Scoping mission Water & Agrofood South Africa

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1. Introduction

The Netherlands Enterprise Agency (RVO.nl), Partners for Water program, assigned a team of two experts to prepare and execute a scoping mission to identify concrete opportunities for Dutch businesses in the cross-over water & agrofood in South Africa.

The team has been operating under the supervision of RVO.nl, in close cooperation with the Netherlands Water Partnership (NWP) and the Embassy of the Kingdom of the Netherlands in Pretoria (EKN). The mission took place from March 6 till March 10 2017. Ms. Isobel van der Stoep, irrigation expert (Isowat Consulting, South Africa) and Mr. Peter Prins, expert Water & Agriculture (Land Water Food Consult, Netherlands) formed a team. They got the dedicated support of Mr. Ruben van Dijk (intern at the Embassy of the Netherlands in South Africa). During the mission, 6 provinces of South Africa were visited (Gauteng, Limpopo, Mpumalanga, North-West, Northern Cape and Western Cape) and 15 meetings were arranged. Annex 1 includes the schedule of the mission.

An important entry point for the team was the vision of the Netherlands on Water & Agrofood. The Netherlands, through the Partners for Water program, promotes smart water management in agricultural production, including aspects of soil, irrigation, fertilization and crop management to achieve an effective use of available water resources in a catchment area (www.dutchwatersector.com). Netherlands Water Partnership provided input for the mission by mapping the interests of the Dutch Water & Agrofood network: 28 companies and organisations responded to an online questionnaire. Specific interests are used for the overview of potential leads and matching partners (chapter 5).

2. Objectives

The objectives of the survey were:

- To identify the need for innovative water management practices in the South African water & agrofood sector;
- To investigate the possible connection between the need of South African businesses in the crossover of the water & agrofood sector with Dutch expertise;
- To formulate promising product-market combinations (PMCs) in the crossover of the water & agrofood sector;
- To formulate at least five (5) leads for potential business development in the water and agrofood sector.
- Translate at least two (2) of these leads into proposals for follow-up activities, including recommended market entry strategies and opportunities for Dutch and / or international funding.
- To report back transparently if these leads, connections between the South African agrofood sector and Dutch water sector are not or limitedly feasible.

3. Context

3.1 Institutional framework Water & Agrofood

South Africa is divided in 9 water management areas (WMAs), which are to be managed by Catchment Management Agencies (CMAs), statutory bodies, based on the National Water Act (No. 36 of 1998). Initially 19 water management areas were identified but these were reduced to 9 in order to reduce the administrative load on the water users. Currently a transition towards the 9 CMAs is ongoing, with 2 CMAs having been established.
As such the CMAs form the institutional framework for local water management, as carried out by the Water Users Associations (WUAs, which are mostly former government water schemes) as well as by irrigation boards (IBs), which are private organisations that were established under the previous water Act of 1956. In total there are more than 300 irrigation boards in South Africa.

The Netherlands supports the establishment of the distinct CMAs by the active role of the Dutch Water Authorities through the Kingfisher program. Currently the CMAs of the Inkomati-Usuthu and Breede-Gouritz WMAs are frontrunners in developing their governmental bodies. WUAs and IBs are responsible for general operation and maintenance of the canals, from the dams (reservoirs) to the users. Extensive concrete canal systems of sometimes more than 100 km length distribute water to the field of the farmers.

Water users are registered by the Department of Water and Sanitation (DWS), but are managed at a regional level by the CMA, if established. If no CMA has been established yet, there are regional DWS offices that perform the CMAs' functions. Every farmer has a lawful quota of water that can be used per year. The WUAs and IBs manage water at a local level, ensuring supply of water to each farmer, depending on the availability of water. In case of deficits (low level of water in dam) a reduction could be applied. Due to the drought in the last year, in several regions quota per farmer were reduced by 70 or 80 %. While the drought has been alleviated in the summer rainfall in some regions of the country, in the Cape region the drought is still a severe problem, with surface water in the dams reaching their lowest levels in years (as low as to 15 %).

WUAs and IBs are normally funded through charges levied on it members. Users pay a volumetric levy. The levy varies from R 0,20 to R 0,30 per m3. A part of this fee the WUA pays over to DWS as regional water management levies. In return DWS takes care for necessary resource management measures.
Efforts by DWS are ongoing to see that the relationship between DWS and the lower authorities process smoothly in order to have successfully functioning distribution systems.

Farmers sometimes construct their own on-farm storage for water, to have a certain buffer to irrigate their crops. The Department of Environmental Affairs (DEA) provides permission to store larger amounts of water on agricultural land, while dam safety permission may also be required from DWS in the case of dams storing more than 50 000m^3.

Although the regional water authorities are still developing, DWS has much impact on their daily operations.

Governance remains a challenge in South Africa and is firmly on the radar at DWS. However, through DWS' closely monitoring of the regional water authorities and the process of setting up local institutions processes can get delayed (insufficient manpower, budget etc.). Law enforcement sometimes is a challenge as well, for instance when the water quality is badly affected by sewage water from cities and effluent from mining industries.

3.2 Development of agriculture

The structural change in South African agriculture is illustrated by the long-term trends in the number of farm units and farm sizes. In 1910, there were about 76.622 farm units in South Africa with an average size of 1.019 hectares. The number of farm units grew steadily to its peak of 119.600 units in 1953 and an average size of 750 hectares. In the second half of the twentieth century the number of farm units more than halved to 39.966 farm units with an average size of 2.366 ha by 2011. According to the Agricultural Census of 2007[1], there were an estimated 45.750 commercial farmers and about 221.341 small-scale farmers in South Africa. That is almost five times more small-scale than commercial farmers. Although no official statistics are available on the progress of land reform (particularly as it relates to its contribution in settling small-scale farmers), these numbers clearly give some evidence on the significant size of the emerging sector. The number of commercial farmers has dropped to below 30.000 over the last 10 years.

Commercial farmers can be categorised according to their levels of income. The Western Cape farmers generated the highest total income (R 16.7 billion), which corresponds with the dominance of high-value products such as fruits and wines in the Province.

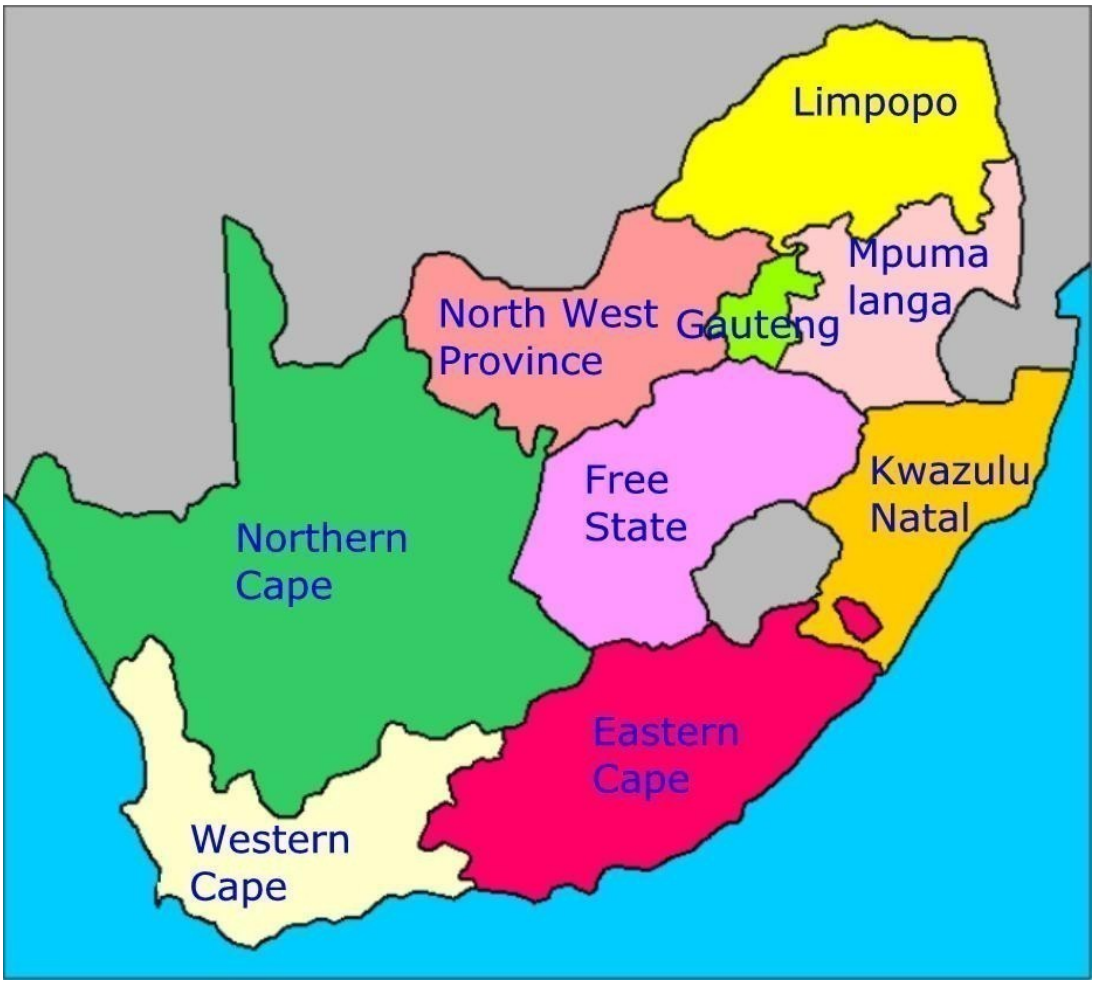
The productivity of different crops has developed over the years. The area planted with maize and wheat declined by 34.6 % and 43.7 % respectively to 2 859 thousand and 605 thousand hectares in 2011. As a result of much higher price increases for soya beans, the area planted increased by 908 % (46 thousand hectares to 418 thousand hectares) between 1993 and 2011.

All major grain crops experienced an increase in productivity over the last 18 years except for sorghum with a decrease of 19.3 %. Groundnuts (61.6 %), sunflower (42.4 %) and maize (40.3 %) show increased yields per hectare. This is also a proxy for increased investment in agriculture production.

The productivity of potatoes, oranges, apples and grapes increased from 1993 to 2007. The yields for potatoes increased from 18.5 tonnes per hectare in 1993 to 32.7 tonnes per hectare in 2007, reflecting an increase of 43.2 %. A similar trend is observable for oranges, grapes and apples with production yields increasing by 35, 34.9 and 11 % respectively.

[1] Statistics South Africa http://www.statssa.gov.za

Latest information indicate that the large commercial farms are becoming bigger and bigger. But up to date there are approximately 25.000 commercial farmers, less than 10 % can be regarded as mega commercial farmers with a gross income of more than R 3 million per year, whereas 75 % of the farmers has an income of R 500.000 or less.



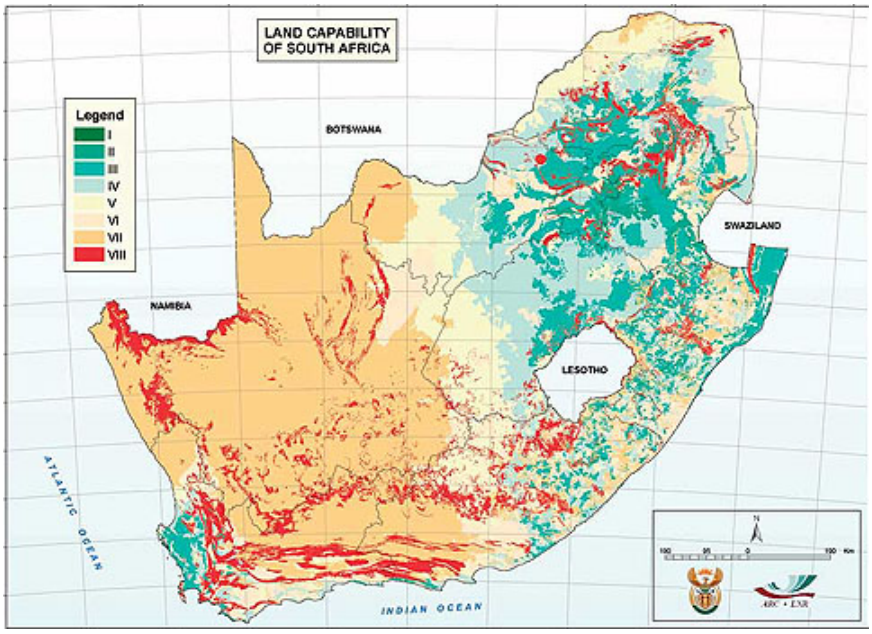
Provinces of South Africa

Farmers in South Africa are organized in 4 national operating organizations: AgriSA, Transvaal Farmers Union, NAFA and AFASA. NAFA and AFASA represent the black farmers.

For this scoping mission, the goal of the team was to introduce the Dutch water and agrofood network to potential interested partners in South Africa and to foster collaboration. Farmers' Federation AgriSA played a valuable role in the preparation of this mission. AgriSA contributed to the success of the mission by introducing several key stakeholders from the agricultural value chains, research and government. The federation joins the forces of 8 provincial Farmers' Unions and 23 commodity organisations. Their challenge and ambition is to unite the several farmers' organisations especially on those policy issues that require one voice at the national level, for instance on water. AgriSA is a good entry point to get access to partners in the agricultural value chain. Practical projects with farmer involvement are mostly initiated at provincial or commodity level. AgriSA encourages initiatives to achieve and implement sustainable practices, for instance on water and climate change.

3.3 Water & Agrofood

South Africa has a relative abundance of agricultural land, although the overall productivity of land is relatively marginal. This is mainly due to limitations of soil quality, limited rainfall and agro-climatic conditions. Prime agricultural land (suitable for the use as arable land) is in total 2 % of South Africa's surface. The figure shows the suitability of the soils. Classes 1 and 2 contain prime agricultural land. Class 8 is wilderness.



Classification of soils in South Africa

A key constraint in South Africa is the amount of water available, either directly through rainfall, ground/underground water resources, or through water capture. Consequently, about 15.3 million hectares (ha), which is only 11.8 % of South Africa's land area, is suitable for crop production. Since 1994 there were no significant changes in the total cultivatable area. The total area of arable land decreased by a slight 2 % to 14.4 million ha, while the total area used for permanent crops increased by 2 % to 950.000 ha from 1994 to 2009.

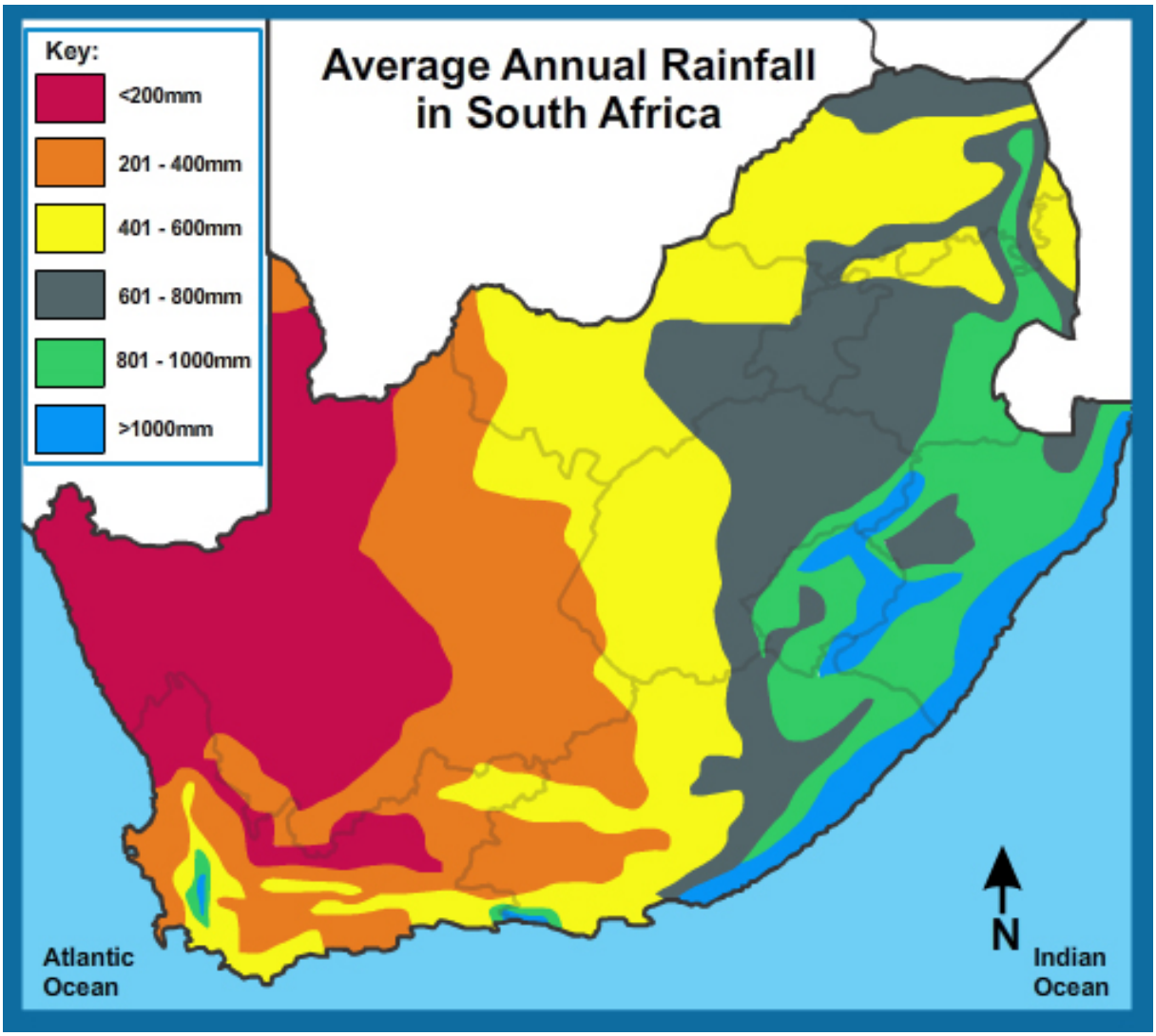
Since about 65 % of South Africa does not receive sufficient precipitation for rain-fed crop production, the expansion of agricultural production under irrigation may prove to be an option. Rainfall across the country varies from as little as 100 mm to more than 1000 mm per year.

According to The South African Agricultural Baseline (BFAP, 2011) current irrigation infrastructure allows for the irrigation of 1.6 million hectares[2]. Limited water availability and unfavourable soil characteristics are the main limitations for expansion of crop production. It is estimated that a maximum of an additional 707.000 ha of land can be brought under irrigation by efficiency gains, additional storage capacity and using existing capacity. Developing the required infrastructure is a long-term process and it is therefore envisaged that in the medium term of up to ten years irrigation can be expanded by 145.000 ha.

[2] http://www.bfap.co.za/documents/baselines/BFAP_Baseline_2011.PDF

A final option is to increase the use of ground water for irrigation agriculture. Middleton and Bailey (2008) estimated that currently only 40 % of the available ground water resource is used. If assumed that agriculture would use 60 % of this available surplus groundwater, an additional 270.000 ha could potentially be irrigated with groundwater[3].

Mining activities, and the expansion thereof, puts pressure on the availability of agricultural land. New areas identified for mining activities, particularly in Mpumalanga and Limpopo, have put some of the highly arable and high potential land at risk. Mining, and the discharge of waste water, affects the quality of surface water streams and groundwater resources.



Average annual rainfall South Africa

[3] BFAP 2012

4. Findings

Agriculture in South Africa can be characterized as very diverse. Large scale commercial farmers, managing ten thousands of hectares with specialized staff on their payroll versus emerging farmers who need to be trained in basic agricultural skills, sometimes struggling to set up their businesses.

Given this landscape of agricultural development, several target groups can be distinguished. Every target group has its own needs, based on level of education, location and biophysical aspects, size of the farm and access to finance. Within this assignment the focus was on the demands of the farmers which are not in the category of the large scale commercial farmers. Large scale commercial farmers will find their way and apply high technology where appropriate. But what can be offered to the large number of farmers which face issues like water shortage and interlinked factors like soil and access to tolerant varieties and crops? Could introduction of aspects of smart water management, as promoted by the Dutch water sector be a solution?

4.1 Bulk water supply

South Africa has a large number of dams to store water for bulk water supply. Nationally, the total storage capacity of the major reservoirs in the country currently amounts to about 33.900 million m^3, which is equal to approximately 70% of the mean annual runoff from the land surface of the country. This storage has been created by the construction of 252 large dams. In addition, some 3500 dams with a height of greater than 5m have been registered with the DWS's Dam Safety Office.

The total water consumption (year 2000) of 13.3 km^3 /year (1 km^3 = 1 million m^3) is used as follows: domestic consumption (29 %), irrigated agriculture (59 %), industry, mining and thermal power generation (8 %) and commercial afforestation (which decreases runoff) (4 %). Per capita water resource availability is about 1100 m^3 per annum hence the classification of South Africa in terms of international norms as water stressed (SANCOLD, 2017)[4].

An extensive system of irrigation canals distributes water from dams to users. These canals are mostly concrete lined and were constructed between as early as the 1930s to as recently as the 1980s. Erosion of the lining of the canals is hampering the velocity of water and the capacity of the systems. Coating can mitigate the problem, since complete reconstruction or new canals is too expensive. Water Users Associations and Irrigation Boards are in charge to maintain the infrastructure of bulk water supply and to monitor this distribution system.

Leaking of canals and dams is a reason why the entire volume of available water does not reach the users. Approximately 20-30 % of the calculated water supply gets lost on its way to the agricultural fields (leakages, illegal use).

[4] SANCOLD. 2017. South African National Committee on Large Dams. http://www.sancold.org.za/index.php/about/about-dams/dams-in-south-africa. Accessed on 31 March 2017.

Inlet of water per user (farmer field) is most calculated based on the dimension of the inlet and the velocity of water. Smart (telemetric) monitoring systems at farm off-takes are not implemented yet. However, the need is obvious. Real-time monitoring of the water distribution system would be an enormous step forward to achieve an appropriate functioning supply system, as mentioned by the water managers of WUA Breede and IB Loskop. In the ideal situation loggers at all crucial locations would automatically link data of the water supply system to the control room (central computer) of the Water Users Association. Adequate systems should use very little energy and be 'vandal-proof' (small, hidden). Where several WUAs are orienting on this kind of automatic monitoring there are opportunities for Dutch suppliers of water data loggers and management systems to offer their services to South African partners.

Irrigation canal, erosion of lining (left hand side)

4.2 Water use on farm

At the farm level several irrigation techniques are applied:

- flooding (14 %)
- sprinkler (32 %)
- micro-irrigation (26 %)
- moving systems (29 %)

The share of micro-irrigation systems is increasing over the last years. In 2008 19 % of irrigated land was under this kind of systems.

Sometimes sprinklers and drip systems are combined to prevent heat stress and to use the advanced system of fertigation for the application of water and

nutrients. More than 350.000 ha is irrigated with center pivots. Approximately 150.000 ha is under drip.

Subsurface drip irrigation is rarely used, for instance in sugar cane where it is implemented at relatively small scale yet.

The National Water Act (NWA) (1998) makes provision for a person to use water:

(a) without a licence
    (i) if that water use is permissible under Schedule 1 of the Act;
    (ii) if that water use is permissible as a continuation of an existing lawful use (ELU); or
    (iii) if that water use is permissible in terms of a general authorisation issued under section 39;
(b) if the water use is authorised by a licence under this Act

Schedule 1 entitles a person to take water for reasonable domestic use in the person's household, for small gardening not for commercial purposes and for watering of animals grazing on the land.

ELU is applicable to a water use that has lawfully taken place at any time during the two years (the qualifying period) before the date of commencement of the specific section of the NWA, subject to the conditions under which it was lawfully exercised. Under certain circumstances, water uses that do not qualify may be 'declared' as existing lawful use as described in section 33 of the NWA.

General authorizations apply in certain areas, usually specific relatively small uses, meaning that while staying within the limitations provided in Government Gazette Notice 398 of 26 March 2004 (which has been extended to 30 June 2012), a licence is not necessary.

In the absence of any of the previous three types of authorization, water may not be used without a licence issued under Chapter 4 of the NWA.

The current water quotas will not be reconsidered if the farmer seem to over use water. Only the moment of application of the water license will lead to a re-assessment of the farmers' quota.

Limited flexibility to adjust the quota can be a driver to find ways to use available water volumes more efficient. On the other hand, the trend to replace annual crops like maize and lucerne by perennial crops as citrus and pecan nuts, can also lead to a situation that the demand of water will increase. These crops can be less sensitive to drought but still require a large amount of water per hectare (up to 12.000 m^3/ha). The high value of the fruit makes it more profitable for farmers to shift to these perennial crops. The development of a new promising crop can go fast. In a period of 10 years the acreage of pecan nuts in the Vaalharts WUA increased from a few thousand hectares to 11 000 ha, almost 30 % of the total area of the irrigation scheme. In other regions a fast shift from sugarcane to macadamia or from grapes to citrus nuts can be observed. Also shift from grapes to citrus.

On-farm water storage enhances the flexibility of water use by the farmer. It increases the water buffer capacity on-farm and in the total system as well. On-

farm basins make the farmer less dependent on the bulk water supply in case of water scarcity, especially when for certain purposes a larger amount of water in limited time is required.

The efficiency of irrigation is also determined by aspects such as soil, fertilization and crop choice. Water saving is possible by using mulch or compost to cover the soil. Other options include using green cover crops. Due to the tight schedule of the mission the water use on farms was not included in this scoping. However, the experiences of the fruit sector (Hortgro) indicated that there are still challenges to save water in the production of apples and pears. Moreover, the impact of overuse of water will be subject of a call for proposals, which will be published soon by Hortgro.

Sunhemp is used to increase soil organic matter and the water buffering capacity in the soil

Smart information systems (probes, sensors) to measure soil moisture as a base for irrigation seem to be commonly applied at commercial farms. Realtime monitoring of irrigation practices making use of LoRa-applications (long range low power) could be of additional value to raise awareness, especially to be used in training programs for the mid segment and emerging farmers. LoRa offers wide area networks for Internet of Things. LoRa could offer other advantages as well, for instance by enabling automatic water meters in the inlet of water from the distribution canals. Water users associations, extension services and farmers could be clients to invest in this kind of sophisticated equipment.

Invasive trees and water plants can cause severe problems in water management. Walls of canals can be damaged and leakages can occur. Cutting or removing this species will lead to huge amounts of biomass, which could be valuable for agriculture when processed to mulch or compost. Landowners and water managers are looking for affordable techniques to achieve viable business

models. For farmers it is obvious that soil improvement by application of organic matter can increase the water buffering capacity of the soil, thus a step towards a (climate) resilient crop production. Local or on site processing would be the most preferable option, due to the high costs of logistics. This was already done in the Baviaanskloof and Bergriver project. Landcare is taking this forward to the BRIP Breede River Improvement Plan already. This initiative offers the opportunity to achieve synergy.

4.3 Water quality

Water quality is a serious issue in relation to the agricultural water needs in South Africa. Bulk water can contain too much physical impurities (sand, clay, organic matter) causing clogging of drippers and sprinklers. Due to discharge of waste water from households and industries surface water can be chemically or biologically polluted (e.g. pathogens like E-Coli, Cholera). In several regions this topic was addressed, especially in relation to food safety standards like Global GAP. Domestic retail organisations and international importers are keen on the quality of fruits and vegetables. The growers need to deal with this challenge, knowing that communal sewage water treatment systems are not functioning well. In some cases retail organisations even ask more of the farmers. Woolworths, for instance, requires reuse of drainwater from greenhouses. Common practice is that farmers will dump it on their fields. Reuse could also mean use of valuable nutrients in the effluent. This could save 30 % of the nutrients and be very beneficial for the growers.

The main supply systems don't have the collective facilities to purify the raw water. It's the farmer's individual responsibility to treat water if his irrigation system or crops require an upgraded quality. Several counterparts asked for affordable water treatment systems, systems that selectively clear the water to achieve to needed quality. The most appropriate technique will differ and will depend on the kind of pollution and the final destination of the product due to food safety reasons. Products for direct human consumption like lettuce and tomato will require a higher standard than other crops, like fruit growing in trees. Ultraviolet disinfection could have perspective in cases where pathogens need to be killed, while nutrients may remain and could be reused for fertigation. That could be a niche for Dutch water tech companies.
In other cases a sand filter or constructed wetland filter could be sufficient.

Water filtration at farm level

Priority lead 1
Introduction water technology

The need for safe food and international quality standards both require controlled production processes. Clean irrigation water will become a licence to produce and will be crucial to export agricultural products. Growers are aware of the sense of urgency. Selective removal of pathogens and reuse of nutrients can be beneficial for the growers. Dutch water tech companies are very active in developing appropriate treatment methods for horticulture. TNO and WUR-PPO are supporting innovation by applied research and by knowledge dissemination. This collaboration offers opportunities for entering the market in South Africa by joint action and by exploring viable business models.
Partners in International Business (PIB) would be an appropriate facility to support this cluster. TNO and NWP are conducting this growing network of companies and will use the opportunity to encourage the private partners to take initiative to explore the South African market.

4.4 Adoption of advanced technology

4.4.1 Administration and monitoring

The scale of water management and agricultural production requires appropriate technology. Introduction of monitoring and administration systems is an important step to organise water management in an effective manner.

The Water Administration System (WAS) is developed to reduce the losses in irrigation systems. WAS is international rewarded by International Committee on Irrigation and Drainage due its aim to minimize water losses in water distribution systems in South Africa. The potential of WAS and the impact a large scale application could have, is interesting for Dutch partners. WAS offers opportunities to improve governance systems, but could be used for training and awareness purposes as well. Since WAS will be rolled out with support of the Strategic Water Partners Network, it is a system with huge potential as a key driver for change in water management in South Africa.

Mr. Nico Benadé[5] (NB Systems) designed the software, currently containing 9 modules to monitor and optimize the functioning of irrigation schemes. The modules are: administration, water order, accounts, measured data, report, water release, dam information, crop water use and bulk sms. The crop water use module is linked to weather information, provided by YR (Norway). This can be improved and adjusted, for instance by linking to Dutch interventions as HydroNet and Rain4Africa. Crop Water Use could also be extended by information with respect to soil characteristics (pF curve, waterbuffering capacity).

Results showed that 20-30 % water saving is feasible. Main reason for WUA's to implement WAS is the possibility to improve the system of sending invoices to the users. Online registration of the weekly demand of the users also offers the

[5] https://www.youtube.com/watch?v=z4urMpV5w5o and http://wateradmin.co.za

opportunity to calculate the intake from the dams in a convenient way, reducing paperwork and the costs of labor.

Strategic Water Partners Network South Africa (SWPN) funds a project to roll out WAS in several irrigation schemes: Vaalharts, Orange Riet WUA, Loskop IB, Lower Olifants, Impala WUA, Hartbeespoort IB (East Canal). Vaalharts Irrigation Scheme is the oldest and largest scheme of South Africa.

As said WAS is a valuable tool, not only offering support to the WUA's in their daily operations, but also offering information that could be very useful for raising awareness of the users. Farmers gain insight via the crop module. WAS could be the core of training programs, including all relevant aspects of efficient water management on the farm. Collaboration with Dutch partners offering extension services and information systems (soil fertility, water retention curve, soil moisture content, remote sensing) could have additional value.

Priority lead 2
Introduction Water meters and Monitoring

Rolling out WAS in several Water Users Associations offers the opportunity to introduce automatic monitoring systems for the water managers and the farmers on a large scale. The potential of implementation comprises 300 irrigation boards/WUAs and 9 CMAs.
Dutch companies could team up with South African-partners like NB-systems, the South African Association for Water Users Associations to achieve scale. Synergy could also be found by connecting to the efforts of the Dutch Water Authorities. Collective promotion of technology would make sense especially when equipment can be tested in pilots. Facilities like DHI could support demonstration of proven techniques. Partners in International Business could be valuable as well, due to the components of government to government (G2G), knowledge to knowledge (K2K) and business to business (B2B).
The timing could be perfect due to the support WAS is getting for implementation the upcoming years by the Strategic Water Partners Network South Africa.
NWP/RVO are proposed to invite interested Dutch companies to elaborate a strategy to get in touch with South African partners, in close collaboration with Dutch partners who are already active in the country.

4.4.2 Greenhouse horticulture
Undercover farming will be of increasing relevance in South Africa, due to the impact of climate change and El Nino. The risk of extreme weather events (hail storms, heat waves) can't hardly be covered by insurances, given the high costs. Therefore shade netting is becoming more popular to protect fruit and vegetables to the devastating impact of not only hail but also evaporation. Nets with a high density are able to reduce evaporation and contribute for that reason to water efficiency.

The market for more sophisticated greenhouses is limited, although climate control good offer necessary advantages to increase production with an efficient use of inputs. Dutch input and technology suppliers could have potential, especially when the design of undercover farming is more customized to the local

needs and the systems would have multiple wins. A valuable suggestion was done by a Dutch supplier of horticultural systems. Their solution is to develop a low budget greenhouse system for combined production of vegetables and fish, making use of distinct qualities of water within the process (cascading). This system is aiming at the use of the best quality water for the crop that has the highest requirements first, and subsequently the discharge water for a cultivation which requires a lower quality. The final result should be a zero discharge of water. In this concept not only every m^2 of land is used most optimally, but also every drop of water.

Shade netting to prevent damage hail in citrus plantation

4.4.3 Remote sensing as a tool for irrigation management

Using satellite data is valuable for agricultural development in South Africa. Several Dutch projects in South Africa make use of remote sensing and services of Dutch partners. Unfortunately these services as such are not commercially profitable yet, despite their obvious advantages for the farmers. Images can show differences in crop growth and soil moisture. However, the link with satellite information with observations on the ground still can be improved to convince the farmers of the benefits. This could be done by linking to the actual soil fertility and soil moisture. Dutch companies offer unique and affordable products in this field, which could be very useful for individual advice and training programs. Examples of these technologies are a soil test based on Near Infrared Spectroscopy, soil moisture sensors and water meters linked with the LoRa technology could be valuable as well. In the optimal situation not only the farmers get real-time information on their screens, but also advisers. The internet offers the opportunity to conduct farmers in their irrigation management by a shared 'dashboard' with field information. These techniques might not always be available or affordable for largescale implementation yet, they could be very useful for groups of farmers, learning networks, etcetera.

4.4.4 Climate Adaptive Drainage

Some areas along rivers and canals face problems with seepage, causing low yields and increased pressure of pests and diseases. However, the same areas

could be exposed to drought in the dry season as well. At a limited scale drainage systems are introduced to tackle the wet conditions in the field. Drains (110 mm) are put in the field at a distance of 60 to 120 meter. The question was raised whether alternative systems could have more impact to achieve good soil condition not only in the rainy season, but in the dry season as well. Climate Adaptive Drainage or a (simple) option based on this principle could be such a solution. Climate adaptive drainage takes the actual situation into account and will focus on the required ground water table in the upper layers of the soil. The drains will not only be used for discharge of water, but also infiltrate water from the distribution canals of a basin.

4.5 Capacity building / Institutional aspects

Sound governance and well educated technical staff are prerequisites to successfully manage water systems. Appropriate technology can support operations. Most counterparts addressed the issue of lack of capacity, pointing out that it is hard to recruit and keep excellent staff. This issue was not only raised by public partners, but also by companies[6]. The mentioned challenges effect policy making, the collection and allocation of funds. Currently available budget is mostly used to cover costs of maintenance and refurbishment. Urgent investments in infrastructure are needed, both on federal and local level.

Land reclaims in the Broad-Based Black Economic Empowerment framework (BBBEE) will offer emerging farmers the opportunity to establish their own businesses. Within the irrigation schemes, these farmers need to get access to water resources. Implementation of good agricultural practices require comprehensive training programs including the interlinkages between crop and variety use, soil management and fertilization and last but not least irrigation management. Several counterparts emphasized to offer this kind of overarching programs.

Construction of a basin for emerging farmer

[6] GWK, mr. A. Prins

Strategic Water Partners Network South Africa (SWPN) is a partnership between the Department of Water Affairs and Sanitation and the private sector, established to close the national water gap. Companies like Coca Cola and Nestle are leading members from the private sector. Important stakeholders like AgriSA (Federation of Farmers' Unions) and World Wildlife Fund are members, representing the civil society (among others). Several working groups are deepening distinct issues. Agricultural and Supply Chain Water is one of the subjects. Currently, the Netherlands is not involved in SWPN. However, this platform could offer the opportunity to link not only existing Dutch activities and expertise to leading stakeholders in South Africa, but also be an entry point to initiate new business opportunities. A membership and eventually pro-active role of the Netherlands could contribute to strengthening the position of the Netherlands as a partner on water and related subjects: not only to agriculture but also to mining and governance. SANEC represents several companies which could be potential member of SWPN (e.g. Heineken, Unilever).

5. Overview potential leads and cases

Based on the interviews with our counterparts several suggestions can be done for follow up. Due to the character of the meetings, these ideas may be considered as potential leads and not thoroughly elaborated project ideas. Therefore, a new business oriented relationship will need more and careful steps to explore the perspective of collaboration between the South African counterpart and interested Dutch partners. A successful follow up requires sound steps to find a mutual base. Netherlands Water Partnership, RVO and the Embassy of the Kingdom of the Netherlands all can play their role to set up a fruitful collaboration and to eventually support projects. Several subsidy schemes are available for funding (DHI, Sustainable Water Fund, Partners in International Business etc).
Most important is that initial contacts with SA-partners will be business to business oriented.

The compatibility is an estimation, based on the sense of urgency as expressed by the SA counterparts, the proposition Dutch partners could offer and the potential return on investment.

Subject	**Lead**	**SA counterpart**	**Potential matching partners NL based on survey NWP (not exclusive)**	**Compatibility**
Bulk water supply (4.1)	Introduction automatic water meters (loggers) and monitoring systems	L. Bruwer (Breede WUA)	Royal Eijkelkamp	**
Water use on farm (4.2)	Saving water use in fruit (apples/pears)	W. Steyn (Hortgro)	Delphy, PPO Randwijk/WUR, Broere Hortitech, Solteq, Royal Eijkelkamp, Sensoterra	*
Water use on farm (4.2)	Research Impact over water use (Hortgro will publish call for proposals later this year)	W. Steyn (Hortgro)	PPO Randwijk/WUR, Broere Hortitech	*
Water use on farm (4.2)	Affordable solutions for processing invasive plants/trees	L. Bruwer (Breede WUA)	GIDO, Dutch Water Authorities, Aqua Terra Nova, Aqua Soil Group, SoilTech, For Elements, Living Lands	**
Water quality (4.3)	Introduction affordable water filtration systems	Renald Radley (IB Malelane)	Broere Hortitech, NPI	**
Water quality (4.3)	Introduction affordable water purifying systems	Peter Bakker (Simply Salads)	Svenson, Aquest Colsen, bestUV, Colsen, BSS Holland, NPI	***
Water quality (4.3)	Reuse drainagewater greenhouses, pilot icw Woolworths	H. Stolker (Delphy SA)	Svenson, Aquest Colsen, bestUV, Colsen, BSS Holland, NPI	***

Subject	Lead	SA counterpart	Potential matching partners NL based on survey NWP (not exclusive)	Compatibility
Administration and Monitoring (4.4.1)	Extension Water Administration System	Nico Bernadé (NB Systems)	Deltares, HydroLogic, KNMI, Sensoterra, Weather Impact	***
Administration and Monitoring (4.4.1)	Introduction Smart Water Meters	Louis Bruwer (WUA Breede)	Royal Eijkelkamp, Broere Hortitech, AKVO Foundation, van Essen Instruments, Solteq,	**
Greenhouse Horticulture (4.4.2)	Design low budget model Aquaponics	R. v.d. Donk (Bosman van Zaal) icw mrs. Erna du Plessis (Renlyn)	B. Schuilenburg (Aqua Farm Consult), WUR, Welland College, Green Farming	*
Remote Sensing (4.4.3)	Strengthen position providers remote sensing services by linking 'on ground' information	mrs. C. Jarmain	eLeaf, Eurofins Agro, Broere Hortitech, Royal Eijkelkamp, Delphy, Sensoterra, KnowH2O	*
Climate Adaptive Drainage (4.4.4)	Pilot Climate Adaptive Drainage	W. de Bruyn (Dept of Agriculture, Northwest)	KnowH2O	*
Governance (4.5)	Capacity building farmers	Boy Dhluwayo (WUA Vaalharts, entry point)	Delphy SA, Sensoterra, Broere Hortitech, AKVO Foundation, Living Lands, Four Returns	**
Governance (4.5)	Capacity building institutional organisations	Nico Knoetze (SAAFWUA icw WUA Vaalharts)	Dutch Water Authorities, Living Lands, Four Returns,	**
Governance (4.5)	Membership Strategic Water Partners Network	SWPN, to be approached by NL Embassy	Networks NWP and SANEC	***

6. Recommendations

- Explore the feasibility and strategic impact to become a member of the Strategic Water Partners Network South Africa (SWPN). This platform could offer the opportunity to link not only existing Dutch activities and expertise to leading stakeholders in South Africa, but also be an entry point to initiate new business opportunities. A membership and eventually pro-active role of the Netherlands could contribute to strengthening the position of the Netherlands as a partner on water and related subjects: not only on agriculture but also on mining and on governance.
- Foster involvement of the Water Users Associations and Irrigation Boards in activities of the Dutch Water Authorities, to engage stakeholders acting at the grass root level from the early beginning, mapping their needs to design the final organizational structure of the CMAs. A closer relationship would not only contribute to mutual understanding of multi stakeholder processes but also generate broader support for policy and projects.
- Find synergy with rolling out the Water Administration System to scale up good practices and proven techniques on soil, water and weather information services (for instance by linking to programs such as Geodata for Agriculture and HydroNet)
- Mobilise Dutch water technology sector to join forces to promote affordable water treatment methods, tools for monitoring etcetera. The sector should develop an Action Plan for a strategic entry of the SA market including promotion, demonstration pilots, mapping local partners and collaboration with knowledge partners.
- Explore opportunities for further collaboration with producers' organisations and organisations in the agricultural value chain, especially the high value commodities with a strong connection to the Netherlands. Potential partners are Hortgro, Fruit SA, IA Africa (citrus) and SASA (sugar). The water footprint of these commodities is not really addressed in most international standards, however the challenge to save irrigation water (and nutrients) is a mutual and international binding topic. Strong partnerships of Dutch and South African partners in the fruit chain (production, trade, applied research) could have added value and be beneficial for all the stakeholders of the chain. Not only to reduce post-harvest losses, but also to improve the quality/shelf life of products.

7. Summary

To achieve water efficient agriculture, an enabling environment is crucial. South Africa works hard to establish a national covering network of Catchment Management Agencies to govern regional water management issues. During this transition, daily operations are the task of Water Users Associations. In the meantime, their role is also changing: from former small Irrigation Boards towards local water managers aiming at achieving equity among all users in the system. The building process of new government bodies will take time.

The mission on Water & Agrofood focussed on the needs of South African stakeholders and explored opportunities for bilateral collaboration. Capacity building and training is spearheaded by a lot of counterparts.

The diversity of agricultural enterprises (varying from large scale commercial farmers to emerging farmers and smallholders) urges to distinct several target groups when it comes to a follow up. Their needs are different, the level of technology and education differ, but also the access to credits.

During the scoping mission several potential leads were identified. The Netherlands could offer partners on the distinguished topics like:

- capacity building (public and private target groups);
- water treatment;
- extension of water administration systems including metering and monitoring;
- improving efficient irrigation by using smart information systems to map soil, fertilization, biomass, soil moisture.

Several ongoing activities and projects of Dutch partners can offer synergy to give follow up to the leads which were identified during the short scoping mission. Recommended is to give follow up to the identified potential leads, to activate potential partners from the South African and Dutch sides.

Abbreviations

ARC	Agricultural Research Center
BBBEE	Broad-Based Black Economic Empowerment
B2B	Business to Business
CMA	Catchment Management Agencies
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EKN	Embassy of the Kingdom of the Netherlands
ELU	Existing Lawful Use
G2G	Government to Government
IB	Irrigation Board
K2K	Knowledge to Knowledge
LoRa	long range low power
NWA	National Water Act
NWP	Netherlands Water Partnership
PIB	Partners in International Business
PMC	Product – Market Combination
R	South African Rand
RVO.nl	Netherlands Enterprice Agency
SAAFWUA	South African Association for Water User Associations
SWPN	Strategic Water Partner Network
WAS	Water Administration System
WMA	Water Management Area
WUA	Water Users Associations
WRC	Water Research Center

Annex 1

Schedule mission

Date	Time	Location	Purpose	People
06-mrt	08:00-10:00	Pretoria	Dept of Agriculture	Mary-Jean Gabriel
			ARC - IAE	Felix Reinders
			ARC-ISCW	Chris Kaempfer
	11:00 - 13:00		Travel to Groblersdal, Limpopo	
	13:00 - 16:00	Groblersdal	Loskop Irrigation Board	Pieter Pretorius
			Schoeman Boerdery	Johan van der Westhuizer
			Travel to Nelspruit, Mpumalanga	
		Nelspruit		
	19:00		Dinner	Peter Bakker
07-mrt	08:00 - 09:00		Travel to Malalane	
	09:00 - 11:00	Malalane	Irrigation Boards	
			Irrigation farmer	Renald Radley
	11:00 - 16:00	Malalane	Smallscale sugar farmers (RCL Foods)	Roger Armitage
			Smallscale sugar farmers (RCL Foods)	Greg Gillespie
	16:00 - 20:00		Travel to Pretoria	
		Sleep in Pretoria		
08-mrt	8:00 - 09:30	Pretoria	NB Systems	Nico Benadé
	10:00 - 11:30		AgriSA	Nic Opperman
	12:00 - 17:00	Pretoria	Undercover Farming Conference	Suzanne Oosthuizen
	17:00 - 19:00		Travel to Ventersdorp, North West	
		Ventersdorp		
09-mrt	06:00 - 10:00		Travel to Jan Kempdorp	
		Vaalharts irrigation		
	10:00 - 15:00	scheme	Vaalharts WUA	Boy Dhluwayo (CEO)
			SAAFWUA	Nic Knoetze
			Drainage expert / Farmer	Willie de Bruyn
	15:00 - 16:00	Travel to Kimberley		
	16:00 - 17:00	Kimberley	GWK Coop	Andre Prins
	18:50		Fly to Cape Town	
			Rental car	
		Somerset West		
10-mrt				
		Travel to Worcester		
	09:00 - 10:00	Worcester	Breede Gouritz CMA	Phakamani Buthelezi
	11:00 - 12:00	Robertson	Irrigation Boards	Louis Bruwer
	13:00 - 14:30	Nuy wine estate	Researchers	Dr Caren Jarmain
				Dr Elmi Lotze
	16:00 - 17:00	Stellenbosch	Hortgro	Dr Wiehann Steyn
		Travel to Cape Town Airport		
	20:00	Depart		

Annex 2. Agrofood sector survey

Summary Water and Agrofood sector survey

Date: 23 February 2017

Authors: Maaike Feltmann & Mark Niesten – Netherlands Water Partnership

Introduction

In close cooperation with RVO.nl, NWP and the Embassy of the Kingdom of the Netherlands in Pretoria a scoping mission in South Africa will be conducted in March 2017. The main objective of this mission is to identify concrete opportunities for Dutch businesses in the cross-over water & agrofood. The focus of the mission is on efficient water use in the agrofood sector. The mission will investigate the possible connection between the demands of South African businesses in the crossover of the water & agrofood sector with Dutch expertise.

As preparation for this mission, a sector survey is conducted with Dutch organisations active in the water and agrofood sector with an interest in South Africa. The survey gives an overview of Dutch organisations orienting on/active in the South African market in the water and agri-food. The survey indicates the different phases of business development of these organisations in South Africa for different products and services. There is a large variety among the respondents and this translates to various views on the market strategy of the participants. This summary of the survey aims to give an overview of generally shared views of the Dutch organisations on the South African Water and agrofood market. In addition, specific views and suggestions are reflected if considered to be valuable for the scoping mission. Please keep in mind that individual reactions may differ from the in this summary presented outcome.

Respondents

A total of 28 respondents has responded to the survey. The respondents consist of a mix of organisations from the water sector and the agricultural sector. The respondents represents companies (MKB and larger organisations), knowledge institutes, social enterprises and NGO's.

The organisations from the water sector indicate to provide knowledge/expertise and (innovative) technologies for water supply (e.g. water efficiency and irrigation techniques, quality tests, UV-technologies) and technologies for waste water treatment (e.g. reuse of waste water for agriculture). The agricultural oriented organisations provide technologies for crop production (e.g. saline agriculture) and soil management (e.g. soil moisture sensors, groundwater monitoring).

Based on the indication of the respondents on their activities and nature of their business development in South Africa there are three stages in which organisations can be categorized.
1. Market orientation; this phase is characterized by participation in events/conferences, and organisations have the intention to further explore opportunities in the market via a market study.
2. Market entry; this phase is characterized by further exploration of the market with potential partners and finance opportunities. First contracts and commitments are established and the organisation is ready for first implementation.
3. Market expansion; this phase is characterized by the implementation of (pilot) projects and expansion to new customers and partners.

Half of the respondents is in the phase of orientation/entry and the other 50% is already familiar with het market and is looking for expansion of their activities. The long term ambition of the respondents can be summarized by Business to Business development, including new partnerships, implementation of projects and increase of the sales market. The expectation of a number of respondents is that these developments will contribute to the increase of food production in South Africa and a better living environment.

South African water & agrofood market

In the survey respondents could indicate opportunities and challenges of the South African water and agrofood market from their perspective.

There is not one geographical region in South Africa indicated as most promising for the all respondents. Most of the respondents are interested in more than one region. Regional focus is mainly on cities and industrialized areas, namely the regions of the Cape, Gauteng, Durban and Port Elizabeth.

What crops are most promising for the business development is very company specific. For some organisations agriculture in general is the focus, others focus on more specific crops such as grapes yards (wine) or potato, paper or vegetables in general. Focus on related industries such as energy and mining are also mentioned as segments to focus on. Organisation that not focus on specific crops indicate the waste water treatment and water supply segments as most important for their business in the water and agrofood cross-sector.

On the question what needs/demands or market drivers are considered to be most promising for business development the response was mostly related to water scarcity, the rising water price, and water quality. Other respondents mentioned also the growing demand for food and the legislation for waste water discharge. Finally the opportunities for business to business was stated, related to the role and functioning of the governments.

The latest is also reflected and emphasized by a third of the respondents when it comes to limiting developments in South Africa for their business. 9 of 28 respondents mention political instability in terms of lack of functioning government, changing legalization, political decision making as a negative influence on their business opportunities. Related to the political instability, also the financial instability is mentioned as a limiting factor for business in South Africa. According to some of the respondents the exchange rate creates a decline in the economic position of South Africa and is due to the mismanagement of the government.

Based on the above it is not surprising that respondents indicate a stable political and economic situation as a critical success factor for their businesses. Moreover respondents indicate a trustful local partner and/or strong partnerships critical for their success because of the local presence, ownership and employment of local South Africans. Companies are more willing to work with commercial entities than with governmental bodies, due to the lack of transparency and corruption in government.

Finally one of the success factors mentioned is the opportunity to show inspiring examples of implementations and spin offs of demonstration projects. (Potential) clients need to see the value realization from the services and products. One of the respondents indicates 'If the client cannot generate additional income or reduce costs he will not return'. Additionally to this, another respondent concluded the importance of the involvement of end users.

Finance and support

Not all respondents consider financial support necessary for their business in South Africa. 5 out of 28 answer this question with 'no'. However, some of them do confirm the potential of financial support in the starting phase. Most of the respondents who indicate financial support necessary do also emphasis the importance of financial support in the starting phase. A reason that is given for this importance is the long time it takes to start up a business in South Africa. Furthermore financial support is considered as a catalyst for future business. However some of the respondent stress they will not adjust their business strategy to fit the criteria of the instruments. One other respondent even stated the criteria of the funding instruments are not always matching the ambitions of the

Dutch sector. This respondent is referring mainly to the Dutch funding instruments such as PvW, FDW, DHI and more. Some of the respondents also indicate to look at other financing such as public finance, investors and loans of banks in a later stage. To conclude finance is very welcome at the starting phase of the business development, and co-finance from South Africa should not be forgotten!
The expectation of the respondents of this scoping mission and the support of the EKN/RVO.nl and NWP in general is very practical a can basically be divided into three characteristics:

1. **Promotion Dutch sector**;
   This includes pro-actively promote the Dutch technologies in the cross-sector water and agrofood, e.g. via visibility in (inter)national conferences.
2. **Network and sector information**;
   Respondents indicate they value the support by EKN/ RVO.nl and NWP by sharing information and linking with relevant partners. For example via this scoping mission when it generates information on developments, identify key players and promising needs and demands. Some of the respondents have hopes for individual questions such as the identification of potential distributers. One of the respondents for example state the potential of this scoping to identify barriers in this case to the financing of wastewater projects. More commonly mentioned is the potential for this scoping mission and its follow up to help establish longer term relationships with local partners and governmental organisations.
3. **Finance and subsidies**;
   Thirdly the support from EKN, RVO.nl and NWP is valued for their support and information on finance instruments such as PvW, DGGF and more.

Final recommendation for this scoping by the respondents
In general the respondents' advice is to include farmer organisations, governments, local authorities and development organisations is this scoping mission. More in detail the respondents mention: Department of Environmental Affairs, Department of Agriculture, Port Elisabeth (Floyd Murray) Greenport Holland / DHTB (Harm Maters, Norbert van der Straaten); Renlyn (SA), South African Weather Service (SAWS) as potential organisations and key figures to include in the study .

Three of the final recommendation of the respondents are:

- Manage expectations in SA and in NL. There are plenty of opportunities, but finance and policy is lacking.
- Keep it practical: focus mainly on business.
- Be positive and realistic!

Conclusion
Based on the respondents of 28 water and agrofood organisations with an interest in South Africa, the following recommendation for the scoping mission can be made:

- Respondents are very interested in realistic and practical opportunities.
- Respondents are looking for information on the needs and demands in the cross-sector of water and agrofood, in where the Dutch technologies can have a visible added value (generate extra income or reduced costs directly). Concrete opportunities for pilot projects which can demonstrate this added value of NL technologies.
- Information on the (potential) ownership in South Africa and available finance opportunities is preferred.
- For the sector promising and limiting factors are in the political and economic (in)stability. Mainly the exchange rate and the developments in the political situation are of influence on the business opportunities. As some of the respondents recommend the focus of the scoping mission should me primarily on the private sector.