

**Experiences with Micro Agricultural Water Management
Technologies:
Namibia**

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**An input to the Study on Agricultural Water Management Technologies for Small Scale
Farmers in Southern Africa: An Inventory and Assessment of Experiences, Good Practices
and Costs**

Report on Experiences with Micro Irrigation Technologies: Namibia

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1. Introduction

Purpose

Water for agriculture is increasingly recognized as a major constraint to improving the lives of the rural poor and is an important component of rural livelihood programs to be established in Southern Africa. The overall goal is to contribute to improving the lives of rural poor through better and sustainable agricultural water technologies/ practices leading to increased agricultural productivity and incomes for small farmers in Southern Africa. FAO Investment Centre is designing a regional program on agricultural water management on behalf of SADC and the African Development Bank. This project is meant to provide inputs into this larger program.

Specifically, the project aims to identify suitable innovative agricultural water management techniques and approaches and determine the corresponding unit costs as a basis for agricultural water investment planning in the pilot SADC countries. This project is linked to a USAID-funded project, “An Inventory of Agricultural Water Technologies and Practices in Southern Africa and an Assessment of Poverty Impacts of Most Promising Technologies.” The two are being implemented in a way that will ensure synergies between them.

Scope and definition

Agricultural water management embraces a whole range of wider practices including in situ moisture conservation, water harvesting, rainwater harvesting, supplementary irrigation, irrigation, various techniques of wetland development such as treadle pumps, drip irrigation systems, sprinkler systems, etc.

Namibia is a water scarce country. Livestock production is the major agricultural activity for both small-scale and commercial farmers, while the current and potential development of irrigation schemes is limited. In this context, any study on agricultural water use in Namibia would be incomplete without attention to water development in support of livestock production.

This report provides information on the promotion of water management technologies in support of poverty alleviation in Namibia, namely livestock watering, conservation agriculture, rainwater harvesting and irrigation.

Methodology

The terms of reference required a desk study and key interviews to identify the most promising technologies, rather than a comprehensive inventory of all the water management technologies used in Namibia. The desk study included an internet search, telephone interviews and a country visit to interview key stakeholders and collect relevant literature.

Although not required in the TOR, limited field visits were conducted in the North of Namibia, which has somewhat higher rainfall (but still low at two-thirds of the world average rainfall) and where the largest percentage of the Namibian population and the largest number of poor people live.

The Ministry of Agriculture and Water Resources Development (MAWRD) were extremely helpful in arranging interviews with relevant stakeholders in government departments, non-governmental and private sector organizations.

Limitations

?? This study does not intend to provide a comprehensive representation of all

agricultural water management technologies in Namibia. Rather, it focuses on the most commonly promoted and/or most promising technologies.

?? Literature sourced from the internet (on Namibia and other countries) tended to be anecdotal and seldom provided technical specifications, information on costs, or on the details and extent of uptake of technologies.

?? The information on water management technologies in this report is based largely on the experiences and opinions of the promoters of the technologies. There has been hardly any opportunity to get the viewpoint and experiences of the users of the technologies directly. The author views this as a significant shortcoming in the study.

?? Information on indigenous agricultural water management practices in Namibia were obtained during the limited field visits only. Due to the limited scope of the field visits, this study thus most probably fail to adequately reflect indigenous practices and farmers' rationale for their use.

2. Overview of Food Security, Hunger, Agriculture and Water

Namibia has a population of 1.8 million and is one of the most sparsely populated countries in Sub-Saharan Africa. The largest population concentration and also the largest prevalence of poverty are found in the Northern parts of the country.

While Namibia is a middle-income country, it also has a highly skewed income distribution and is concerned that poverty, hunger and vulnerability is hidden by its middle-income status. Therefore, Namibia is currently engaged in a comprehensive programme of Participatory Poverty Assessments (PPAs), which aims to elucidate the nature and prevalence of poverty and hunger. One quote from these assessments is “we live like flies, looking for food all the time and eventually dying in the milk”.

Namibia has played a leading role in the formulation of the Millennium Declaration. According to Prime Minister Gurirab, who served as President of the UN General Assembly in New York during the Millennium Summit in New York in 2000: “..the single greatest challenge in meeting the MDGs in Namibia is to win the war against poverty and HIV/AIDS”.

In Namibia's first report (2004) on progress towards the achievement of the MDGs, it reported a worsening situation with respect to HIV prevalence, and is concerned about the rapid decline in per capita overseas development assistance. Namibia achieved progress on all other targets and in 2003 already achieved its 2006 target for the supply of safe drinking water.

Progress on child mortality has been slow and 1 in 4 children under five are still underweight.

A lack of data was reported on households living in relative poverty (i.e. who spend more than 60% of their income on food), and those living in extreme poverty (spending more than 80% of household income on food).

While poverty alleviation is central to Namibia's National Development Plan II, the Institute for Public Policy Research criticized the 2003/04 budget as follows: “Our analysis of the budget shows that the poor come off particularly badly in the services they require most – policing, primary and secondary education, primary health care, and social pensions.”

GOAL	1992	2003	2006 target	Progress towards target
1. Eradicate extreme poverty and hunger				
Proportion of households living in relative poverty	38 %	-	28 %	Lack of data*
Proportion of households living in extreme poverty	9 %	-	4 %	Lack of data*
2. Achieve universal primary education				
Net primary school enrolment	89 %	92 %	95 %	Good
Survival rate for Grade 5	75 %	94 %	95 %	Good
Literacy rate, 15-24 years	89 %	89 %	94 %	Slow
3. Promote gender equality and empower women				
Primary education (girls per 100 boys)	102	100	100	Good
Secondary education (girls per 100 boys)	124	113	100	Good
Tertiary education (girls per 100 boys)	162	111	100	Good
Proportion of seats held by women in National Assembly	9 %	19 %	30 %	Slow
4. Reduce child mortality				
Infant mortality (per 1000 live births)	67	52	36	Slow
Under-five mortality rate (per 1000 live births)	87	71	54	Slow
Proportion of one-year-old children immunised against measles	63 %	72 %	80 %	Good
Underweight among children under five	26 %	24 %	17 %	Slow
5. Improve maternal health				
Proportion of births attended by trained health personnel	68 %	75 %	88 %	Good
Contraceptive prevalence rate	21 %	37 %	50 %	Good
6. Combat HIV/AIDS, malaria and other diseases				
HIV prevalence among 13-19 year old women	6 %	11 %	9 %	Worsening
HIV prevalence among 20-24 year old women	11 %	22 %	15 %	Worsening
TB treatment success rate	58 %	69 %	75 %	Good
7. Ensure environmental sustainability				
Proportion of rural households with access to safe drinking water	45 %	80 %	80 %	Good
Proportion of rural households with access to basic sanitation	15 %	21 %	50 %	Slow
Freehold land	5 %	6.1 %	8.5 %	Slow
Registered conservancies	0 %	4.9 %	10.9 %	Slow
8. Develop a global partnership for development				
Per capita overseas development assistance to Namibia (in US\$)	130	60	90	Worsening

Note: The table provides a quick overview of progress on selected targets for each of the eight MDGs. The data is grouped to represent the closest year to 1992, 2003 and the medium-term targets for 2006. The last column assesses progress against the medium-term target. Good means that if the rate of progress seen since the early 1990s continues then the target will be met. Slow means that progress since the early 1990s has been positive but is not strong enough to reach the 2006 target. Worsening means that the situation has deteriorated since the early 1990s.

** A new Household Income and Expenditure Survey will be finalised in 2004 which will update the income poverty figures.*

Source: Namibia 2004 Millennium Development Goals, National Planning Commission, Office of the President

National food security depends on imports of 50% grains and 85% of vegetable and fruit requirements. 85% of beef production is exported (personal communication, MAWRP).

According to officials at MAWRD, an estimated 50 000 – 60 000 households are engaged in rainfed cultivation of particularly ‘mahangu’ and some maize, but are extremely vulnerable to both dry years and mid-season dry spells.



3. Analysis of Good Practices in Agricultural Water Use, Micro Irrigation and RWH

Introduction

In Namibia, government is currently engaged in the 'Green Scheme', which has established 150 smallholder farmers to date and aims to establish 4000 smallholder irrigation farmers on approximately 27 000 ha over the next 15 years, in a novel approach which inculcates structured collaboration between smallholder farmers and commercial entities.

Small growers along the Okavango river have developed an irrigation/water conservation technique along the Okavango river which requires very little cash input to establish and could possibly expand through the introduction of treadle pumps and vegetable markets.

Farmers, NGOs and government have developed shallow wells and introduced manual pumping technology (mostly Bush Pumps so far) to improve livestock watering and some limited supplemental irrigation to protect against crop failure due to mid-season dry spells.

The Ministry of Agriculture, Water and Forestry's (MAWRF) Rural Water Supply unit develops combined rural water supplies for human and animal use, and places much emphasis on the establishment and training of community structures for the control and self-management of water points.

The Agronomic Board of Namibia is achieving success with the promotion of animal draught and conservation agriculture/minimum tillage to bring improved yields within the grasp of smallholder farmers with limited resources.

Bush clearing is being debated as a strategy to improve water infiltration and aquifer recharge, particularly in commercial farms.

Fog harvesting has been studied and pilot tested by the Desert Research Foundation of Namibia (DRFN). The technology has never been implemented at a significant scale. DRFN has two substantive libraries with a vast array of scientific publications on a wide range of topics.

The development of water harvesting methods is identified in the Namibia MDG report (2004) as a priority for development assistance.

Irrigation: Nombete

Description of technology



Photo 1: The first picture shows the location of the ‘nombete’ fields – a thin strip along the river bank. Notice the large unutilized areas, at least part of which could become productive with the introduction of small pumping technologies and good markets for produce. This possibility stretches for hundreds of kilometers along the Northern border of Namibia, where the largest number of poor people reside.

Photo 2: In the second picture, the farmer has pulled away the protective grass and thorn branches to reveal her seedling nursery in the river bank.

Photo 3: The last two photos show the layout of the ‘nombete’. Note the raised beds and organic matter in the planting pits. Simple rainwater harvesting could easily be introduced, by creating tied ridges between the raised beds. Irrigation is done by watering can from the river. Treadle/manual pumps could reduce the labour requirement for irrigation, but would need to be easy to carry, since people walk significant distances to their gardens (see photo 1).

Nombete (meaning ‘beds’) is a low cost indigenous irrigation technique, involving the making of small irrigation beds for vegetable production along the Okavango river. According to local growers, the technique evolved over the past five years. Initially, growers made small planting holes for the vegetables and irrigated these by bucket. They found that the water spilled out of the small planting holes, and watering took a long time. They then experimented until they arrived at the present technique, namely raised beds with larger planting holes which can be filled quickly and left to infiltrate. Organic matter (kraal manure, plant rests, etc) is applied in the planting holes for both

fertility and improved infiltration, and several plants are planted per hole. Small nursery beds are created right next to the river, and completely hidden and protected with thorn branches and grass.

The irrigation labour required for both the nursery beds and the 'nombete' could be reduced dramatically through the use of treadle or other manual pumps, which are unknown in the area. The pumps should be highly portable, as these growers walk long distances from their homes to cultivate their food gardens. The introduction of cheap portable pumping could enable the expansion of current gardens and the development of new ones.

This technique has evolved along the Okavango river and is viewed by the author as potentially important, because Namibia's largest concentration of poor people live in the North of the country, many of whom have access to the river.

Being in the river floodplain, the 'nombete' are susceptible to flooding, but are remade after flooding, since it requires no cash input or permanent infrastructure.

The proximity of sales points in Rundu should not be underestimated as an incentive for production. Therefore promotion of similar production through 'nombete' along the Okavango and other streams should investigate the possibilities for facilitated marketing along the models and ideas developed by the National Dairy Development Board in India, which collects its milk from large numbers of small milk producers across the state.

Costs and benefits

Cash costs of the present technique relate only to access to a hoe and watering can, and possibly bought seed and manure/fertilizers, where own/traditional sources are unavailable.

Own labour is used, and not costed here because alternative paid employment is unavailable and therefore a monetary value cannot be placed on 'opportunity cost'.

Factors contributing to success/failure

The most important success factors of this technique are as follows:

- ?? that people need little if any cash to enter into production; and
- ?? that they can produce independently of anyone else (without the need for joint structures as for water sharing on formal irrigation schemes).
- ?? Further, ready access to a market for vegetables serve as an important incentive, although growers' first priority is for home food security.

Funding and support

None at present.

An important potential player with significant experience in on-the-ground support to small growers, is the Lihepurura NGO based in Rundu. They have an excellent manufacturing workshop for steel products in Rundu, but currently lack funding to continue their activities.

Irrigation: Green Scheme

Description of technology

In Namibia, government is currently engaged in the 'Green Scheme', which has established 150 smallholder farmers to date and aims to establish 4000 smallholder irrigation farmers on approximately 27 000 ha over the next 15 years. Total irrigation in Namibia is currently 8 600 ha.

Namibia has designed the Green Scheme initiative to utilize the country's considerable commercial agricultural knowledge and experience in support of smallholder farmers. The schemes are designed as permanent Joint Venture entities, in which a commercial entity holds ownership and production authority over say 50% of the cultivated area, while smallholders each have their own plot of land. Each smallholder plot/enterprise is designed to generate a worthwhile family income. The commercial entity is responsible for technical advice, processing and marketing of its own and smallholders' production.

All types of normal commercial irrigation technology are utilized in the Green Scheme, particularly drip and micro irrigation and centre pivots, depending on the crop, soils and other normal factors of selection.

Costs and benefits

Full economic viability studies and market assessment are performed prior to approval of a scheme for development under the Green Scheme. Individual smallholder holdings are designed to generate a worthwhile family income.

Factors contributing to success/failure

The Green Scheme aims to improve success potential by providing built-in technical advice, processing and marketing to smallholder farmers through the commercial partner, while ensuring ownership and participation by allocating plots to individual smallholder farmers. Effectively, economic interdependence is created which aims to act as an incentive to the commercial partner and smallholder farmers equally to collaborate.

Funding and support

Irrigation schemes under the Green Scheme are developed with government funding. Commercial partners are invited to tender, while prospective smallholder farmers from anywhere in Namibia may apply in writing for a plot on the scheme.

Valley bottom cultivation, shallow wells and Bush pumps

Description of technology



Soils in Namibia are generally extremely sandy, with serious deficiencies in terms of water holding capacity. Cultivation is practiced in valley bottoms and in the ‘streets’ between dunes, where the clay content of soils is somewhat higher. Shallow wells are constructed and sometimes equipped with Bush Pumps or other manual pumping technologies to extract water for human use, animal watering and in some cases, for supplementary irrigation to carry crops through dry spells (see photos).



These four photos show a fenced field in a valley bottom with a shallow well, lined with iron sheeting. The farmer was not present and could not be interviewed, but the well was dry at this time, which was the end of the dry season, and rains being very late. It would seem that the farmer had dug the well to provide supplementary irrigation to rainfed crops during mid-season dry spells, thus preventing crop failure. It was not possible to ascertain how water was extracted from the well or applied to the crops; possibly by bucket/watering can.

Costs and benefits

Costs for this privately owned shallow well would be primarily own labour. The iron sheeting could

be scrap metal or purchased.

Benefits would be the annual ability to save a crop from failure, thus ensuring food security and possibly some income. An estimated 50-60 000 households engage in field crop farming in Namibia, with very variable production depending on the rainfall for the particular year. It is unknown how many would have access to areas suitable for shallow wells.

Factors contributing to success/failure

Access to water is fundamental in Namibia. The success factors of the privately owned well shown here would be independence of development and operation, and consequent private access and control over the well.

Funding and support

None known presently for privately owned shallow wells.

Significant support for the improvement and equipping of communal shallow wells have been provided by government and Lihepurura NGO in Rundu. However, Lihepurura's funding programme has come to an end, and alternative funding has not yet been forthcoming, largely because the previous funders are shifting their attention to post-war Angola across the river.

Lihepurura has a well-equipped mechanical workshop in Rundu and is producing several types of animal drawn ploughs and cultivators and Bush Pumps on demand. This workshop is well-placed to support agricultural support initiatives in the poorest region in Namibia, and could easily adapt to broaden their range of products to include treadle pumps and other equipment.

Conservation Agriculture: planting pits and animal draught

Description of technology



The photos above were taken from a light aircraft just after eight o'clock in the morning, near Rundu. A good 10mm rain shower the previous night had obviously spurred a flurry of smallholder activity since the crack of dawn. The picture on the left shows the preparation of planting pits, while the farmer on the right is about to complete the last ploughing line (see lighter line two-thirds from the left of the ploughed area) with his ox-drawn plough.

The Agronomic Board of Namibia has recognized the appropriateness of Conservation Tillage and animal draught techniques for smallholder cultivation and have been implementing a support programme with funding from the sale of grains for food aid. These initiatives are called DAPAP and PUMP.

There is a significant amount of technology exchange taking place on this topic between Namibia and other SADC countries, and especially the GART research organization in Zambia.

The Conservation Tillage promoted by the Agronomic Board emphasizes the practice of recultivation in planting pits, meaning that the effect of efforts in soil preparation and soil improvement build up year-on-year.

Costs and benefits

According to the Agronomic Board, the establishment costs of conservation tillage are difficult to quantify in N\$, and involves mostly farmers' own labour. The practice involves lot more work in the first year, but work can be spread over a long period and done in small steps, diminishing the work load from year to year. It results in less weeds and higher yields.

The farmer has to have a hoe and use her/his time. Other inputs are the same as in use now. The recurrent requirement is labour.

The technology exists and is well-understood by scientists by now. The main cost resides in convincing and training farmers to adopt the new method. The Agronomic Board has started with 17 farmers, mainly female in 2005. The cost of promotion to target 8000 well distributed farmers by using 400 Community Contill promoters from which farmers can learn, could be N\$ 4 000 000, based on the Agronomic Board's experience over the past two years.

Factors contributing to success/failure

The most significant challenge is to promote the uptake of the technology. The strength of the technology is that it requires reduced labour over time and can be achieved without additional cash inputs from the farmer, compared to current practice, while enabling improved yields.

Funding and support

Conservation tillage is being promoted by the Agronomic Board of Namibia. It was not possible to obtain information on separate government activities in conservation agriculture, but there is collaboration on this between government and the Agronomic Board.

Debushing for aquifer recharge and improved grazing capacity

Description of technology

Some areas in Namibia have only bush and no grass left, due to bush encroachment. Particularly the areas below the veterinary cordon fence down to Windhoek would benefit from a de-bushing effort (bush thinning is not seen as strong enough due to the severity of the problem).

Recent research has shown that the dense bush is preventing the recharge of basin-shaped aquifers, resulting in the failure of water points and consequent loss of the use of large areas of grazing, in addition to the loss of grass due to bush encroachment.

Costs and benefits

Chemical debushing costs about 150 -300 N\$ per hectare for initial clearing, whereafter the recurrent costs would be 50 N\$ per ha after 5 years, to maintain its status.

The value of bush clearing is widely recognized in Namibia, and improved uptake could be expected if farmers had better tenure security, or if government should subsidize the use of chemicals.

Many of the affected areas are commercial farms, many of which having been bought by black farmers by now. Production and productivity could go up substantially with a large action of this kind and it could create a substantial amount of employment and export earnings.

Stabilizing the charcoal market is viewed as another way of achieving more debushing, however there is doubt as to the wisdom of state intervention in private enterprise.

Funding and support

None at present.

Rural Water Supply: Human and livestock water points

Description of technology



Photo 1, 2 and 3: A single borehole and pumping installation serves both human and animal watering needs. The motor is protected inside a sturdy steel cage against animals and theft. The large corrugated iron reservoir stores animal water, which is accessible via a separate trough not visible in these pictures. Where relevant, easy access to water by game, especially elephants, is ensured to avoid damage by these powerful animals. Note the wooden enclosure constructed by the community to protect the tapstand against damage by goats – a signature of community management of their own water point, which includes record keeping, revenue collection and routine maintenance.

Photo 4: Making a plan. This lady is treasurer of the community water committee. At her own house, she captures every drop she can of the occasional rainfall. Note the makeshift gutters and the positioning of the old ice cream freezer to capture run-off from the roof.

The Rural Water Supply unit of the Ministry of Agriculture, Water and Forestry has surpassed Namibia's 2006 MDG target for safe drinking water supply to rural communities by reaching the target of 80% coverage already in 2003. This achievement is all the more remarkable because implementation is not limited to infrastructure rollout, but includes community institutional development and capacity building for self-management of the water points. The unit is keen to next turn their considerable skills to sanitation, but this is currently the responsibility of a different Ministry.

Namibia has no lifeline tariff for water and the affordability of water is a significant issue for poor

households.

Costs and benefits

A total of 1364 new water points and 46 new dams were constructed since 1990. This excludes pipeline water points. In 2003 Namibia had 6867 water points which supplied 87% of the population with safe drinking water.

Costs and benefits for agricultural production is not quantified here, since the purpose of these water points is not horticultural production. Rural water supply is, however, benefiting animal production through increased access to grazing areas which were previously inaccessible due to the distances to water.

Factors contributing to success/failure

The success of the water point development programme rests on several pillars, at various levels:

- ?? RWS uses thorough planning and project management approaches to programme the work of its own staff and private sector service providers;
- ?? Infrastructure priorities respond to community demand and willingness to cooperate, which creates a powerful incentive for communities to organize themselves and pull together;
- ?? Implementation includes the structuring and training of community water committees in record keeping, revenue management and maintenance. This is supported through standardized community-based administrative systems, which enable water committees to generate and interpret their own management information; and
- ?? The ability to adapt infrastructure solutions to lessons learnt and changing demands.

The rural water supply policy is weakest in respect of poor households' ability to pay for water.

Funding and support

The government of Namibia has implemented rural water supply from a combination of its own resources and donor funding. To avoid repayment problems, it has been consistent in declining loan finance for the construction of water supply infrastructure. A total of N\$269m was received from primarily Germany, Finland and the Netherlands from 1991-2003. Since 2001, donor funding to Namibia has declined sharply, based on Namibia's status as middle income country. This has left Namibia with a significant challenge to address its inequalities (Gini coefficient=0.7).

4. Review of Agricultural Water Programs under the Initiative to End Hunger in Africa (IEHA)

The Initiative to End Hunger in Africa (IEHA) is not implemented in Namibia.

5. Summary of key Actors in Micro Irrigation and RWH

The following organizations are active in the development and support of Agricultural Water Technologies in Namibia:

Government: ?? Ministry of Agriculture, Water and Forestry (MAWRF) (previously Ministry of Agriculture, Water and Rural Development (MAWRD)).
Non-governmental: ?? Agronomic Board of Namibia ?? Desert Research Foundation of Namibia ?? Lihepurura NGO, Rundu ?? Other NGOs ?? Consulting firms
International: ?? USAID (limited direct involvement in agriculture)

The Ministry of Agriculture, Water and Forestry, through their Rural Water Supply unit, has been responsible for the early achievement of Namibia's 2006 target for safe drinking water. MAWRF is also implementing the Green Scheme (irrigation scheme development) and is increasingly paying attention to options for Conservation Agriculture.

The Agronomic Board of Namibia has launched a focused programme for the promotion of minimum tillage and animal draft practices among smallholder farmers over the past two years.

Lihepurura NGO in Rundu has a substantial and well-kept manufacturing capacity in Rundu for animal draft equipment (ploughs and cultivators) and manual pumps (Bush Pumps). Their remoteness is simultaneously an asset and a challenge – they are located in the poorest and most populous area in Namibia, where their services are most needed, but not sufficiently prominent to secure regular orders to allow them to gear up for consistent throughput through their workshop. They are loathe to shift their attention to commercial production of steel manufacturing requirements, because their mission centers on rural development. It could be advisable for Namibia to recognize, utilize and diversify this manufacturing capability to include a broader range of products in support of smallholder farmers, including a range of treadle/manual pumps and other equipment.

The Desert Research Foundation of Namibia (DRFN) has been active for 30 years and has two substantial scientific libraries, one in Windhoek and the larger one at Gobabib. DRFN has done several participatory rural appraisals over the years, which provides insight into the livelihoods and thinking of rural dwellers in Namibia. These results could possibly complement the current Participatory Poverty Assessments being done across the country.

USAID is actively involved in the establishment of Conservancies, which is one of Namibia's MDG strategies to ensure environmental stability. USAID has also supported Junior Achievers Namibia, which has launched several high school youth into the world of business through first hand experience of establishing, running and winding down their own companies.

6. Recommendations and Conclusions

The following recommendations are based on the limited scope of the study and are subject to confirmation by a wider range of stakeholders within Namibia.

- ?? There is a need to profile and understand the coping strategies of poor households in Namibia. The current Participatory Poverty Assessments are exemplary and expected to significantly address the lack of information on households living in relative and extreme poverty reported in Namibia's first MDG report (2004). However, this expected improved understanding of poverty should probably be complemented by work to understand people's own coping strategies, so as to find ways of strengthening and/or complementing these. This is particularly relevant in remote areas.
- ?? Significant resources are required for the implementation of Namibia's Green Scheme. This should arguably be complemented with a similar focus on strategies that have the potential of reaching the larger numbers of dryland farmers. Potential for improved livelihoods (especially in-field drought management strategies) through Conservation Agriculture, minimum tillage, various forms of rainwater harvesting and soil moisture retention need to be analysed and acted on appropriately. Labour saving agricultural methods will continue to become more and more important as the effects of HIV/AIDS are felt.
- ?? In view of both the above recommendations, it could be meaningful to develop a compendium of indigenous agricultural practices as a basis for further scientific work to underpin improvements and expansion. For example, the 'nombete' method discussed in this report, and the possible improvements through the introduction of appropriate complementary technologies from other African countries, like in-field rainwater harvesting, portable manual pumps, etc.
- ?? Attention could be paid to the identification and harnessing of existing implementation and manufacturing capacity in Namibia, and particularly in poorer regions, such as the Lihepurura NGO in Rundu, in the implementation of poverty programmes.
- ?? The possible deployment of the considerable infrastructure development capacity and skills of the Rural Water Supply unit could be considered for the achievement of Namibia's sanitation goals. Sanitation is identified as one of the key factors in infant mortality and stunting through diarrhoea, which makes it a priority and relatively easy intervention in the fight against the effects of poverty and HIV/AIDS.

Annex 1: List of contacts

The following organizations and individuals are active in the development and support of Agricultural Water Technologies in Namibia:

Organisation	Contact person	Contact details	Website/Email	Technologies/ practices promoted; Programmes
MoAWF Rural Water Supply	Ms A Shiweda Mr. Harald Koch	Ministry of Agriculture Water and Forestry P/Bag 13193 Windhoek Namibia (264)61 2087266	www.mawrd.gov.na shiwedaa@mawrd.gov.na kochh@mawrd.gov.na	
MoAWF: Rural Water Supply Rundu	Mr Mpareka Mr Livingi	Rural Water Supply Kavango Region P/Bag 2147 Rundu (264)66 255039	rwsrundu@iafrica.com.na	
LuxDev Rundu	Mr R Luvhengo Mr J Muremi	PO Box 2292 Rundu (264)66 255651	reckson.luvhengo@luxdev.lu	Rundu town water supply and sanitation
Lihepurura		Rundu		NGO: rainwater harvesting, small pumping technologies, well improvement
Lund Consulting	Ms Miriam Truebody	Lund Consulting	truebodym@lce.com.na	Consulting firm, community facilitation and training
USAID	Dr T Dooley-Jones Mr S Reddy	USAID P/Bag 12028 Ausspannplatz Windhoek (264) 61 273713	tdooley-jones@usaid.gov sreddy@usaid.gov	CBNRM; establishment and support countrywide of Conservancies and tourism development; interest in Conservation Agriculture initiative of Namibian Agronomic Board (DAPAP)
DRFN	Ms Mary Seelie Ms Carol Robberts Ms Inge Henschel	Desert Research Foundation of Namibia PO Box 20232 Windhoek Namibia (264) 61 230172	ingeh@drfn.org.na	Fog harvesting; substantive Library and Resource Centre on wide range of research publications
MoAWRD Irrigation	Mr T Basson Mr P Liebenberg Mr K Jacobi	Windhoek Namibia (264)	bassont@mawrd.gov.za liebenbergp@mawrd.gov.na jacobik@mawrd.gov.na	Green Scheme: Irrigation scheme development. Conservation Agriculture
MoAWRD Water Resource Management	Mr S de Wet	Windhoek Namibia (264)	wets@mawrd.gov.na	Water resources management
Namibian Agronomic Board	Mr R Hoffman	PO Box 5096 Ausspannplatz Windhoek Namibia (264) 61 221208	pump@iway.na	PUMP – Productivity Upliftment Micro- Projects; DAPAP – Draught Animal Power Acceleration Programme

Annex 2: List of documents

1. Guidelines for the Implementation of Community Based Management in Rural Water Supply
2. Presentation: Some Findings from PPAs in Caprivi, Ohangwena & Omaheke – Poverty Reduction & Equity Subdivision
3. Presentation: Poverty Analysis & Role of Participatory Poverty Assessments (PPAs)
4. Presentation: Start-up Workshop PPA
5. Presentation: Linking PPA to Regional Planning Roles of Stakeholders
6. Fieldwork Manual: Participatory Poverty Assessment (PPA)
7. Poverty Bulletin September 2005, Vol. 1 No. 1
8. DRFN Organizational Structure
9. Putting Communities at the Centre of Their Own Development Process
10. The Impact of HIV/AIDS on Gender Burdens and Household Incomes in Kavango: Technology and Policy Implications
11. International Conference on Fog and Fog Collection, Proceedings: First International Conference on Fog and Fog Collection
12. The Ecology of Fog in Namib Desert Dunes.
13. Local Level Monitoring for Enhanced Decision Making – A Tool for Improved Decision Making by Farmers in Namibia
14. Ministry of Agriculture Water and Rural development, 10 Years, Directorate of Rural Water Supply 1993 – 2003
15. Water Use and Management in Communal Areas
16. Rainwater Harvesting Namibia's Country Inventory Report
17. Community Managed Water For Life
18. Map 1:2,000,000: Namibia Water Infrastructure, July 2005-12-08
19. NAMFOG: Namibian Application of Fog-Collecting Systems, Phase 1: Evaluation of Fog Water Harvesting