Consolidated PGIS Report for Zimbabwe

CPWF-L1 Project

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1.0 Introduction

In Zimbabwe, the Participatory Geographic Information Systems (PGIS) data collection exercise for the Challenge Program on Water and Food (CPWF-L1) was done in three districts that fall within the confines of the Limpopo River Basin. These districts are Insiza, Matobo and Gwanda which are all found in Zimbabwe's Matabeleland South province. In all the districts data collection was done at two levels, in which the first level entailed conducting interviews and focused group discussions with the district stakeholders. The second level of data collection entailed conducting focused group discussions with the selected communities. Three PGIS team members facilitated the data collection exercise with the support from the provincial Agritex office.

The **main objective** of the PGIS data collection exercise was to identify successful cases on Agricultural Water Management technologies that have been implemented in these districts and hence develop a clear understanding of what made these technologies successful from a variety of viewpoints. The identified technologies were described in terms of adoption, adaptation and contribution to livelihoods among the rural communities.

Key stakeholders were invited to attend the data collection exercise at the district level. These included District Administrators, Rural District Councils, AGRITEX, NGOs and other government line ministries operational in these districts. At the community level, a specified number of farmers involved in the identified projects were invited to attend the focus group discussions. This report gives a consolidated outline of the intervention technologies that were identified in these three districts and further gives a reflection on some of the lessons learnt during field work which could be of benefit for similar data collection work in the other countries within the Limpopo River Basin. Briefly the main intervention technologies identified were: conservation agriculture in Insiza district, sand water abstraction in Matobo district and fodder production in Gwanda district.

2.0 Data collection

2.1 District level

As indicated earlier, data was collected at two levels in which the first level was done at the district level. For each data collection exercise a specified number of participants was invited. The number of participants involved in the discussions varied from one district to the other. The preferred number was however between eight and ten participants for each discussion. In some cases more than eight participants attended the meeting while in some cases less than eight participants attended the discussions. Table 1 below shows the number of stakeholders who attended the discussions for the district level meetings.

Table 1: Participant numbers for the district level meetings

District	Number of participants
Insiza	16
Matobo	6
Gwanda	5

Data collection was mainly done through focus group discussions and interviews. Interviews were specifically done with NGOs who have implemented the identified successful projects in order to get an in-depth understanding of their projects. Participants were also requested to indicate on the district map and show different land use areas within the district. The discussions were guided by a set of questions (*refer to Annex 1*). The collected data was then digitized in GIS (*refer to Annex 2*).

The figure below shows one of the participants drawing on the district map.

Figure1: One of the participants marking areas faced with water quality problems in Insiza district

After each district level meeting, wards were selected where the community level PGIS exercise was going to be conducted. This was done together with the district stakeholders. Community level meetings were meant to give an in-depth understanding on the identified technologies as viewed by the farmers who have been involved in the implementation of the projects.

2.2 Community level

The second level of data collection was done with selected farmers within wards. In each ward a minimum of two and maximum of three community level meetings were done in order to have a better representation of opinions and views from the farmers across the selected wards. Not more than 15 participants were invited for each community level meeting, however, in some cases more farmers attended the meetings. Traditional leaders were also invited to attend the meetings. Table 2 below shows the number of participants for each community level meeting done.

Table 2: Participant numbers for the community level meetings

District	Ward	Number of females	Number of males	Total
Insiza	19 (village 9a,9b, 10, 11)	7	10	17
	17 (village 18a, 18b, 20, 21)	6	6	12
	4 (village: Khangela)	5	2	7
Matobo	Malaba (7)	8	5	13
	Maqhina (13)	6	5	11
	Sontala (12)	13	4	17
Gwanda	Nhwali (24)	3	6	9
	Silonga (15)	6	7	13

Data was mainly collected through focused group discussions and community mapping. Community mapping was done in order to better understand the identified successful projects as viewed by the beneficiaries of the technology as well as to highlight some of the resources such as water and forests available and being utilized by the communities. The discussions were guided by a set of questions (*refer to Annex 1*) and where applicable the participants were requested to mark on the map some aspects within the ward/village. On average each community level meeting took about 3 to 4 hours. GPS co ordinates for each site where the meeting was done were also recorded for digitizing. The figure below shows some of the participants during the community mapping exercise.

Figure 2: Some of the participants during the community mapping exercise in Matobo district

3.0 Identified successful agriculture water management technologies in Zimbabwe

The following sections give an overview on the identified successful agriculture management technologies in each of the three districts in Zimbabwe.

3.1 Insiza district: Conservation Agriculture

In Insiza district, outcomes from the discussions held showed that conservation agriculture (C.A) is considered to be one of the successful intervention measures. C.A which entails the use of basins and laid out practices and principles of C.A. Basin tillage and mulching are the main techniques which are used to manage agricultural water. Basins, which farmers are encouraged to dig in the winter season and before the onset of the first rains, capture rainfall and confine it into a small area. This results in more water being available to the plant than would otherwise be not available under conventional tillage practices. Mulching traps moisture and reduces evaporation. This also helps in maintaining the soil moist. This technology relies on rain water. Another recent approach to C.A which has been introduced to the communities is the use of ripper tines to prepare the planting rows instead of using the hand held hoe. C.A requires minimum resource utilisation. C.A requires one to have a hoe, pegs, strings, tape measure mulch, manure, fertiliser and seed inputs. It is mainly practiced at a small scale 0.25ha -0.6ha plots. Most recently (2011 farming season), the farmers have been engaged into contract farming of sorghum through conservation agriculture for beer brewing companies i.e. Ingwebu and Sondelani Trust. Farmers were assisted to fund the investment into contract farming by the implementing organisations such as World Vision and the farmers are expected to pay about 10% commitment fund towards the contract.

In relation to gender implications of C.A, it emerged from the discussions that women were mostly involved in the work as it has always been the traditional practice when it comes to farming activities. Only in few cases were men reported to be involved in the practice as some of them engage in other activities like gold panning or migrate to the neighbouring countries. Thus, C.A was also highlighted to be labour intensive especially considering that the initially targeted beneficiaries were poor households who could not afford to hire labour.

Livelihood strategies in the district

Other livelihood strategies in the district include: traditional conventional farming, small scale gold panning activities, livestock (mainly cattle) rearing, horticultural practices through nutrition gardens, fishing and remittances from outside the district and across the borders especially from South Africa. It was argued that about 50% of the population in the district is involved in the illegal gold panning activities. Other households practice a mix of these livelihood strategies.

Adoption and Adaptation

C.A is reported to have been easily adopted by farmers following the setting up of the demonstration plots and the practical trainings that were done with the technical support from Agritex and the implementing organisation(s). The initial involvement of the communities was through meetings and trainings that were done for those farmers who had joined the project. The farmers were also supported through the provision of the seed and fertiliser inputs. In addition, competitions were held among farmers and a show case of the best farmer practices was done and in this way the communities were motivated and encouraged to adopt the technology.

Given that some of the requirements in C.A such as application of mulch and maintaining it throughout the year did not suit the local practices in which farmers usually allow livestock to feed on the maize stover after the harvesting period, the farmers had to adapt such aspects of C.A to suit their situations. Such measures included building high rise structures to keep some of the maize stover as mulch. Furthermore, mulch was considered to be a challenge and hence the percentage mulch cover was reduced to about 30% in the plots and in some cases no mulch was applied in the plots. These were therefore some of the preferences that farmers had to make for them to be able to adopt the technology.

Ownership of the technology was ensured through the trainings that were done, involvement of the stakeholders like Agritex who are the custodians of the agricultural activities within communities as these continue to support the communities even when NGOs end their projects. Farmers were also given the opportunity to take the lead in the project and also train others. Other NGOs like World Vision introduced the concept of field farmer school which allowed farmers to train other community members and hence share their knowledge. Observations from these discussions with the communities showed that the level of ownership of the technology varies. In ward 4 and 17 the farmers showed ownership of the technology while in ward 19 some of the farmers abandoned the technology when World Vision pulled out of the district

Level of support given to the farmers

The implementing organisations gave both technical and material support to the farmers. A number of trainings were done for the farmers and these trainings were done practically in the demonstration plots that were set up within the villages. Other trainings offered focussed on C.A principles, spacing, micro dosing, pre-planting, crop management and post harvesting. Furthermore, the farmers were also provided with inputs which included: fertilizers (Compound D and Ammonium Nitrate; 50kg each), Maize seed (10kg each) and legumes seed (either cowpeas or groundnuts; 3kg each). Therefore the level of support by the implementing partners and Agritex was high and this enabled the farmers to successfully implement conservation agriculture.

Challenges of the intervention

The main challenges of C.A were related to labour intensiveness of the technology, fencing of the C.A plots and competition for maize stover between mulching and livestock feeding. The intervention was initially associated with the poorest members of the communities who did not own draft power and this led to the stigmatisation of such community members. Such challenges were addressed through advising farmers to follow the CA calendar in order to reduce the labour demands and furthermore, mechanised CA (use of ripper tines) has been introduced which requires less labour.

Impacts: crops and livestock

Overall, C.A is reported to have led to the increase in average yields of the crops (especially maize, legumes and small grains) that have been grown under this technology. Some stakeholders reported that the yields have almost doubled from C.A compared to the conventional agriculture. In some cases the increase in yields has been reported to be between 1.5 to 3 times compared to conventional agriculture. These increased yields have enabled the farmers to get enough grain to last them until the next planting season. Some even have surplus grain which they sell and use the money to meet other household needs like school fees and medical costs. In this way the technology has increased the sustainability of crop production.

For example in one of the wards it was reported that sorghum yields were quite high among the farmers using CA. One farmer reported that she managed to harvest three times more sorghum from her plot under CA than from the plot not under CA. She planted 0.25 ha and her yield was 6 x 90kgs bags of sorghum. Other testimonies shared by the farmers included other farmers who indicated to have harvested 5 x 50kgs bags of maize from the C.A plot of 50 x 100 m size. Another farmer reported that she had harvested 2 x 50 kgs of maize from a plot of dimensions 10 x 20m. The average yield from C.A was reported to be about 10 x 50kgs of maize per plot. This was said to be more than what farmers were harvesting from their fields under conventional farmer practice, which were said to yield about 8 x 50kgs of maize from generally the same size of fields. In fact some of the farmers reported that they were getting as low as 6 x 50kgs bags of maize from fields under conventional cultivation. An indicator which was given to show that farmers were harvesting more under CA was that households reported that they now get yields which lasts them from the harvest time until September, which is longer than they used to.

Furthermore, C.A is reported to have led to the conservation and reduced use of fertilisers, seeds and manure as only specified quantities are applied in the field. This is opposed to conventional farming systems in which these inputs are randomly spread in the field and in the process more quantities of these are wasted. The most notable indirect impact in relation to livestock has been the reduction in the use of draft power for farming purposes within the communities. This has therefore allowed livestock to regain weight for re-sale, produce more milk and in the process contributing towards household food security.

Wider impacts of Conservation Agriculture: environmental and human impacts

Some of the wider impacts as seen by the stakeholders include: minimal soil disturbance, reduced soil erosion, soil structure improvement, reduction in the use of pesticides and fertilisers which is beneficial to the environment through reducing the pollution of water sources.

Human impacts

Some of the reported negative effects of the technology are back aches that community members complain from. This is due to the labour intensiveness of C.A (basins) and the farmers have to spend most of the time working in the C.A field.

On a lighter note, the intervention led to the formation of farmer groups that were supporting each other in C.A. They used to visit each other and also work together in the demonstration plots that were set up. In addition, lead farmers were also selected from the communities and this is said to have led to more collaboration among the farmers.

Water use and Water Management

Generally, the water resources in the district are managed by various structures which operate at different levels. ZINWA is responsible for the water resources in the piped (urban) areas of the district while DDF works in the communal areas and mainly assists in repairing of the major breakdowns of boreholes and other water infrastructure. At community level structures such as the borehole management committees have been set up. However, the main sources of water in the farming season are the rains except irrigation schemes and nutrition gardens which rely on dams and borehole water. Irrigation schemes exist in the district but stakeholders indicated that these benefit limited populations within the district/wards.

These water sources were reported to be inaccessible to some communities who have to travel long distances to access water. Water availability in these sources in the dry season is low as some boreholes and dams dry up. This forces the affected communities to rely on water sources from another community group/village and this often results in some conflicts on the use of the water. Water uses include domestic use, crop and vegetables irrigation, livestock watering and brick making. Water is used on a daily basis to meet these needs among the communities. Given the unreliable nature of these water sources, the water available is not enough to meet the crops and livestock needs in the district. The main water quality issues are related to hardness of borehole water and the use of unsafe water sources for domestic purposes like collecting untreated water from dams and unprotected wells.

Conflict management and institutional network

Stakeholders were of the opinion that C.A did not bring any conflicts to the different livelihood strategies, however, it is reported to have created some tension among communities; between the farmers who were involved in the project and those who were not part of the project. Initially, the project was viewed as targeting those poorest community members who felt somehow stigmatised. The project team addressed this by engaging the farmers in discussions and to explain the benefits of the technology to any member of the community regardless of the social status. Furthermore, the traditional leaders were also engaged as they were able to discuss with their communities. The recent approach of mechanised agriculture and contract farming is also seen as a way of addressing these tensions and all interested community members can join the project regardless of whether they are rich or poor.

3.2 Matobo district: Sand water abstraction

The participants who attended the meetings were involved in the sand water abstraction garden projects that have been implemented by three organisations i.e. ORAP, World Vision and Dabane Trust. However, the gardens for these implementing organisations are located in the different villages of the ward and along the rivers that pass through the ward. The first organisation to introduce the technology in the ward in the 90s was Dabane Trust. The farmers that worked with Dabane Trust indicated that they initially had gardens which they were watering using buckets before the intervention was introduced. They approached Dabane Trust when they heard about their sand abstraction projects that they had introduced in other areas in the district through the media. When they started, it was initially a group of females but they now have some men who joined them but it is dominantly a group of women. Targeting of the garden beneficiaries by World Vision and ORAP was reported to be gender balanced.

In total, nine sand water abstraction gardens were identified in the ward along Shashane and Semukwe Rivers. The technology did not result in the change of the conventional rain fed agriculture; instead it complements the cropping system through relish provision since the farmers mainly grow cereals in their conventional rain fed fields. The sizes of the gardens differ; they are 0.75 Ha for those who are supported by Dabane Trust while those being supported by ORAP are 2Ha. The number of farmers per garden also varies; with about 40 households in the ORAP supported gardens while there are about 10 households in the Dabane Trust supported gardens. The farmers under the ORAP project have not yet received any training on system maintenance while a number of trainings were given to the farmers under Dabane Trust. Such trainings include leadership, system maintenance, food preservation and processing, value chain addition and growing vegetables, crop rotation etc. These trainings seem to have also contributed towards the sustainability of the garden projects.

Sand water abstraction, as the name suggests, works by abstracting water trapped in sandy river beds. Water which is abstracted in this way ranges from water lying just below the surface to, in some cases, water in the saturated zone. However, in most rural areas the depth from which is abstracted is limited to a few metres below the surface (5 to 10 meters). Traditionally, communities have abstracted water trapped in sandy river beds by digging in the sand and allowing the water to collect in containers. This has been practised in the semi-arid parts of the catchment, such as in the Matobo, Beitbridge and Gwanda areas. Average rainfall in some parts of the catchment is just about 500mm/a. Surface water is very scarce, due to low rainfall totals and high evaporation rates. This explains why most rivers in the catchment only flow soon after the rains for a few weeks or days of the year. Thus tapping water for agricultural and other uses is very difficult. However, because of the sandiness of the riverbeds, a lot of water is trapped below the surface, and the sand water abstraction project was based on the possibility of tapping this water resource. Another factor which led to the adoption of the project was that in most communities in the catchment the practice of abstracting water from the river beds was quite common. Water users in the district stated that they have always relied on water in the river beds for their domestic needs. This meant that when the sand water abstraction project was started communities were already familiar with the technology and found it easy to adopt.

The technology used to abstract water from sand river beds is a low cost technology which works by drawing water from shallow groundwater supplies. The rowa pump, which lifts water from the river bed, is a displacement pump which was developed under the Protracted Poverty Reduction Programme 2 (PRP II). The pump is connected to a well point in the riverbed. This technology uses two pumps, the Rowa and the Joma pumps, to abstract water from sandy river beds and to pump it into storage tanks. Figure 3 shows the rowa pump. The joma pump is used to pump water to a higher level, such as a storage tank from where water can be fetched for irrigation. Figure4 shows the joma pump.

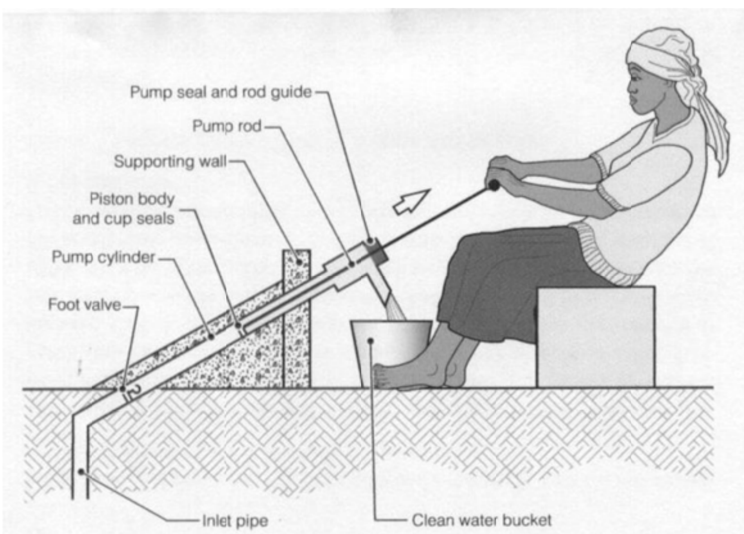


Figure 3. The rower pump (Hussey, n.d)

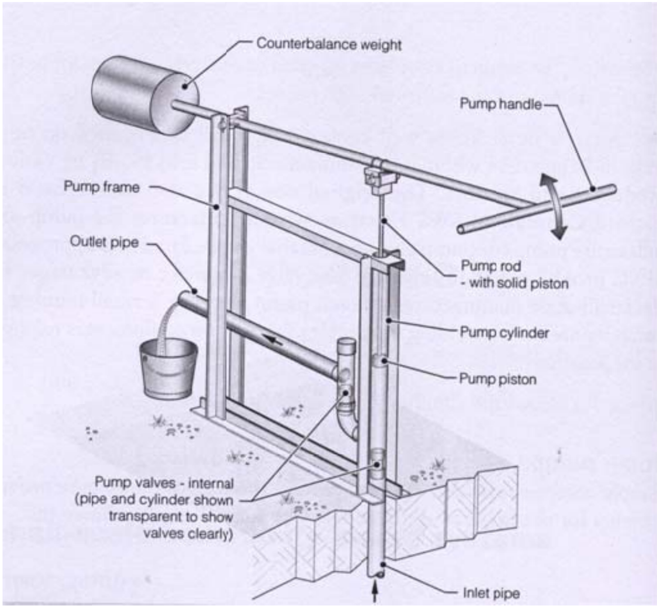


Figure 4 . The Joma pump (Hussey, n.d.)

Sand water abstraction has been used mainly to provide water for both domestic and productive uses. In places where sand abstraction has been implemented water has been used to irrigate gardens. It was reported that in most cases water users were involved in the siting of the pumps, that is in making the choice for where wells should be cited along the river bed, and where the pumps should be positioned. However, water users were not consulted in the actual design of the pumps.

The technology was said to work best where there are sandy river beds which trap water. An important limitation of the technology is that it can only be used where there are gentle slopes (below 5%). The technology was said to be difficulty to utilise in areas where gradient is more than 1:70. It was also reported that because of the nature of the technology, water yields are generally low. This was said to be a compromise meant to keep the pump less heavy and therefore easy to operate.

Adoption and Adaptation

An important finding was that the technology has been widely adopted. It was reported that about 200 rowa and joma pumps have been installed throughout the catchment and also in other parts of the country. It was reported that these sand water abstraction technologies were found in more than half of Zimbabwe's provinces, and in about 40% of the country's districts. The technology has been so successful that the DFID funded PRP II programme has been implementing the technology in Zimbabwe through eight non-governmental organisations and their partners. Although sand water abstraction was started mainly by non-governmental organisations, water users were reported to be starting their own gardens based on sand water abstraction. Some were reported to have started gardens as large as 4 hectares using their own resources. This is much larger than the less than 2 hectare gardens which some non-governmental organisations have started. It was reported that water users were keen to develop sand water abstraction by installing diesel or electricity powered pumps to replace the rowa and the joma pumps. However, the process would remain based on sand water abstraction.

Strong ownership of the technology was realised from the farmers who were assisted by Dabane Trust as this was indicated by the continued existence of the gardens, years after the technology was introduced in the 90s. However, the farmers who were being assisted by the other organisations have not yet realised much benefits as they have had challenges related to the system breakdown. The farmers in one of the wards (Maqhina) indicated that they are determined to make the project a success as they have agreed to contribute some money to purchase a generator to address the labour demands of pumping manually. This could be an indication of the ownership and willingness of the farmers to invest in the technology.

Level of support given to the water users

It was reported that the Dabane Trust trained water users in the basic processes of pump repair and maintenance. Water users were therefore able to carry out simple repairs and maintenance procedures. Water users were also given 'starter packs' to set them up. These consisted of, among other things, wire making machines so that they could make fence for their small gardens.

Challenges of the intervention

It was reported that the two pumps are low cost technology and were said to be easy to maintain. Informants from the Dabane Trust, which has been designing and manufacturing the pumps, stated that the pumps are made from locally available materials which can be fabricated at the local level. However, water users stated that a major problem is that spare parts for the pumps are only obtainable from Dabane Trust. This means that if Dabane Trust does not have the spares in stock the water users cannot repair or maintain the pumps. The fact that spares are only available from Dabane Trust also means that water users are unable to get spares at the local level, but have to travel to Bulawayo, where Dabane Trust is located, to get the spares.

Impacts: crops and livestock

Water users reported that they were able to grow vegetables such as green leafy vegetables, tomatoes, onions, carrots and butternuts using the water from sand abstraction. They reported that they were able to grow these crops all year round since water is available all year round. Livestock were also being watered using the water from sand abstraction, and that was reducing the distance livestock have to walk to water-points in the dry season.

The benefits of the sand abstraction gardens as testified by the farmers who have been practising since the 90s are related to the increased availability of relish within their homesteads. Some even harvest green mealies (maize) from the gardens. Some have been able to buy household assets and pay school fees using the money gained from selling the produce from the gardens. The year 2001 was mentioned as the period when significant harvests were realised from the Dabane Trust supported gardens which even led them to conduct a field day to show case their produce and farming practice. Generally, the farmers indicated that they don't use machinery and they are encouraged to practise organic farming with limited use of fertilisers and pesticides. The farmers indicated that they sell their vegetables locally to other community members and to local business shops. On average the farmers are selling a bundle of green leafy vegetables for USD 1.00. A bucket of tomatoes is being sold for 100 rands and in a day they can sell about 6 buckets. They also dry the green leafy vegetables, process and also sell them. The communities have also donated the vegetables to the nearby hospital (Tshelanyemba) for relish. Generally livelihood strategies in the wards include livestock rearing, rain fed agriculture and remittances from neighbouring countries especially South Africa. In addition to the sand water abstraction for gardens, the project has also introduced the filling of dip tanks through pumping water from the sand abstraction sites. This is reported to have led to the reduction of incidences of ticks affecting livestock.

Water use and Water Management

As far water use and management are concerned, it was reported that in most cases the water is used by users organised around small gardens, and as a result committees are elected to manage the water resources and the pumps. There were no conflicts that were reported in the communities as a result of the use of water resources. However, water users were concerned that in some cases they would prefer to extend their gardens and use more water so as to improve their livelihoods significantly. However, this was being made difficult by the fact that once they extended their gardens the national water authority (ZINWA) would start charging them for water use, which would in turn affect their operations.

Generally, the main sources of water in the ward include rivers, boreholes and dams. However, the reliability of the dams depends on the amount of rainfall received, while for the boreholes the water table gets lower in the dry season. They only get water throughout the year from the sand water abstraction points. In some villages water troughs for watering livestock have been connected to the sand water abstraction points and hence this has led to the improved livestock watering especially in the dry season. The sand water abstraction points are managed by the water point committees who are also guided by the constitution for the garden.

Water availability and access was highlighted as a major challenge in Malaba ward. The main sources of water they rely on are the few operational boreholes and dams which are located in the neighbouring areas/wards. Thus the communities transport the water using donkey drawn carts but women also carry the water on their heads. If they receive rains some of the water is accessed from the rivers/streams but most of these are ephemeral. The area is generally reported to be rocky hence not many boreholes can be sunk. Furthermore, the water is not enough for watering livestock.

On the other hand, water access and availability was reported to be not a challenge in one of the wards in Matobo (Maqhina). Some households have a piped water system. The dam in the ward is managed by the Zimbabwe National Water Authority (ZINWA). The participants indicated that water is generally reliable in their ward and hence it is not a challenge. However, for those households who get their water directly from the dam for domestic uses they were concerns related to its quality since it will be raw water. The water from the sand abstraction point was reported to be reliable and also the dam upstream always has water which is used by the large irrigation scheme. The Valley irrigation scheme was reported not to be operational at the moment as there is a need to repair the damaged pipes. Therefore the available water sources are used for livestock, garden watering and irrigation. However, rainfall is not reliable given that the area generally receives low to below average rainfall and this has an impact on their rain fed agricultural activities.

Conflict management

The major conflict has been related to the extensive cutting down of trees by those community members who want to also set their gardens so that they can benefit from the sand abstraction water points (adoption). This has been resolved by the traditional leaders who have in some cases fined the communities who have been cutting down the trees without due care. Besides, the farmers indicated that the garden projects have brought harmony among the group members as they have to work as a team.

3.3 Gwanda district: Fodder production and preservation

Discussions showed that in Gwanda district, Fodder production and small irrigation projects are some of the intervention measures that have recorded success in the district. In Gwanda the main agricultural activity in the ward is livestock rearing as the climatic conditions do not favour crop production unless if it is done under irrigation. The fodder production and preservation project was initiated in 2008. The intervention technology was an improvement on the existing knowledge on the preservation of stover for livestock feeding. The farmers used to leave the stover in their fields without treating it after harvesting and releasing livestock to feed on it in the dry season.

Fodder production for livestock feeding mainly involves growing of fodder crops like bannar grass, velvet beans, ground nuts and dual purpose crops like forage sorghum for livestock feeding. Farmers then harvest these crops to prepare urea treated stover and sillage (made up of fermented maize, sweet sorghum and beans). Such livestock include goats, sheep, cattle and donkeys. The farmers plant these crops in their individual gardens/fields where they grow other crops. The fodder crops are mainly grown within areas of between 0.1 and 0.2 ha. Some of the gardens are watered by fuel (petrol or diesel) powered pumps while other farmers still rely on rains. The project targeted 81 farmers from ward 24.

Outcomes from the discussions showed that the farmers were initially trained in order to identify their needs before the fodder production project was introduced by the implementing partner. This therefore means that they were involved in designing and during the implementation stages of the project. Some of the farmers involved in the project also hold master farmer certificates from the then Zimbabwe Farmers Union and they were familiar with fodder production and stock feed preparation.

Fodder production was reported to be mainly done by men given that they are traditionally responsible for livestock in a household. However, some women were also reported to be involved especially in planting and watering of the fodder crops while men are responsible for watering and preparation of the stock feed. As a result some men have somehow forgone some of their livelihood strategies like wood carving so that they can work on the project. The main requirement to start the project was reported to be the seed inputs for the fodder crops. This means that the equipment to start the project for the communities can be easily accessed especially considering that there is no need to clear new pieces of land as these crops are grown in already existing gardens/fields.

The technology was reported to work best in those areas where the water table is high so that boreholes can be sunk to water these gardens. There were no reported surface water sources close to these projects that farmers rely on since Gwanda is generally a semi arid region and hence communities only rely on underground and sub surface water. Drawing of the water for watering the fodder crops is done using fuel (petrol, diesel) powered pumps while some farmers rely on solar power. Human power is mainly used during planting and harvesting of the fodder crops. The reliability of fuel powered pumps depends on the availability of fuel in the markets, however, solar power is said to be much reliable though the only possible risk would be theft of the solar equipment.

The project team provided several trainings to the farmers. Some of the trainings were on establishment of fodder gardens, planting, harvesting, preservation, treatment of stover, livestock feeding, body scoring among others. ICRISAT together with AGRITEX also provided the farmers with technical support in terms of agronomic practices and livestock feeding. They conducted monitoring visits and gave advice to the farmers on how to deal with some of the challenges they were encountering. When the project was introduced, the farmers were provided with seed inputs and those who could afford, bought water pumps to draw water from boreholes. Therefore the financial costs to the farmers are related to the investment and maintenance of the technology. The fact some of the farmers managed to buy pumps shows their willingness to invest in the technology while some farmers also wish they could buy these pumps but they cannot afford.

Adoption and Adaptation

It was reported that the adoption of the project by farmers was easy. However, modifications to the intervention were made to suit local conditions. Such modifications included, setting up the shade to dry the harvested fodder and farmers made changes on the mixture ratios of the feed they had to prepare for their livestock especially the quantities and ratios of crops used for stock feed preparation. Furthermore, some of the adaptation measures done by the farmers were the introduction of small irrigations to water the fodder crops so that they do not rely on rains. In addition, the technology was mainly introduced for small livestock such as the goats but the farmers have extended it to ensure that they also provide for other livestock like cattle, sheep and donkeys.

The farmers indicated that it was easy for them to adopt the technology as they didn't have to make any modifications to their farming system. They only had to introduce fodder crops in their existing fields. Local modifications to the technology were done by the individual farmers to suit their situations. Such adaptation measures included practising either intercropping of these fodder crops or growing the crops in separate blocks in the field. Though the project was initially targeted at small livestock especially goats, the farmers had to feed both their small and large livestock. Other local adaptation measures also included irrigating the fodder gardens instead of relying on rains. In this way, farmers were able to establish a seed bank for the fodder crops. Some of the complicated aspects of the technology like the stock feed mixture ratios and quantities for the urea treated stover were adjusted by the farmers as they made their own estimated measurements.

The farmers seemed to have a strong ownership of the technology. This was ensured through the trainings that were done, use of demonstration plots within communities, setting up of farmer discussion platforms, use of lead farmers from these communities and hence in this way the farmers had strong ownership of the project. Farmers received several trainings some of which included: goat rearing, vaccination, dosing, treatment, feeding, and dealing with drought, sillage making, and animal husbandry among others. However, some outstanding trainings included pricing of livestock, grading and weighing. Farmers also organised themselves into groups which allowed them to share knowledge and experiences. In terms of material support, the farmers received starter packs in form of seed inputs from ICRISAT, ORAP, AGRITEX, Gwanda RDC and Matobo Research Station. Partner organisations also provided technical support other than the material support.

The financial cost of adopting the technology to the farmers included purchasing of water pumps which cost about USD 400 each. Other maintenance costs include purchasing fuel for the water pumps. Farmers are willing to invest in the technology though some cannot afford to purchase the water pumps so that they can put their crops under irrigation.

Challenges of the intervention

The main challenge of the intervention was reported to be due to the shortage of rains, prolonged excessive hot and dry conditions which lead to the drying and withering of the crops under the rain fed system. The fodder gardens/fields that are not well fenced off were reported to be prone to livestock destruction.

Impacts: livestock production

The participants indicated that the fodder production projects had brought significant improvements in the availability of stock feed within communities (stock feed security). Reduced incidences of livestock mortality were reported notably in ward 17, 24 and 19. The farmers have more animals to sell and gain increased income from this. Other benefits of the intervention have been related to improved nutrition of livestock and hence good quality meat. Farmers indicated that the main impact of the project has been improved goat rearing, no miscarriages, reduced incidences of diseases, healthy livestock including young ones. Farmers reported to have gained improved knowledge on livestock rearing. All these benefits are said to have been realised in the first year when the technology was introduced. Furthermore, farmers can afford to pay fees, purchase food and clothes using the gains from selling livestock. Farmers further indicated that there are improved standards of living at the household level and harmony among communities. In addition, farmers have had the privilege to exchange knowledge with other farmers from other provinces on fodder production. The introduction of the technology resulted in water management changes as more water had to be used to irrigate the crops and for livestock watering.

The introduction of the technology was reported to have resulted in changes in water management as the communities had to reserve more water towards watering of the fodder crops and for livestock watering in general. The farmers realized improvement in livestock during the first year when the technology was introduced. The project has therefore increased sustainability of livestock rearing in the district given that, this is the main livelihood strategy among the rural communities.

Farmers mainly sell their livestock at established livestock selling points in the wards. Such areas in the district are in ward 24, 15, 12, 13, 17, 19, 11 and 9. Participants indicated that the frequency of selling of livestock especially goats has increased since the intervention. The average price for a goat was indicated to be about 30USD, an increase from the average price of 15 USD before the intervention. Furthermore, the number of goats sold has generally increased since the intervention. Farmers indicated that they sell their livestock to buyers from other provinces in the country and also among themselves.

Other non financial benefits of owning livestock include provision of relish, manure and payment of the bride prize, prestige within the community, availability of draft power especially donkeys and cattle, increased milk availability for household consumption. One notable change in infrastructure within communities due to the intervention was reported to be the construction of small livestock dip tanks which communities did not have construction of goat sale pans and improved housing within individual homesteads.

Wider impacts of Fodder production: environmental and human impacts

The wider environmental impacts of the project were reported to have been due to reduced pressure on the veld and hence allowing for increase in biodiversity. On the other hand, the intervention also contributed to increased deforestation as the farmers had to get thorn bush to fence off their gardens. Given the improved quality and number of livestock in the district, there were reported cases of livestock theft.

In terms of the livestock, the intervention led to reduced livestock pests and diseases, improved nutrition, increased household income, improved farmer status, availability of manure. Furthermore, the project resulted in the formation of farmer discussion platforms such as the innovation platforms, producer groups and stock feed buyers. Some farmers opt for barter exchange of livestock for stock feed instead of getting money and hence the intervention has brought increased collaboration among farmers than before.

Water use and Water Management

Participants indicated that all the water in the district belongs to the Zimbabwe National Water Authority (ZINWA). At the community level the use of the water resources is guided by the community by-laws, which are over seen by the laid out structures such as the traditional leaders i.e. the chief, headman and kraal heads. Water point committees also exist to manage the use of these resources such as community boreholes. For example, a borehole within a school is regarded as private property and it is managed by the school committee.

Farmers mainly access water from groundwater and subsurface sources; however, during the rainy season they also access water from rivers/streams but most of these are ephemeral. Other sources of water are open wells. There were health concerns related to the quality of water from open wells and a few incidences of diarrhoea break outs were reported due to the use of unclean water.Water sources in the district are generally accessible though not reliable especially the rains and some boreholes which dry up easily. Water is mainly used for livestock watering, domestic uses and crop irrigation. Given the hot and dry conditions in the district, water use is frequently high. The water used for irrigation and livestock watering is mainly transported through canals and fuel powered pumps. In general, the water is not enough to meet all these needs owing to the poor rainfall patterns. Over the years since the inception of the project, some fodder crops grown under rain fed agriculture have been affected by the poor rains and farmers have failed to harvest fodder crops to prepare livestock feed, this situation forced some farmers to irrigate these crops in their gardens using fuel powered water pumps.

Conflict management

The participants indicated that they have not been any conflicts among community members due to the introduction of the technology. However, it is envisaged that they could be potential conflict and tensions in the future as the technology is being adopted by more farmers. This could be as a result of the increased demand for water and more farmers would want to put their fodder gardens under irrigation, thereby drawing more water from the few existing water sources and also intensifying competition for water with other users in the district.

The intervention is reported to have brought harmony and co operation among farmers as this has resulted in the formation of farmer groups (Innovation platforms), where farmers have the liberty to decide the prices they want for their livestock, they can decide to conduct livestock sells or to barn the auctions. In this way they talk with one voice and can make informed decisions on how and when they want to sell their livestock.

3.4 Gwanda district: Small scale irrigation garden project

Another technology which was identified to have been successful in Gwanda are the small scale irrigation garden projects. One such project is in Silonga ward (15) which is located in the southern part of Gwanda district. The greater part of this part of the district is characterised by semi arid conditions. This is also considered to be among vulnerable wards to food insecurity in the district. The area is characterised by excessive dry and hot conditions especially during the dry summer season. Therefore, the main agricultural activity in the ward is livestock rearing as the climatic conditions do not favour crop production unless if it is done under irrigation.

The Silonga irrigation project was initiated in 2010. Farmers in this project grow different types of vegetables under irrigation. The project consists of 56 members each with their own vegetable beds. The main crops grown include green leafy vegetables, cabbage, tomatoes and beetroot. The vegetables are watered using the bucket system. The concept of vegetable gardens was not new to the communities as they had seen it being practised by other community members. The main implementing organisation is CARE International. The farmers approached the organisation with this request to set up the garden. The project proposal was written by the farmers and CARE international was involved in the design of the garden i.e. its location in relation to the water sources that are being used to water the vegetables and the irrigation system.

The project currently has a high number of women compared to men as it was indicated that there are 42 women and 14 men. This could be explained by the fact that traditionally women have been responsible for the provision of relish/vegetables at home. The equipment needed to start the project includes seed inputs, fence, poles, manure and cement. Farmers indicated that this equipment is readily available in the local markets. The farmers each contributed USD 1.00 each towards the purchase of seed inputs. Equipment for head water works and other equipment such as the fence, poles and cement was provided by the implementing organisation.

The farmers who got involved in the project joined voluntarily. However, the number of farmers who wanted to join the project was higher and each village was requested to select a specified number of farmers to join the project. The participants indicated that it was easy to adopt the technology as it was not new to them. Furthermore, they were trained by AGRITEX on growing vegetables and hence it was not a challenge for them to put it into practice. Farmers felt that they have strong ownership of the project as they have contributed their monies towards the purchase of the seed inputs and the land where the garden is located belongs to them as a community.

At the moment, water is drawn from the nearby stream using a petrol powered generator while the operation of the siphon is based on the gradient as it goes over the dam wall. Currently, the power source (generator) has been reliable but there is a need for a contingency plan especially if the generator breaks down as this would affect the project since there will be no water. Farmers also had fears related to reducing water levels in the dam due to increased demand from different water users and uses. Currently, the labour demands of the technology were reported to be high since the siphon broke down hence the farmers spend the whole day watering as they use buckets to carry water.

Farmers indicated that they received several trainings which include: farming as a business, marketing/demand management, crop management. However, training gaps were also identified especially related to conflict management. The farmers did not get any loans from the implementing partner but they instead contributed money towards the purchase of some of the equipment like the generator which costed USD 200 and the group contributed

10% towards its purchase. Furthermore, the farmers pay monthly subscriptions of 5 rands each towards the purchase of fuel for the generator. Therefore, the group has contributed towards both the investment and maintenance costs of the project. Farmers indicated that they are willing to invest further in the technology and if they are to get loans they would want to construct storerooms for the vegetables, replace the current wooden poles with metal ones which are not prone to termite attack and also avoid cutting down of trees for poles. Furthermore, they would want to drill a borehole as an alternative water source.

Impacts: crop production

Some of the notable impacts from the project include harvesting and selling of green leafy vegetables and provision of relish to their homesteads. The project led to some changes in water management as they also had to draw water from the dam and hence competing with other users. The demand for water is envisaged to increase in the dry season which if not well managed will result is tension over water use between the different water users. The farmers have also had to use pesticides to control pests. Currently, farmers sell their vegetables to other community members but they also send some of the vegetables to two supermarkets in Gwanda. They are also still exploring more markets for their produce. They transport their produce every weekend using transport (car) offered by well wishers. On average they sell 150 bundles (about 300kg) of green leafy vegetables per week. The supermarkets are buying the vegetables for 6 rands/bundle. No infrastructural developments have been realised yet since the project is only realising its benefits now.

Water use and water management in Silonga ward

The main sources of water in the ward include a large dam (Silonga dam) and some boreholes. The dam is the main source of water in the ward and it has been reliable for many years now since it doesn’t dry out during the dry season. Some of the boreholes were reported not be reliable especially in the dry season and some of them breakdown frequently. Water is mainly used to irrigate vegetable gardens, domestic uses, livestock watering and breeding of crocodiles in the dam. Generally, the water is not enough in the ward as the dam also serves other communities in the neighbouring wards when their boreholes and dams dry out in the dry season.

The main water quality issue is related to hard water from the boreholes and this is also reported to be a contributing factor towards the repeated breakdown of these boreholes. Farmers mainly transport water using buckets, wheel barrows and donkey drawn carts. Since the project recently started, the farmers indicated that the project would work better during the years when the rains are good as other dams in the neighbouring wards will have water hence reducing the pressure on the main dam on which the project is dependent on. Of late, it was reported that the siphon that draws the water from the dam into the garden is not working which is forcing the farmers to carry water using buckets. The watering system is strenuous as they have to rely on the water that is pumped from the stream below the dam (breather).

Summary for Silonga garden project

In conclusion, the farmers consider the garden project to be a success for now as they have been able to establish the garden and harvest some vegetables but they are some urgent issues that they have to address to ensure the sustainability of the project. These are related to water management and they have to set up a water management committee and establish an alternative means of water supply to the garden in the event the current systems breakdown. Furthermore, there are some training gaps on some technical issues such as conflict management. The group also has to find their own means of transport that will benefit all garden members and also this would ensure that they deliver the vegetables more often to the markets in Gwanda.

4.0 Identified success factors

Outcomes from the discussions done with the district authorities and communities in all the districts showed that some of the factors that have contributed to the successful implementation of the identified intervention measures can be summarised as follows:

- If the project beneficiaries realize benefits or positive impacts from the intervention, the project is likely to be a success e.g. for the case of conservation farming, the increase in yields compared to conventional farming contributed to the success of the C.A in Insiza district.
- Building the capacity of the farmers through trainings and provision of both material and technical support. Furthermore, the use of evidence based trainings such as setting up demonstration plots, show casing of best farmer practices and use of lead farmers ensures sustainability of projects.
- The involvement of major stakeholders (multi-stakeholder approach) such as Agritex and district authorities contributes to the successful adoption of community projects and also ensures the continuity of the intervention even when the implementing partners pull out of the district. In addition, there is a need to engage local authorities at all levels of the project starting from the planning stage, implementation, monitoring and evaluation of the project.
- There should be strong community ownership of the project and implementing partners should ensure that communities own the intervention projects.
- Inputs required for the projects must be locally available or easily accessible for communities to adopt projects. Such inputs include seed inputs, fuel and materials to set up the project sites.
- The project has to be relevant and contribute towards addressing the needs of the communities such as the fodder project which farmers consider to be relevant in the semi arid conditions of Gwanda and the project also addresses their needs related to livestock rearing.
- Bottom-up approach can lead to successful adoption and ownership of the technology.
- If the farmers are motivated and committed in the project, it is likely to succeed.

In brief, the outcomes from the discussion showed that the success of these interventions also has to do with the involvement of the farmers at the initial stages of projects. If farmers realize the benefits of the project and have ownership of the technology, they can even invest further in the technology due to the numerous benefits they will be realizing as demonstrated by the farmers from these three districts. However, these success factors are not exclusive but rather a combination of one or more them.

5.0 Conclusion

In conclusion, the most common technologies identified in the three districts include conservation agriculture in Insiza, sand water abstraction in Matobo and fodder production in Gwanda. There are also a range of other intervention measures that have been introduced in these districts which have also recorded varying levels of success while others have failed. Success of these intervention measures hinges on the ownership of the projects by the communities as this would ensure their sustainability. Furthermore, technical support and cooperation with the custodians of agriculture related activities within the communities i.e. AGRITEX remains a crucial factor in ensuring the successful implementation of these technologies.

Of paramount importance, is the fact that these identified successful intervention measures have contributed to the improvement of household food security considering the challenges related to poor rainfall patterns hence persistent and recurrent droughts that communities are faced with. Such drought conditions threaten rain fed agriculture productivity, lead to food insecurity, affect livelihoods and livestock in these areas. Therefore, lessons learnt from these case studies can be replicated in those parts of the Limpopo River Basin that are faced with similar challenges related to poor rainfall patterns and excessive dry and hot conditions.

ANNEXES

Annex 1: Guiding questions for the district and community level meetings

District level meeting: guiding questions

Characteristics of the Project

Aim: To get an overall description of the project and its characteristics which we will discuss in more detail in the following sections.

- What interventions/AWM technologies did the project introduce?
- Where were they introduced? ➲ <u>If possible mark the extent on the map.</u>
- When did it start and end? How many households or farmers did the project team aim to work with?
- How many farmers/households (from the knowledge of the project team) are still using the technology?
- What other organisations did the project work with?

Design and implications of the technology

*Aim: To identify how the project was designed and the level of community involvement. It should also look explicitly at the **gender** implications of the technology.*

- Were communities involved in the selection of technologies/interventions?
- Were they involved in designing the project? If so at what stages and how?
- Was there existing knowledge of the project intervention/technology already present in the participating communities?
- Were the specific implications of the technology on men's and women's livelihoods considered?
- For the technology/intervention to be outscaled – was all the required equipment available to the local communities? Could they outscale it if they wanted to (or were there barriers)?

Adoption and Adaptation

Aim: How were communities and people involved in the running of the project, how did the project get 'buy-into' the technology and transfer the ownership of the innovation buy to the people? Also what were the implications of utilising the technology for the farming systems – and did this lead to adaptation?

- How did the project get communities or people involved? What worked and what didn't?

- How easy was it for communities or people to adopt the technology – did they have to modify their farming/cropping system – or could it work in their existing approach?
- Did the community or people involved in the intervention modify or adapt the technology to local conditions/preferences?
- How did you ensure ownership of the technology by the community or people?
- What were the main challenges for adoption – and how did the project overcome them?

Technological Requirements

Aim: To identify the bio-physical requirements for the technology. Some questions/themes will only be relevant for specific types of technology, for example 'depth to groundwater' is only relevant for technologies such as treadle pumps that accessing this underground water resource.

- Soil types: On what soils did the technology work? Where did it not work?➲ <u>If possible mark the appropriate and inappropriate soils on the first acetate.</u>
- Soil erosion: Is soil erosion a problem? If so where?➲ <u>If possible mark the soil erosion issues on the map.</u>
- Slope: On what slopes did the technology work? Where did it not work? Slope should be classified as: flat (0-2 %), gentle (2-5%), moderate (5-8%), rolling (8-16%), hilly (16-30%), steep (30-60%), very steep (>60%) ➲ <u>If possible mark the suitable areas map.</u>
- Water Table: Where does the technology work in terms of the depth of the water table?
- Surface Water: How far away from the watercourse do you think the technology could work?
- Water Quality: Is water quality a problem? If so - what kind of problem (sediment load, salts, heavy metals, faecal matter)?
- Resilience of the technology: Has the technology been damaged by livestock/wild life?

Water Use and Water Management

Aim: how is water managed and utilised in general – there are specific questions in relation to the technology/intervention and water management later on.

- What are the institutional arrangements for water use?
- Where is water accessed from by farmers through the season? (rain, surface, ground water) ➲ <u>If possible mark these locations on the map.</u>

- How accessible are the water sources – are there any barriers to use?
- How reliable are these water sources?
- How is the water used: Crop irrigation, Watering livestock, Household/domestic use? How frequently is it used?
- Is there enough water available (for crops and livestock)?
- Are there any water quality issues affecting their use?
- How do people transport water to their fields/livestock (focus on additional delivery systems used in conjunction with the technology/intervention)?
- Do you think the years the project was running were good/normal/bad in terms of water availability? Why?

Details of the AWM technology/intervention

Aim: What are the inputs (power, labour, financial, educational) required to make the technology work successfully both from the community and the project team.

- How is the technology powered? Where does this power source come from? (E.g. electricity, diesel, human, animal, solar...). How reliable is this power source – are there any problems with accessing power reliably?
- What labour inputs are required to utilise the technology/intervention successfully? Who provides this labour in the project communities (gender balance, labourers etc)?
- Has the required amount of farm labour changed since the technology was introduced? (This change could be positive – or negative, for example, the farmers can now achieve an additional harvest, but this requires that they work in the fields throughout the year)
- Did the project team provide training to the community? If yes what kind(s) (technology, maintenance, farm management)? In general, what level of support did the project team and partner organisations provide to the communities to help ensure the successful implementation of the intervention?
- Did you provide or support access to loans, grants, subsidies, etc. to help fund the investment in the technology for farmers?
- What is the financial cost for farmers to adopt technology (investment, maintenance)? Were farmers willing and able (financially) to make investments in AWM technology improvements?

Impacts – Crop Production

These questions were only asked if the AWM intervention was focussed on crop production.

Aim: To identify the benefits to the farmers resulting from using the technology/intervention in their crop production.

- Overall has the technology resulted in any improvement in cropping? If so is this due to: Change in number of **harvests**? And/or - changes in average **yields** for each crop? ➲ Mark the locations of these improvements in relation to the landuse/crop fields mapped on the acetate in Stage 6.
- Did the introduction of the intervention result in changes in water management? What crop growing stage is now most critical to water availability? Was this different to before the AWM intervention was introduced?
- Were these improvements also linked to changes in other farm inputs: fertilisers or pesticides, machinery?
- In what year, after farmers got the technology, did improvements happen?
- Overall has the project increased sustainability of crop production?

Impacts – Livestock Production

These questions were only asked if the AWM intervention was focussed on livestock production.

Aim: To identify the benefits to the farmers resulting from using the technology/intervention in their livestock production.

- Did the AWM technology result in a change in the quality of grazing land? ➲ Mark these locations these improvements in relation to the landuse/grazing areas mapped on the acetate in Stage 6
- How has the technology improved livestock management and/or yields (meat, milk, quality of livestock) and if so by how much?
- Did the introduction of the intervention result in changes in water management?
- In what year, after farmers got the technology, did any improvements in livestock production occur?

Overall has the project increased sustainability of livestock keeping?

Infrastructure – Crop Production

These questions were only asked if the AWM intervention was focussed on crop production.

Aim: The selling of produce by the farmers.

- Where are the markets farmers sell their produce at? ➲ Where possible mark the locations on the acetate - or else just record the place names
- How do the farmers transport their produce to market?
- On average how much of their crop is sold (this can be the % of the crop sold)? Has this percentage changed since intervention?
- Were there any other changes in infrastructure in the project communities that could have helped achieve the successful implementation of the AWM intervention (new/improved roads, schools, government changes (policies, subsidies, etc.)) ➲ Where possible mark the locations of these changes on the second acetate

Infrastructure – Livestock Production

These questions were only asked if the AWM intervention was focussed on livestock production.

Aim: The selling of produce by the farmers.

- Where are the markets farmers sell their livestock at? ➲ Where possible mark the locations on the acetate - or else just record the place names
- On average what (financial) income do farmers get from their livestock? Has this changed since the project intervention?
- Are there any other non-financial benefits of owning livestock? Have these changed since the project intervention?
- Were there any other changes in infrastructure in the project communities that could have helped achieve the successful implementation of the AWM intervention (new/improved roads, schools, government changes (policies, subsidies, etc.)) ➲ Where possible mark the locations of these changes on the acetate

Conflict Management

Aim: To identify if the introduction of the AWM intervention has exacerbated any conflicts between livelihoods and over water use.

- Have there been changes in the nature or severity of conflicts between different livelihood strategies or communities resulting from the introduction of the technology?
- Have there been changes in conflicts related to water between different livelihood strategies or communities resulting from the introduction of the technology?
- Did the project manage/address these conflicts? If so how?

Wider Impacts of the AWM Intervention

Aim: To identify if the introduction of the AWM intervention has led to any environmental and human impacts

Environmental Impacts

- Have there been wider environmental impacts resulting from the introduction of the AWM intervention? (These could be positive – or negative – or a mixture).

  Question in terms of:

  - Water availability (upstream/downstream/between different livelihoods)
  - Water quality
  - Biodiversity
  - Pests
  - Salinity

- In case of negative ones – how have these been managed (by the community and/or project)?

Human Impacts

- Were there any health related issues resulting from the introduction of the AWM intervention? (These could be positive – or negative – or a mixture).
- Did the introduction of the AWM technology result in any new community or farmers groups being established?
- Did the introduction of the AWM technology result in farmers collaborating or working together more than before?

Key Lessons Learnt

Aim: Key lessons learnt by the project team.

- Were there any **critical factors** that made the project a success?
- What do they feel are the key factors for **wider uptake**?
- What **main lessons** were learned by doing this project?
- Ask if they have any more critical points to share...?

Community level guiding questions

Characteristics of the intervention

*Aim: To identify how the technology is used and introduced. It should also look explicitly at the **gender** implications of the technology.*

- What type(s) of technology are you using?
- Did you know the technology introduced by the intervention already?
- Have you been involved in the design of the technologies?
- Are there specific implications of the technology on men's and women's livelihoods?
- Is the required equipment available for anyone else to start using the technology?

Adoption and Adaptation

Aim: How were communities involved in the running of the project, how did the project get 'buy-into' the technology and transfer the ownership of the innovation buy to the community? Also what were the implications of utilising the technology for the farming systems – and did this lead to adaptation?

- How did you get involved?
- How easy was it for you to adopt the technology – did you have to modify your farming/cropping system – or could it work in your existing approach?
- Did you modify or adapt the technology to local conditions/preferences?
- Do you have ownership of the technology?

Land Use Classification

Aim: To identify the land use in the area and the institutional arrangements for resource management.

- For each participant: where are their crop fields? What are the crops types? Where are vegetable gardens? Where is grazing land? Etc…➲ Mark the different land uses on the map
- How are crop areas, and grazing areas etc. managed?
- Where are other resources participants use: Forest resources including fuelwood, building materials etc? Wild foods? Medicinal plants? Etc…➲ Mark the different resources on the map
- How are these other resources managed?
- Has the use and demand of these resources changed since the intervention?

Water Use and Water Management

Aim: how is water managed and utilised in general – there are specific questions in relation to the technology/intervention and water management later on.

- How is water use organised?
- Where is water accessed from by farmers through the season? (rain, surface, ground water) ➲ <u>If possible mark these locations on the map</u>
- How accessible are the water sources – are there any barriers to use?
- How reliable are these water sources?
- How is the water used: Crop irrigation, Watering livestock, Household/domestic use? How frequently is it used?
- Is there enough water available (for crops and livestock)?
- Are there any water quality issues affecting their use?
- How do you transport water to your fields/livestock (focus on additional delivery systems used in conjunction with the technology/intervention)?
- Do you think the years the project was running were good/normal/bad in terms of water availability? Why?

Details of the AWM technology/intervention

Aim: What are the inputs (power, labour, financial, educational) required to make the technology work successfully both from the community and the project team.

- How is the technology powered? Where does this power source come from? (E.g. electricity, diesel, human, animal, solar...). How reliable is this power source – are there any problems with accessing power?
- What labour inputs are required to utilise the technology/intervention successfully? Who provides this labour (men, women, children, labourers etc)?
- Has the required amount of farm labour changed since the technology was introduced, how?
- Did receive training? If yes what kind(s) (technology, maintenance, farm management)? In general, what level of support did you get from the project team and partner organisations?
- Did you need loans, grants, subsidies, etc. and got support from the project to access them?

- What has been the financial cost to adopt the technology (investment, maintenance)?
- Have you invested in further AWM technology improvements? Would you be willing to do so?

Impacts – Livestock Production

Aim: To identify the benefits to the farmers resulting from using the technology/intervention in their livestock production.

- Did the AWM technology result in a change in the quality of grazing land? ➲ <u>Mark these locations these improvements in relation to the landuse/grazing areas mapped on the acetate in Stage 6</u>
- How has the technology improved livestock management and/or yields (meat, milk, quality of livestock) and if so by how much?
- Did the introduction of the intervention result in changes in water management?
- In what year, after farmers got the technology, did any improvements in livestock production occur?

  Overall has the project increased sustainability of livestock keeping?

Impacts – Crop Production

Aim: To identify the benefits to the farmers resulting from using the technology/intervention in their crop production.

- Overall has the technology resulted in any improvement in cropping? If so is this due to: Change in number of **harvests**? And/or - changes in average **yields** for each crop? ➲ <u>Mark the locations of these improvements in relation to the landuse/crop fields mapped above</u>
- Did the introduction of the intervention result in changes in water management? What crop growing stage is now most critical to water availability? Was this different to before the AWM intervention was introduced?
- Have you also changed other farm inputs: fertilisers or pesticides, machinery?
- In what year, after you got the technology, did improvements happen?

Infrastructure – Livestock Production

Aim: The selling of produce by the farmers.

- Where are the markets farmers sell their livestock at? ➲ <u>Where possible mark the locations on the acetate - or else just record the place names</u>

- On average what (financial) income do farmers get from their livestock? Has this changed since the project intervention?
- Are there any other non-financial benefits of owning livestock? Have these changed since the project intervention?
- Were there any other changes in infrastructure in the project communities that could have helped achieve the successful implementation of the AWM intervention (new/improved roads, schools, government changes (policies, subsidies, etc.)) ➲ <u>Where possible mark the locations of these changes on the acetate</u>

Infrastructure – Crop Production

Aim: The selling of produce by the farmers.

- Where are the markets you sell your produce at? ➲ <u>Where possible mark the locations on the map - or else just record the place names</u>
- How do you transport your produce to the market?
- On average how much of your crop do you sell (this can be the % of the crop sold)? Has this percentage changed since intervention?
- Were there any other changes in infrastructure that helped to achieve the successful implementation of the AWM intervention (new/improved roads, schools, government changes (policies, subsidies, etc.)) ➲ <u>Where possible mark the locations of these changes on the map</u>

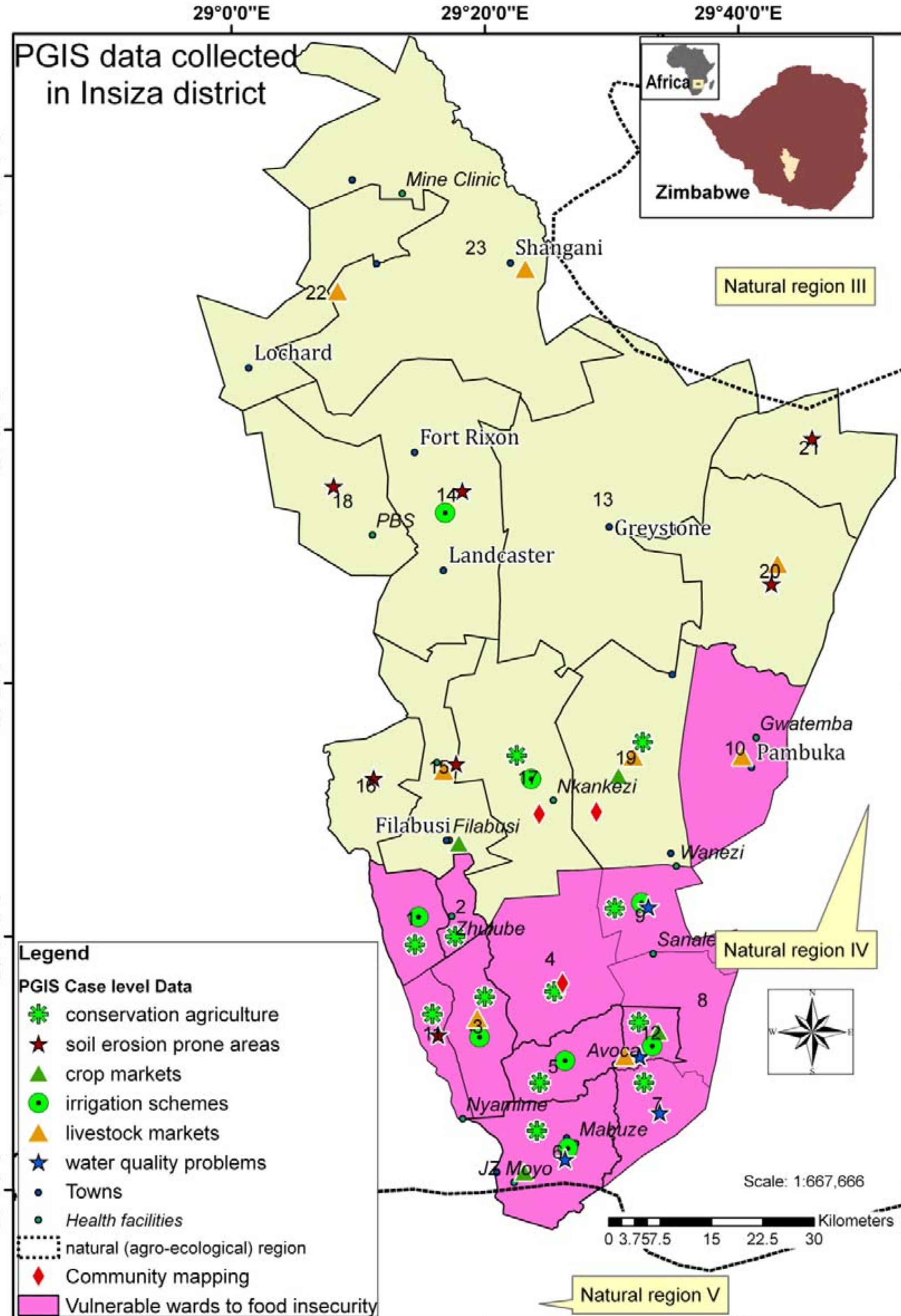
Conflict Management

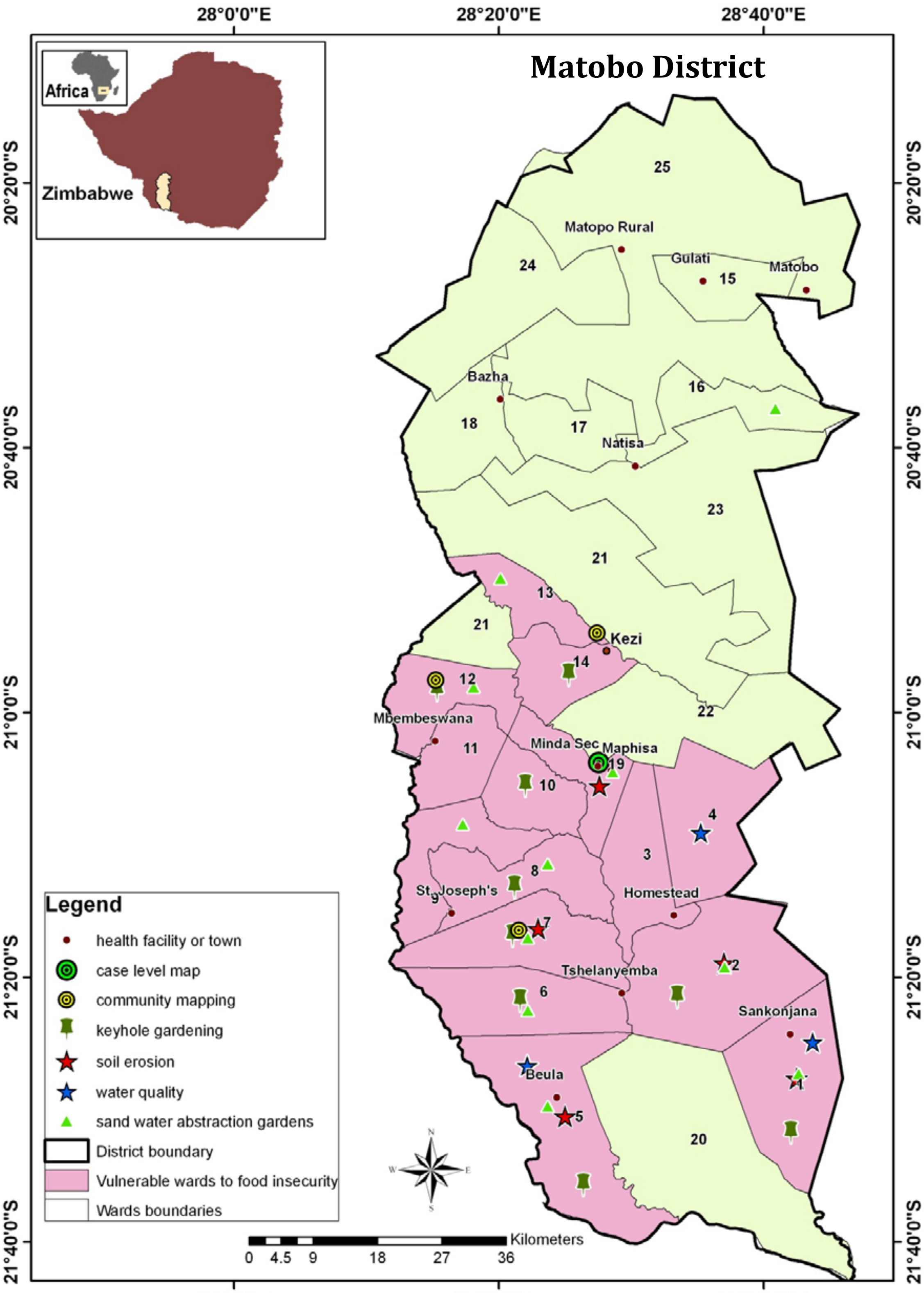
Aim: To identify if the introduction of the AWM intervention has exacerbated any conflicts between livelihoods and over water use.

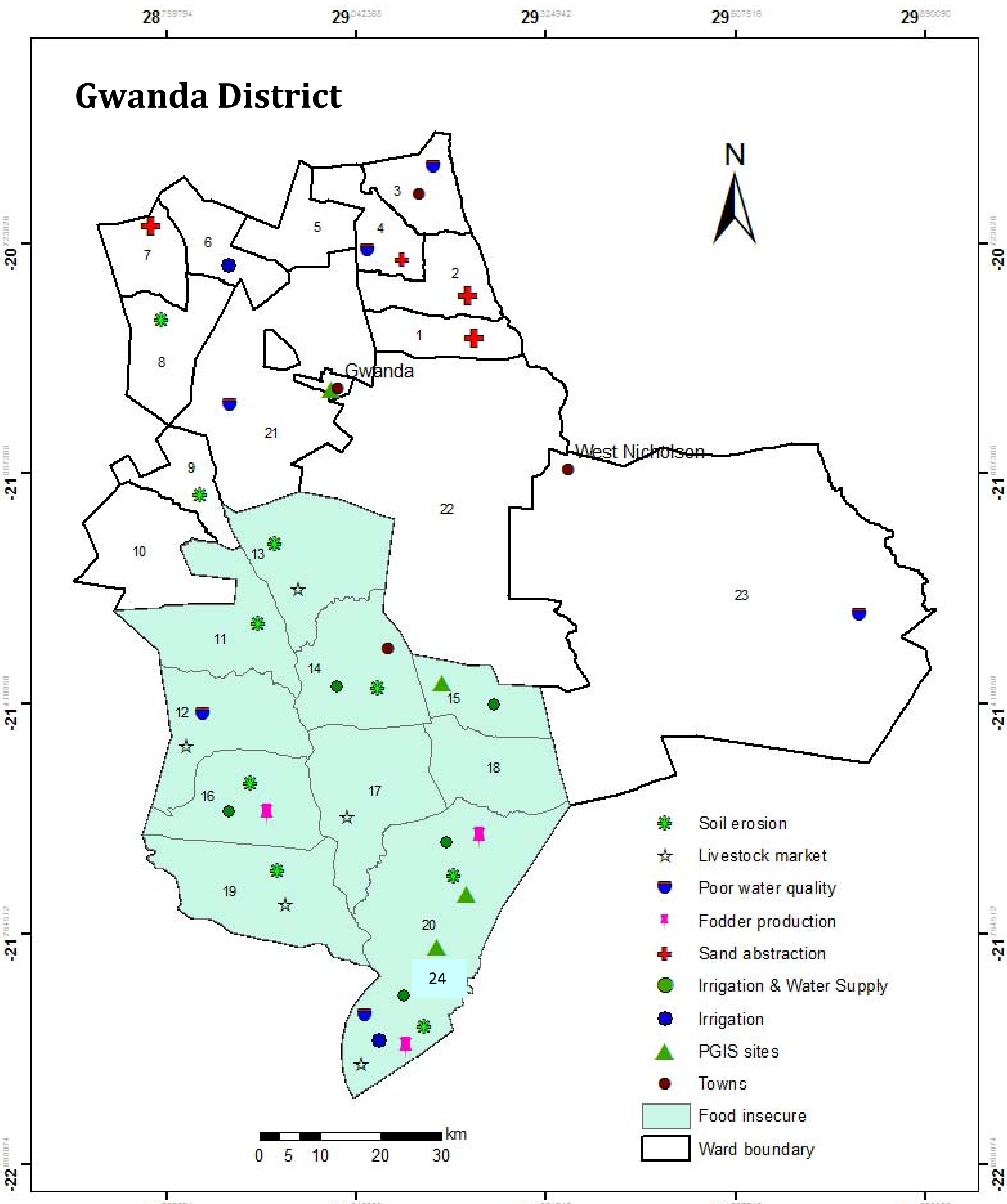
- Have there been changes in the nature or severity of conflicts between different livelihood strategies or communities resulting from the introduction of the technology?
- Have there been changes in conflicts related to water between different livelihood strategies or communities resulting from the introduction of the technology?

How are these managed?

ANNEX 2: Digitised district maps




28°0'0"E
28°20'0"E
28°40'0"E
20°20'0"S
20°40'0"S
21°0'0"S
21°20'0"S
21°40'0"S
Matobo District
Africa
Zimbabwe
25
Matopo Rural
Gulati
15
Matobo
24
Bazha
16
18
17
Natisa
23
21
13
21
Kezi
14
12
22
Mbembeswana
Minda Sec
Maphisa
11
19
10
4
3
8
St Joseph's
9
Homestead
7
2
Tshelanyemba
6
Sankonjana
Beula
5
20
Legend
health facility or town
case level map
community mapping
keyhole gardening
soil erosion
water quality
sand water abstraction gardens
District boundary
Vulnerable wards to food insecurity
Wards boundaries
Kilometers
0
4.5
9
18
27
36


Gwanda District
N
Gwanda
West Nicholson
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Soil erosion
Livestock market
Poor water quality
Fodder production
Sand abstraction
Irrigation & Water Supply
Irrigation
PGIS sites
Towns
Food insecure
Ward boundary
km
0 5 10 20 30