possible, so that Dutch technologies become relatively more attractive to adopt. To get this done, the Dutch Triple Helix within the IC should contact the Dutch Foreign Affairs

Ministry and encourage them to include an adapted Moroccan horticulture regulation in the diplomatic agenda between the countries. A possibly fair measure in return could be the year-round possibility for Morocco to export tomatoes to the EU.

- Simultaneously, the local government should put subsidies for Dutch technologies in place, or force banks to accept greenhouse investments that involve lower equity reserves for growers.
- The governing partners of the IC must adapt the scope of the demonstration greenhouse project if concerns about the transferability of its findings emerge. For example, a smaller plastic greenhouse or reproduction of tests at local growers' facilities can be part of the additional solutions.
- The governing partners should also establish working groups that not only work on elaboration of the knowledge transfer, but also on adapting technologies to the Moroccan needs. Those working groups should be formed based on the different technologies that are to be tested in the demonstration greenhouse, and the needs of the Moroccan companies. In this, the Moroccan knowledge institute and the Moroccan growers association should coordinate the Dutch industry towards the right Moroccan counterpart.
- The Moroccan knowledge institute should as soon as possible engage in collaboration with other Moroccan knowledge institutes to create more comprehensive solutions and use those as input for the working groups that are to be founded.
- In order to extend, adapt, and constantly adjust the project, the initiating actors of the network should have a sufficient number of colleagues on the project within their organizations, so that a sufficient amount of time can be spent on the project.
- The Dutch government should adapt its Impact Cluster subsidy or create another subsidy that facilitates the joint creation of technologies adapted to a receiving country's context. This can already be used in the IC-Agadir setting to foster the joint creation of horticulture technologies adapted to Morocco within the established work-groups.

9 Discussion

This chapter discusses the suitability of the thesis for the EPA-Master, its content and methodological limitations, and reflexts on its societal and academic contribution. Finally, it discusses its potential for further research.

9.1 EPA program suitability

This thesis was written for the MSc program Engineering and Policy Analysis (EPA) at Delft University of Technology, Faculty of Technology Policy and Management. For several reasons, this thesis can be regarded as suitable for this MSc. First of all, the work inherently is analytical in character, as it involves the whole process of examining and evaluating a subject or problem by breaking it down into its constituent parts, analyzing the relationships between those parts, and drawing conclusions or insights based on the analysis. In turn, it uses both a systems perspective and a multi-actor perspective. Because both the perspective of the IC-Agadir network as a whole and its different actors was used during this research. Furthermore, literature/document analysis, observation, interviews and network diagrams are all regarded as EPA methods and techniques for problem analysis. Moreover, this thesis aims to contribute to several Grand Challenges. Finally, it aims to inform the decision-makers of the IC-Agadir and coming Impact Clusters, which are always networks with public and private actors.

9.2 Content limitations

9.2.1 Unclear research outcomes

During the research, the respondents were asked to indicate with which other actors they had contact especially for the IC Agadir. Many actors differentiated in their own way between the degree in which they had contact with others. However, it was beyond the scope of this research to measure this extent and apply a kind of scale to rank the different degrees of contact. Therefore, based on the findings in this research, it is largely impossible to conclude on the exact tie strengths, which was further complicated by the fact that not all actors could be assessed for cross-examination on the indicated connections.

However, the interdependencies of actors and the evaluation of the accessibility to certain actors' resources for others has been sufficiently insightful to draw conclusions and thus, the absence of a clear measure for tie-strength does not have far-reaching consequences for this research.

In turn, this research could only establish the gap between goal failure and success qualitatively. For more specifically determining the gap between failure and success of the broader purpose of both the subsidy (knowledge and technology transfer) and the network (sustainable horticulture promotion in Morocco), having and mapping measurable KPIs for each actor is essential. Those KPIs are often not clear yet, nor has there been asked through enough in some interviews to determine them. For example, considering both the Impact Cluster-subsidy and network, a specific KPI has been set to transfer 1000 local low-tech growers into mid-tech category-growers and 500 local mid-tech growers into high-tech category-growers or at least let them adopt such technologies. However, it is still unclear what exactly determines the tech-level status of a local Moroccan grower, nor has it been identified how many of each type there are. The qualitative nature of this study is not hindering the implications of its results. Contrarily, the fact that quantitative measurement indicators are lacking enhances the idea that goal alignment within the IC is difficult to achieve.

9.2.2 Limited research scope

The research sketches an image from the project process up until just before the very beginning of the knowledge transfer. Since the demonstration greenhouse does not operate yet, this research could only uncover intentions and expectations of effectiveness of the subsidy and network, and no actual goal achievement itself. Nevertheless, the consequences of the barriers identified during the research will carry over in the operational phase of the project. Therefore, the implications of the limited scope of the research are non-impeding for the validity of its outcomes

Some actors have indicated the wish of or actual entrance of new actors during the research phase. This research focused on the network as formed by the actors that were known at the beginning of this research. Therefore, the perspective of the actors that entered or the implications of their entrance on the research subjects has not been included in this study, whereas the importance of involving new actors is found to be very high in this research. Mainly, new Moroccan knowledge institutes, and more active Moroccan industry partners are to be included, and their intentions to be clarified in order to increase the chances of success of the project.

The network demarcation and subsequent questions on the goals for this specific network steers answers towards a certain bias that goals of actors lie predominantly in the realm of the IC Agadir. Therefore, it is not sure whether the actors' indicated goals are fully examined and, if they have multiple, their prioritization between them might not be entirely right or clear. The main example for this is that the Research consortium, consisting of Moroccan and Dutch industry and academic actors, whose actors mostly are also in the Impact Cluster, has not been included as a topic of study in this research. However, the existence of this network-in-a-network

could have implications for goal alignment and priority setting in the IC Agadir. In essence, the examination of actor goals within the IC Agadir has allowed for sufficient mapping of prioritization of the project among actors. However, for influencing this prioritization if lacking, an assessment of other dependencies that play a role for actors in the IC would be of added value.

9.3 Methodological limitations

9.3.1 Lacking Moroccan perspective

Especially the Moroccan industry has been hard to reach during the project. Therefore, the goals and barriers perceived by the industry mainly had to be inferred out of second hand by questioning the other actor types. Since such an important part of the network, being the targeted implementers of the new technologies and knowledge transfer objects, were not consulted, this research can not conclude to its full potential on the research questions. However, the fact that it has been too difficult to arrange interviews with the Moroccan industry, implies that they are not very engaged in the project yet, whereas it has been concluded that they should be.

In turn, during the interviews, there have been a few moments on which representatives indicated that a specific part of the interview should better not be used in order to not harm the collaboration process. In my opinion, the insights from this data would be useful for increasing reliability of the study. However, the lack of consent indicates that some actors do not like to elaborate too much on some aspects of the project, which is in turn a valuable insight.

Furthermore, although for most data, cross-examination has been possible, some data could not be cross-examined. Due to time constraints and the nature of semi-structured interviews, which means certain interviews can deviate partially into different subject paths than others, not all new insights from every interview could be cross-examined. For example, the last interview provided the insight that the constructed demonstration greenhouse might not be suitable in convincing local growers of the functionality of the Dutch technologies due to its – in the Moroccan context – unprecedented design. The perception that data saturation has not fully been achieved decreases the generalizability and validity of the study due to potential biased results.

9.3.2 Flaws in search strategy

The search strategy that was used to draw up the research framework can be called somewhat unstructured due to the omission of one important step, which has been the structured identification of synonyms for search terms and their additional application alongside the finally used search terms. This would most probably have resulted in more literature reviews on the different types of transfer than the very specific terms described in chapter 2.1. As literature reviews can be seen as the most complete integration of other literature, their increased usage would have

made the research framework more robust, make it a more sound base for this research and thus increase the internal validity of this study. However, I suppose that I have identified the large majority of factors of influence.

Moreover, this lack of robustness can have led to the existing overlap in the established research framework. Although most factors that could be read ambiguously in the researched framework, some of the factors that have been established in the constructed research framework are still somehow partially overlapping in content. Absorptive capacity, for example, is a factor that contains not only the cultural aspect of the box it is placed in the framework, such as financial means, human capital, and organizational structure. This has sometimes led to ambiguity during the coding process and codes falling under multiple barriers/enablers in the results. Then, arbitrarily, a choice has been made to include, exclude or re-frame a certain result so that it fit into a certain category or not. This inherently influences the reliability and/or internal validity of the research.

9.4 Reflection on societal contribution

As can be derived from the introduction and case description, the demonstration greenhouse for Souss-Massa is perceived as a means to save water in Moroccan horticulture in a time of unprecedented climate change that intensifies the local water shortage. This increases water security both for the consumption by local inhabitants and by the local horticulture industry, which is an important employer in the region. In providing advice for the proper functioning of the organization around the demonstration greenhouse, knowledge transfer program deployment and adjacent topics, this thesis thus contributes to the achievement of SDGs 8 (Decent work and economic growth), 12 (Responsible consumption and production) and 13 (Climate action), mainly through improving a Partnership for the goals (SDG 17). Although this thesis does not have a direct operational and concrete influence (as it is a paper), the research has indicated that there are many barriers towards an economic and sustainable Moroccan horticulture. Those barriers are partially solvable through the demonstration greenhouse project, but other measures should should be taken as well to achieve that. Finally, even within the demonstration greenhouse project, there are barriers that hamper the project's contribution towards a sustainable Moroccan horticulture in its full potential.

9.5 Reflection on academic contribution

Some remarks on the generalizability of this study can be made. To start, in the IC Agadir, it is very distinct that the local knowledge institute and industry have a very close relationship. This might not always be the case. However, other academic literature supports the idea that such a

strong connection is beneficial for collaboration (Rybnicek et al., 2020; Tseng et al., 2020).

In turn, it is not uncommon that insufficient communication with the local industry is a main barrier for proper function of network collaborations. In many branches of academic literature, such as that of co-creation (Fan et al., 2020; Ansell & Torfing, 2021), collaborative governance (Lahat & Sher-Hadar, 2021), design theory (Wechsler & Schweitzer, 2019) and organizational theory (Pardo-Jaramillo et al., 2020), scholars stress that focusing on the customer's needs is vital for successful transfer of products (and knowledge if that product is knowledge). Carayannis & Campbell (2009) even proposed a new version of the Triple Helix to include the customer in the framework. This raises the question whether the used framework based on Triple Helix collaboration was suitable for conducting this study. However, as the industry can be seen as the customer within the network, and they inherently were included in the research for being part of the Triple Helix, this theory is assumed to have been sufficiently sound for examination of its functioning. This research adheres to the stance that models for successful collaboration must include the customer as a prerequisite to be sound.

Moreover, the findings in this thesis add to the existing literature on the role of the transferring government. As Jull and Sørensen (2014), suggested, there should be a link between the transferring and adopting country's government. This thesis found that that role should not only be in facilitating transfer through subsidies and regulation, as is the case in single-Triple Helix collaborations, but also by advocating for policy change at the adopting government in the collaboration. As indicated, the role of the Moroccan knowledge institute as connected to both the Dutch knowledge institute and industry is considered to be particular to this specific case. Therefore, the general model of Jull & Sørensen (2014) is for now deemed to be sufficient to describe the connections to be establish in this kind of collaborations.

Finally, this thesis used policy, knowledge and technology transfer literature to establish a framework that was used to cover the dynamics potentially in force between international Triple Helix actors. In the end, the project under research was not about the transfer or adoption of a certain policy, but merely that of technology and knowledge. The contribution of this literature branch thus remained limited to the identification of certain characteristics that also play a role in technology and knowledge transfer, such as the existence of appropriate legislation and technology/knowledge transfer policies (Guerrero & Urbano 2019). Probably, a framework for assessment of international Triple Helix collaborations can do without the inclusion of policy transfer literature, if only the importance of the facilitating and advocating role of government is included in it.

9.6 Future research

Apart from overcoming the methodological limitations faced by this research, the study provides interesting starting points for subsequent research. Mainly, the results of this thesis indicate that interaction with other actors currently outside of the network is needed for it to become a success. Therefore, future research might focus on the effect of new entrants on successful collaboration within network collaborations. This is a topic that is extensively treated in academic literature and could be applied to the specific context of international Triple Helix collaborations. For example, Bashir et al. (2022) discuss the role of managing actors in mobilizing new entrants by presenting the mutual benefits and common goal of the collaboration. In turn, it would be interesting to see what new entrants would mean for the wilingness to share information in those networks, such as Svare et al. (2020) have researched in national innovation networks already. Enriching this perspective by including the international dynamics of an international Triple Helix would certainly be welcome.

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