

**Water use options for regional development.
Potentials of new water technologies in
Central Northern Namibia**

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1 Introduction

The CuveWaters project relates the alignment and implementation of innovative water technologies to an Integrated Water Resources Management (IWRM) in the Cuvelai-Etoshia-Basin, which lies in Central Northern Namibia. The aim here is to improve inhabitants' living conditions by means of appropriate technical schemes and measures – particularly with a view to enhancing water supply and basic sanitation (incl. waste water disposal). A focal part of CuveWaters concerns the re-use of water, efficient use of water and utilisation of different water qualities for different purposes (multi-resource mix). With respect to urban conditions and the problems of adequate supply and sanitation, the prospect of a semi-decentralised infrastructure system is under investigation, a concept which includes rainwater utilisation as well as waste water collection and treatment. One major option for such systems, in which waste water is considered a valuable resource, is a washing house combining effective waste water collection (vacuum sewer) with high-tech separation techniques (generation of energy, nutrients and waste water processing). Cleaned waste water – free of bacteria, viruses or pathogens – and fertiliser from an anaerobic waste water treatment plant can be re-used for irrigation in small scale agriculture to enhance food security and/or generate alternative income through the marketing of fresh produce. Energy, in the form of biogas, can be used for cooking or lighting. On the rural sites of the study area, adequate water supply poses a major challenge, for which three technology options are investigated here: rainwater harvesting, solar-coupled desalination of brackish groundwater, and managed aquifer recharge. Suitable technology options are selected for different sites in a participatory process (cf. CuveWaters Project 2008a, CuveWaters Project 2008b).

Thus, general aims of the project in terms of providing regional economic impetus and improving livelihoods are:

- to link integrated water resources management to land issues, develop the technology needed to build capacity, and achieve better governance;
- to bring together supply- and demand-driven approaches in developing the infrastructure;
- to consider water as related to other resources (land, energy, nutrients) and other fields of sustainability such as poverty reduction, equality and regional development.

From these project objectives arise the key questions driving the surveys documented in this paper: what impetus for regional development can be expected from the implementation of technological options selected for the CuveWaters project? What constraints and obstacles need to be considered here, particularly in terms of incorporating the technologies into strategies of IWRM? What conclusions can be drawn when it comes to the supervision of implementation (training, capacity building, governance)?

As early as 1994, the World Bank dedicated its annual World Development Report to the topic 'Infrastructure for Development'. The key conclusion reached by this report: *"Infrastructure can deliver major benefits in economic growth, poverty alleviation, and environmental sustainability – but only when it provides services that respond to effective demand, and does so efficiently"* (World Bank 1994: 2).

Despite the fact that it is now almost 15 years since the report was published, the topic is – once more – a relevant one. From the Millennium Development Goals (MDGs) of the United Nations (UN 2000) it becomes apparent that in many regions of the world, the expansion of supply structures is barely able to keep pace with the growing demand for infrastructural services from private households, agriculture and industry. The fundamental significance of access to clean

drinking water and basic sanitation for human development is also manifest in the Human Development Report 2006 (UNDP 2006). Attention is drawn here to two perspectives of 'Infrastructures and Development': firstly, it is established that "on average, coverage levels for water and sanitation rise with income: the richer the country the greater the coverage. This finding is not surprising because services have to be financed either from household budgets or through public spending." (ibid.: 35f.). Secondly, this report refers to the welfare effect resulting from access to water infrastructures: "Restricted access is a brake on economic growth, a source of deep inequalities based on wealth and gender and one of the main barriers to accelerated progress towards the Millennium Development Goals" (ibid.: 77). While it would be unfair to reduce the Human Development Report to these two statements, one does become aware of the great challenges at stake, which are linked to the MDGs.

There is an international political and scientific discussion taking place as to what impetuses for development can be given via the construction and expansion of infrastructures along with the attendant (public) investments. On the scientific and political stages, however, there is great uncertainty about whether and to what degree infrastructures affect economic growth and economic development (Estache 2008: 48). The fact is that, despite a multitude of existing (national) studies, there is very limited evidence of any general patterns and coherences, since these mostly econometric surveys¹ arrive at contradictory conclusions.

Infrastructure investments and economic development

Fundamental research on the question of impetuses for economic development through public expenditure and investment in infrastructure was carried out in the 1990s, for instance by Aschauer (1989) or Munnell (1992). The latter ascertained surprisingly high productivity losses as a result of declining investment in public infrastructures in the USA. Subsequent studies for other countries using other methodological approaches and patterns of interpretation went some way towards putting these results into perspective. For a detailed discussion of the individual studies, see the recent synoptic papers by Estache (2008), Ayogu (2007) and Romp/de Haan (2007), although older papers such as those by Weiss (1999), Krol (1998) and Gramlich (1994) also provide valuable insights.

To sum up, however, it is fair to say that through (public investment in) infrastructures, it is possible to identify stimulus for growth manifest in a rising national income (GDP) when the return on investment is higher than the opportunity costs of capital. Further impetuses are expected for upstream and downstream economic sectors: public investments – or so it is assumed – reduce the transaction costs in private enterprise, since the (efficiently) installed infrastructural services constitute inexpensive input for production processes. Furthermore, investment, i.e. in the form of public contracts for plant construction, triggers short-term effects such as the creation of jobs and increased turnover for the contracting business. The availability of infrastruc-

¹ Econometric analyses aim at empirical determination of economic laws and relations, using statistical and mathematical methods (cf. Gujarati 1995). In many cases, studies that examine the relationship between infrastructure (investment) and economic development use modelling based on a Cobb-Douglas production function that represents the relationship between production input and output, and allows for model calculation of the output with variable factor input. For example, in this way it is possible to estimate what change in national income (GDP) is to be expected when input (e.g. infrastructure services) vary. Differences in the studies result from differing assumptions within the production function and differing data bases (e.g. international comparison in a point-in-time versus time-series analysis).

tures means that incentives for private investment can be expected, particularly when it comes to the building and extending of production capacities in various economic sectors. These in turn have positive effects on the labour market and internal revenue. Such direct and indirect productivity-boosting effects from public investment are often summed up by the term ‘Public Capital Hypothesis’. Within the scope of pro-poor-growth projects, it is pointed out that infrastructures can contribute towards a reduction in poverty if a high proportion of those benefitting from infrastructural services and their spill-over effects belong to the poorer social strata.

With regard to water and water usage, Saleth et al. (2003) draw attention to the fact that the extension of irrigated agriculture and water supply whilst taking into account the water requirements of ecosystems is of key significance in the struggle against poverty: “With land and other inputs, irrigation leads to higher output and larger employment, contributing thereby to food and income benefits to the poor. Irrigation schemes, apart from their direct contribution to employment in their construction and maintenance, also lead to regional growth, which, taken with the effects of agricultural growth, leads to the expansion of non-farm and livestock sectors which have considerable employment and income benefits for the poor. Multiple uses of irrigation water for domestic and environmental uses also have some amenity benefits for the rural poor. On the other hand, irrigation has some negative effects such as those in the form of the health and environmental consequences of water pollution as well as through the process of land alienation and marginalization associated with irrigation-induced land value changes. Considering the impact of water through water provision as well as through the input and infrastructural roles of water supply schemes for urbanization and industrialization. The impact of water through its ecological uses is both positive (the income, food and livelihood benefits of fishing/aquaculture and forestry/common lands) and negative (health impact of irrigation and water pollution).” (ibid.: 388f.). Saleth et al. place the struggle against poverty and socio-economic invigoration very much in the context of food security and prices, livelihoods and income as well as basic needs; they emphasise climate conditions (aridity/flooding), population development, effects of social and economic conditions/system structures, (in-)efficacy of policies and institutions, (non-)availability of economic and social infrastructures, along with scientific and technological developments as important parameters.

Inadequate transferability to surveys in the Cuvelai Basin

Any further representation of individual work relating to the effect of infrastructure (investment) on economic development is dispensed with at this point, since the state of research, given the questions being examined in the CuveWaters project, manifests fundamental deficits at the present time:

(1) On the one hand, many questions are directed explicitly at the effects on economic *growth*, in other words the contribution to an increase in the gross domestic product (GDP). Other levels of regional development, as primarily addressed in Namibia by Vision 2030 and the National Development Plan (GRN 2004, NPC 2007), remain blanked out under such a constriction. However, as shown in Figure 1, these national goals of the Namibian development strategy (Vision 2030) and the Third National Development Plan (NDP3), currently at the approval stage, represent an important point of reference for the regional economic studies within the scope of CuveWaters. This can be used to weigh up the project’s potential contribution to development via the implementation of innovative water technologies and their incorporation into IWRM strategies (see also Chapter 2).

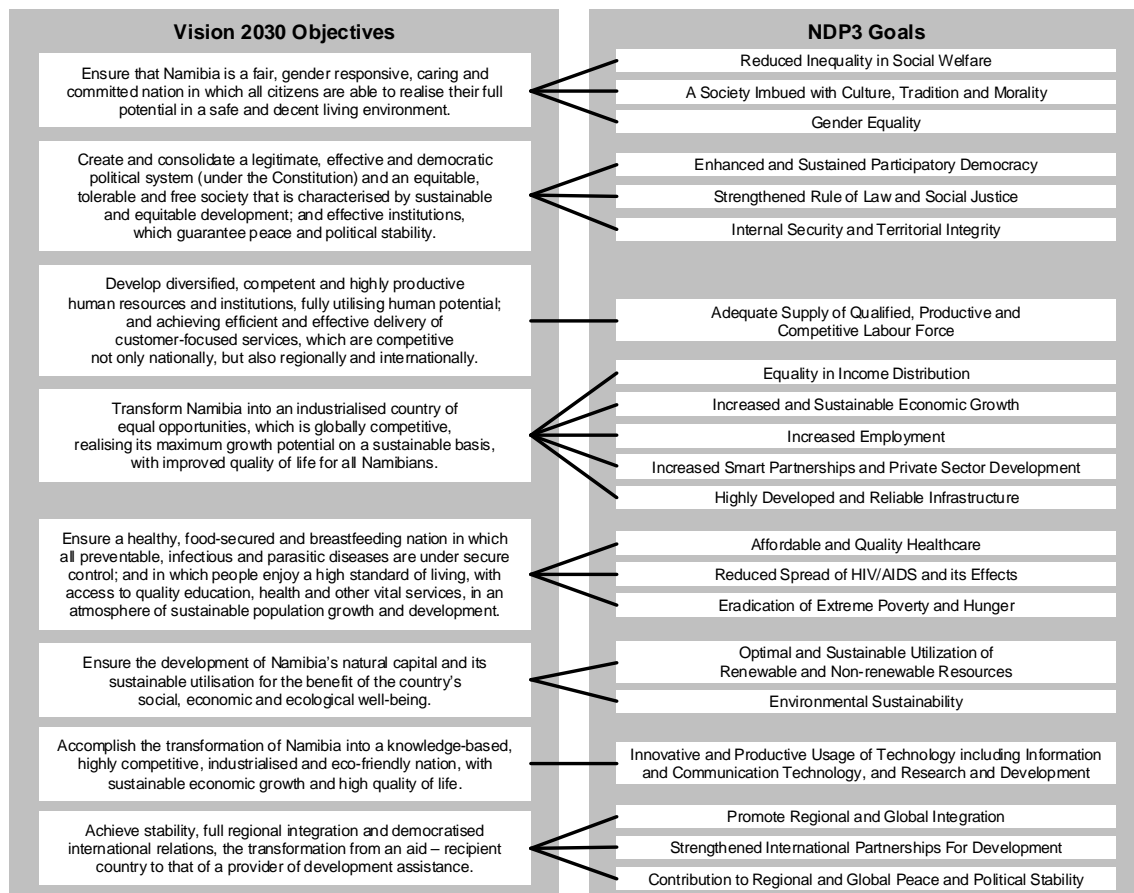


Figure 1. Vision 2030 objectives in relation to NDP3 goals (based on NPC 2007)

The widespread confinement of existing impact analyses to merely economic core indicators gives rise first and foremost to methodological problems for the present study. The existing approaches barely permit any representation of multidimensional Namibian development goals; for example, on this basis it is impossible to fully evaluate distribution justice and optimal use of resources, ecological sustainability, political stability or the reliable supply of infrastructural services. Farther-reaching indicators and extended methods are called for here, particularly if one is to make statements on the regional effects of infrastructural measures and reveal possible overlaps in any such impact. Such an overlap may occur due to the attractor function of infrastructures (Niemann 2008): if water usage increases due to new infrastructural offers, this can lead to a (renewed) bottleneck or interruption in supply. But the feedback effect of urban infrastructures on rural development discussed by Kessides (2006), e.g. via the creation of purchase power for agricultural products, can also be cited in this context in the towns.

(2) The surveys so far often refer to the totality of material infrastructures (energy and water supply, sanitation and sewerage, roads and airports, etc.). Further substantial analyses concerning the specific relevance of innovative water infrastructures as focussed on in CuveWaters remain to be done; this applies to decentralised technologies such as desalination, rain water harvesting or managed aquifer recharge as well as to coupled water systems which combine sanitation and water re-use with waste water recycling and generation of energy, nutrients and purified irrigation water. As Weiss (1999) concludes that water supply, sanitation and irrigation (as well as rural transportation) are most likely to support pro-poor growth, the priority becomes very clear.

(3) One cannot fail to notice that the studies carried out over the past 20 years relate in the main to North America or Europe and only seldom to African countries (cf. Ayogu 2007). But it is fair to assume that the economic impact of expanding infrastructural services along with the public investment that goes with this would be far stronger in developing and threshold countries than in those targeted to date. This is supported in the comparative study by Romp/de Hahn (2007) where they conclude: “In general, the larger the stock and the better its quality, the lower will be the impact of additions to this stock. [...] The effect of new capital will crucially depend on the extent to which investment spending aims at alleviating bottlenecks in the existing network.” (ibid.: 33) But when it comes to infrastructure policy in African contexts, a further assumption is that the impact on economic growth of public investment in infrastructures plays less of a role than the state of infrastructures themselves and how efficiently they are used. (Ayogu 2007).

Procedure and methods used

The reasons for an inadequate transferability of existing research results as outlined here led to the choice of an entirely different methodological approach with which to tackle the research objectives. Essentially speaking, two data survey methods were selected to identify the development impetus of innovative water technologies and the demands on implementation processes: expert interviews and secondary analysis of data and literature. The expert interviews served to garner knowledge from specific players and stakeholders from administration, practice and development work (see Appendix) deemed relevant to the special subject area under review. We carried out guided expert interviews according to Meuser and Nagel (cf. Meuser/Nagel 1991). This variant of expert interviews focuses on that particular area of the experts’ knowledge stemming from their organisational or institutional context that defines them as an expert for the questions at hand. The guide developed for the interviews with the respective experts fulfils two key functions: firstly, the knowledge acquired in order to compile the discussion guide ensures that the interviewer himself ends up as a competent interlocutor capable of conducting the interview “on a par”, as it were, with the interviewee. Secondly, the use of the discussion guide prevents players from getting embroiled with topics that bear no significance for the questions under review. A second main focus of the data survey ultimately lay in the consultation of Namibian and other pertinent scientific publications, texts, documents, data material, etc.

On this basis, potential new options for water usage and the preconditions for realising them were explored from various perspectives. Hence two different areas were targeted in the surveys: one group of experts was asked about general aspects of the regional economy, whereas a second group was interviewed more specifically on aspects of urban agriculture. Overall, the research can thus account for to the regional specifics of economic, social and cultural structures, along with the manifold objectives of national policies, instead of accessing the subject matter from a purely economic perspective. This broad, social-scientific qualitative approach was chosen in order to formulate hypotheses and correlations for further CuveWaters assignments.

Key aspects of the discussions with the experts were:

- Potential economy-related impacts at local and regional level from new water-use options in terms of
 - gradual extension of water availability from water storage (e.g. rainwater harvesting in urban and rural areas; desalination of brackish groundwater)
 - additional water for additional uses that might boost marketing of agricultural goods
 - additional water for additional subsistence-oriented activities, with special focus on urban agriculture
 - additional income from building and maintaining infrastructure elements
- Existing barriers in terms of
 - capacities (skills and labour force)
 - marketing opportunities
 - capital market access and conditions for investments on business level (assistance opportunities)
 - conditions for financing initial infrastructural investments (subsidies vs. full cost recovery)
 - affordability of operation costs through additional income
 - soil quality and extension methods as well as existing land use patterns
 - substitution of existing water supply by new water-use options
 - cultural factors
 - issues concerning land tenure

Structure of the CuveWaters Paper

The following is a bundled presentation of the results and conclusions generated by the study. Chapter 2 begins by outlining the economic and social situation in the Cuvelai-Etosha Basin along with the conditions for urban agriculture. Following on from this, Chapter 3 discusses the potentials for water-related activities in the region, taking into account additional water uses and the operation and development of infrastructures, whilst investigating the potentials of urban agriculture for Central Northern Namibia. Finally, Chapter 4 sums up these potentials and draws conclusions pertaining to flanking measures for technical implementation.

2 Point of departure

The country's major development objectives are defined in the national development strategy of the Namibian government, Vision 2030 (GRN 2004), the National Development Plans (NPC 2007, NPC without year) and sectoral policy strategies². The Namibian goal of combining food security and sufficiency with economic growth is of particular interest for our research question, because if the measures planned in CuveWaters can contribute in this respect, then it also implies possible contributions to regional economic development and the struggle against poverty.

² See, for example, Republic of Namibia (1995) on Agriculture Policy and Republic of Namibia (2004) on Water Policy.

At this point it is, however, important to remember that ‘economic growth’ cannot be gauged solely in terms of GDP growth. There is a need to develop extended perspectives, particularly in the combined area of food security and welfare, and this paper sets out to identify precisely these perspectives.

A certain degree of scepticism towards the successful co-ordination of political strategies within and between ministries became evident from the expert interviews. Nonetheless, in the development strategies mentioned, agricultural production is seen as being an important contributor to greater prosperity (and hence industrialisation). But water availability and soil quality – according to several interviewees – prove to be substantial limiting factors en route. And here we have the first indication that for the successful implementation of water technologies as an element in IWRM, the strategic political foundations at national level require the same amount of attention as the specific local conditions.

The following gives an overview of the current situation in Central Northern Namibia, dealing first with socio-economic structures and moving on to outline economic activities in trade and agriculture along with relevant marketing structures. Finally, the concept of urban agriculture is introduced and initial estimations provided as to its relevance in Namibia and the central northern regions. This takes a relatively detailed form, since the study in question reveals great potential here, despite the fact that there are hardly any coherent background studies to fall back on.

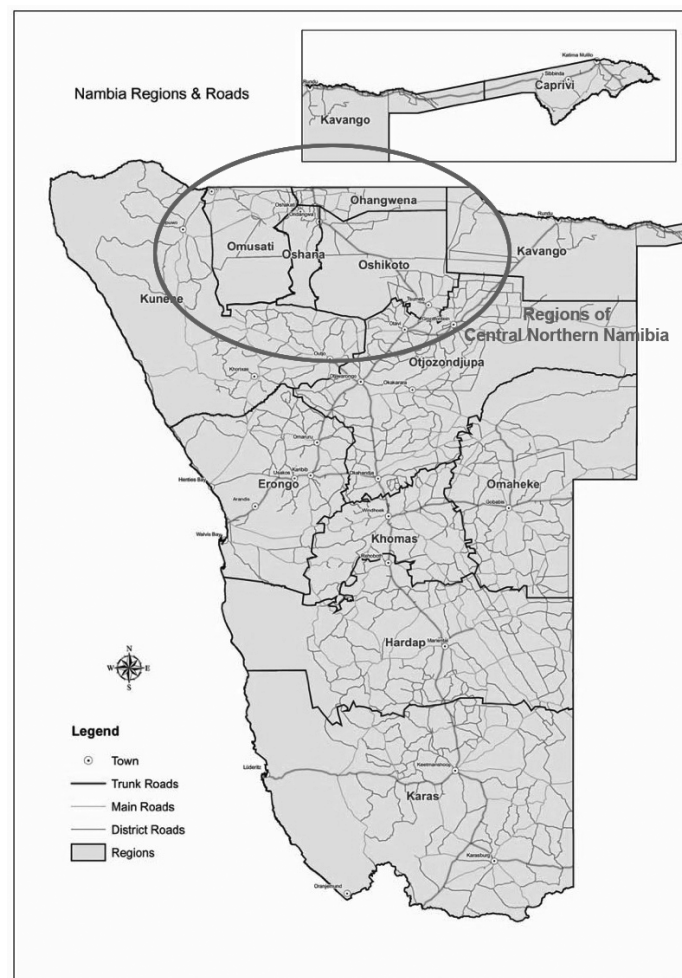


Figure 2. Map of Namibia and its regions (Source: National Planning Commission, modified)

2.1 Socio-economic background in Central Northern Namibia

From an economic point of view, Namibia can be fairly referred to as a land of contrasts. Economic activities differ considerably in terms of their competitiveness and significance for the regional and national economy. This regional heterogeneity is due not least to the distribution of (exportable) minerals and renewable resources, although the impact of HIV/Aids also plays a role in the measurement of economic well-being (cf. Lange 2004). The access to clean drinking water and sanitary installations likewise differs considerably within the country: in Namibia virtually the richest 20% of households all have the use of flush toilets, whereas the poorest 20% have access neither to flush toilets nor to pit latrines (UNDP 2006: 50). These discrepancies are also apparent from regional observations, particularly on taking a closer look at the Human Development Index (HDI) and the Human Poverty Index (HPI) for Namibia (UNDP 2007):³

Table 1. Human Development Index and Human Poverty Index for Namibia's regions (2001–04) (UNDP 2007: 7,11)

Area	Human Development Index	Human Poverty Index
Caprivi	0.421	43
Erongo	0.705	18
Hardap	0.572	30
Karas	0.664	21
Kavongo	0.410	45
Khomas	0.732	19
Kunene	0.504	38
Ohangwena	0.403	42
Omaheke	0.627	34
Omusati	0.476	45
Oshana	0.548	37
Oshikoto	0.490	45
Otjozondjupa	0.638	23
Namibia	0.557	33

Both the Development and the Poverty Indexes fluctuate substantially between Namibia's administrative regions. For instance, the Khomas and Erongo regions enjoy relatively high indexes and are comparable to Iran or Turkey. Ohangwena or Kavango show a HDI which is comparable to that of Sudan or Kongo (UNDP 2007: 19). This variance continues within Central North-

³ The Human Development Index (HDI), as calculated here, represents the three main dimensions of human development in quantitative form: a long and healthy life, knowledge and a decent standard of living. The fourth dimension, 'to be able to participate in the life of the community', has not been taken into account, being difficult to quantify on the basis of the data available. The Human Poverty Index (HPI) is more or less the opposite of the HDI. It represents the lack of preconditions for the three dimensions covered in the HDI (UNEP 2007: 2ff.)

ern Namibia. Whereas the Oshana region is proximate to the national average HDI, the other three administrative regions of relevance, Omusati, Oshikoto and Ohangwena, lie below it. Only the regions of Caprivi and Kunene, likewise in the north, also lie below the mean Namibian value.

The Human Development Index and the Human Poverty Index are aggregated measurements, i.e. they are not confined to the income situation. Whereas Namibia's national economy compares favourably in a ranking based on Gross Domestic Product (GDP) per capita, this position cannot be sustained within a HDI ranking (UNDP 2006: 264). Admittedly, the regional discrepancies continue, particularly if one looks at consumer expenditure in the administrative regions of Central Northern Namibia (see Table 2).

Table 2. Household consumption in Central Northern Namibia (based on CBS 2006:121)

Area	Household consumption	
	total	per household
Oshana	1,396 Mio. N\$	44 K N\$
Ohangwena	821 Mio. N\$	22 K N\$
Omusati	994 Mio. N\$	25 K N\$
Oshikoto	818 Mio. N\$	26 K N\$
Namibia	15,639 Mio. N\$	42 K N\$

Around half the Namibian population lives in the four regions of Oshana, Ohangwena, Omusati and Oshikoto that together make up Central Northern Namibia. The basic population figures for these four regions are given in Table 3.

Table 3. Census indicators 2001 (based on CBS 2003)

Area	Population size	Growth Rate	Population density (persons per sq.km)	No. of households	Av. household size	Population in rural areas	Total Fertility Rate
Oshana	161,916	1.8%	18.7	29,557	5.4	69%	3.7
Omusati	228,842	1.5%	8.6	38,202	5.9	99%	4.9
Ohangwena	228,384	2.4%	21.3	35,958	6.3	99%	5.3
Oshikoto	161,007	2.2%	4.2	28,419	5.6	91%	4.6
Namibia	1,830,330	2.6%	2.1	346,455	5.1	67%	4.1

In the second half of the 20th century, the number of inhabitants in Central Northern Namibia rose steeply and further population growth is anticipated despite the consequences of HIV/Aids, with corresponding consequences for the population and settlement structures. The current processes of urbanisation are also expected to continue (Mendelsohn et al. 2000: 36ff., Fuller/Prommer 2000; see also Chapter 2.3). A special role is played here by existing infrastructures, particularly the water supply, since people settle all around the water points. Minor villages spring up, and with them comes a heightened demand for infrastructural development (Seckelmann 2001). At the same time, subsistence-driven economic activities are of great importance to the population. A substantial proportion of households, for example, cover their cereal requirements via self-production. Around 30% of households produce over 80% of the cereal they consume, and approximately 12% even seem to lead a virtually self-sufficient existence in food terms (Mendelsohn et al. 2000: 65).

However, in evaluating this autarchy or independence from food markets, it should be remembered that many households do not produce their food from their own land and livestock (ownership), but have other means of accessing such resources, for example via leasehold or other (presumably partly informal) land tenures. Table 4 takes into account the distinction between “ownership” and “access” to give a more comprehensive picture of the agricultural situation.

Table 4. Percentage of households with ownership of animals and land (in brackets percentage with access to) (based on: CBS 2006:83ff.)

Area	Cattle	Sheep	Pig	Goat	Donkey/ Mule	Horse	Poultry	Ostrich	Grazing Land	Field for Crops
Oshana	32.7 (2.9)	3.0 (0.2)	23.6 (1.0)	47.7 (3.3)	12.7 (0.8)	0.7 (-)	64.0 (3.1)	0.1 (-)	5.1 (51.3)	39.9 (31.8)
Omusati	37.2 (2.2)	9.6 (0.1)	49.4 (-)	64.2 (0.9)	44.7 (2.4)	0.9 (0.1)	82.9 (-)	0.2 (-)	0.9 (79.3)	6.7 (81.4)
Ohangwena	44.9 (10.0)	0.8 (0.2)	28.1 (3.6)	64.8 (5.1)	21.1 (5.2)	0.8 (1.7)	82.6 (3.6)	0.0 (0.4)	2.6 (86.4)	11.0 (84.3)
Oshikoto	45.8 (8.6)	2.8 (0.8)	26.9 (0.2)	58.1 (3.4)	27.8 (11.6)	2.4 (1.2)	80.2 (0.7)	0.3 (0.1)	0.9 (72.9)	77.8 (5.2)
Namibia	33.7 (7.1)	6.4 (1.3)	14.3 (1.1)	39.0 (3.6)	17.3 (3.9)	5.4 (1.3)	48.6 (2.3)	0.4 (0.2)	4.7 (51.7)	25.1 (29.1)

The basis of subsistence farming is essentially characterised by the farming of cattle, goats and poultry along with the cultivation of grazing land and crop fields. This is also reflected in the land utilisation patterns of Central Northern Namibia (see Table 5). Here, a particularly important role is played by small-scale farming.⁴ Further indications as to the significance of subsis-

⁴ The conservation areas listed in the table are situated largely within the Etosha National Park on the southern border of Central Northern Namibia. Large-scale farming activities and Mangetti Farms are to be found primarily in the south-eastern part of the region. Even though these areas belong to the administrative regions that make up Central Northern Namibia, when it comes to supplying the population in the *Cuvelai-Etosha Basin* they are of more marginal significance and can be disregarded for

tence farming can be gleaned from the surveys on main sources of household income as outlined in Table 6. Subsistence farming plays a substantial role here. At well over 50 percent in some cases, far more households draw their main income from this source than the national average. In the Oshana and Oshikoto regions, salaries and wages are another important source of income besides subsistence farming, while pensions also play an important role in Ohangwena.

Table 5. Areas in Central Northern Namibia used for different purposes (Mendelsohn et al. 2000: 48)

Use		Area (sq. km)	Percentage
Agriculture	Communal grazing	17,000	20.1%
	Small-scale farming	25,470	30.1%
	Large-scale farming	15,000	17.7%
	Mangetti farms	1,370	16.0%
	Gov. agricultural farms	1,000	1.2%
	Gov. quarantine farms	790	0.9%
	Gov. resettlement farms	500	0.6%
	Game farming	330	0.4%
Conservation		22,900	27.1%
Declared urban centres		230	0.3%

Table 6. Households by main source of income in percent (based on CBS 2006:33)

Area	Salaries/ wages	Subsistence farming	Commercial farming	Pension	Remittances/ grants	Drought/ in kind receipts	Business-income	Other
Oshana	30.8	48.3	0.1	3.9	1.5	3.3	9.5	0.3
Omusati	13.1	80.2	–	3.3	0.2	0.1	1.9	0.5
Ohangwena	15.4	57.9	–	19.5	0.5	2.5	3.5	0.2
Oshikoto	25.7	49.9	0.2	12.2	5.2	3.3	2.7	0.7
Namibia	46.3	28.9	0.7	9.2	2.8	2.4	7.1	1.6

Compared to the data of 1996, published by Mendelsohn et al. (2000: 64), one is struck above all the difference in income (salaries/wages). Although Mendelsohn et al. undertook different forms of categorisation and based their data on the population over the age of 15 (not including

the purposes of this study. (At this point, it becomes very clear that water management and political borders rarely coincide, cf. Niemann 2008)

students) rather than on the number of households, the proportion of incomes from non-salaried work would appear to have decreased (1996: 27%, 2003/04: approx. 21% for all regions), along with the proportion of pension payments (1996: 14%, 2003/04: approx. 10% for all regions). These shifts in the income structure point to a shift towards subsistence farming and increased dependence on money transfers (remittances and other transfer payments by the State) in recent years. Nonetheless, the figures given by Mendelsohn et al. (2000: 64) show that in 1996, around 50% of the households included one or more members who were drawing a salary. It is not possible to make a comparable statement based on the data available for 2003/04.

2.2 Commercial activities in agriculture and trade

Economic activities in Central Northern Namibia were examined at a general level by Knutsen (2003). He ascertains that there are hardly local economic cycles. This means that the individual stages of value creation are barely linked to each other at all, thus making for a very fragmented economic system. From this, Knutsen deduces various competitive drawbacks for local economic players: it is often impossible to realise economies of scale, since administrative hurdles and pressure of cost hamper access to capital by comparison with South African commercial enterprises. It also becomes clear in this context that despite preferential government treatment of the region, the local population has virtually no success in bringing political influence to bear on the established obstacles facing them; state investments are insufficiently controlled and make it difficult for individual (economic) players to tackle effectively the problems that exist. As a consequence, faced with somewhat unsuccessful trade and business activities, people in Central Northern Namibia see commercial agriculture as a way out. Here Knutsen (2003: 575) observes somewhat critically: “Because few other investment opportunities are attractive to local black entrepreneurs in the North, income from commercial farming will at best be channelled back into some demand in the retail sector that South African investors dominate. This implies that the surplus trickles out of the North and out of Namibia.”

The general interest of the population in Central Northern Namibia in a strengthening of agricultural activities was also highlighted in the expert interviews conducted as part of the study presented here. Women were named as particularly interested parties. It also became apparent that vegetables and fruit are of greater importance in the (traditional) diet of Central Northern Namibia than in the rest of the country. And yet agricultural activities can currently be seen to focus on cattle farming and the cultivation of *mahangu* (pearl millet). Ecological farming is of scant significance, but is seen by individual interviewees as a chance for the future. But as also shown by Mendelsohn et al. (2000: 60), *trading* in agricultural products is not seen as a primary field of activity, but at best as an evasion strategy in case of drought.⁵

The Green Scheme Mechanism (NPC 2006) along with the National Horticulture Development Initiative represents an important framework for strengthening irrigated agriculture. These two programmes of the Ministry for Agriculture, Water and Forestry are closely connected to the ‘Namibian Market Share Promotion’ scheme that pursues the objective of raising the proportion of national food consumption constituted by locally produced crops, fruits and vegetables and reducing the import quotas with a view to strengthening local agricultural product in the commercial sector (Brock 2007).

⁵ Moreover, the interviews revealed trade in goods over and above self-produced agricultural products as an important economic activity. Certain experiences, competencies and also interests that have been handed down, as it were, are in play here.

Given this background, a national cost-benefit analysis was carried out which – based on data for 2003 – undertakes a comparison of the costs of local food production and the costs of importing food (Price Waterhouse Coopers 2005). The result of this study is summed up in Table 7.

Table 7. Costs and prices for horticulture products – imports vs. local production
(Price Waterhouse Coopers 2005: 13)

Product	Produ- cable in Namibia	Currently Produced Locally	Cold Store Benefit	Imports			Local Production					
				Total Demand in Tons	Import Mass	Import price per ton	Import Value - N\$	Ha planted locally	Total local yield	Local yield/ha	Total Local Value - N\$	Local price per ton - N\$
Potatoes	yes	yes	low	18,924	14,390	2,208	31,773,120	49	2,534	51.7	3,916,886	1,548
Onions	yes	yes	low	12,936	5,962	1,642	9,789,604	143	6,974	48.8	8,015,626	1,149
Green Mielies	yes	yes	high	12,287	10,988	84	922,992	37	1,299	35.1	76,215	59
Cabbage	yes	yes	medium	6,659	3,768	1,369	5,158,392	92	2,891	31.4	2,771,080	959
Tomato	yes	yes	high	6,094	3,448	4,155	14,326,440	66	2,646	40.1	7,697,150	2,909
Oranges	yes	yes	high	3,745	2,738	1,317	3,605,946	68	1,007	14.8	929,037	923
Banana	yes	no	high	3,721	3,721	3,173	11,806,733	-	-	-	-	-
Carrots	yes	yes	medium	3,011	2,166	2,507	5,430,162	38	845	22.2	1,482,764	1,755
Watermelon	yes	yes	high	2,320	253	1,525	385,825	41	2,067	50.4	2,206,196	1,067
Grapes	yes	yes	high	1,137	1,137	5,155	5,861,235	-	-	-	-	-
Pumpkins	yes	yes	low	1,102	647	2,003	1,285,941	13	455	35.0	637,889	1,402
Butternuts	yes	yes	low	1,096	312	2,462	788,144	35	784	22.4	1,351,879	1,724
Lemon	yes	yes	high	1,090	1,084	2,887	3,129,508	12	6	0.5	12,124	2,021
Lettuce	yes	yes	high	1,007	750	4,972	3,729,000	9	257	28.6	895,842	3,488
Mango	yes	yes	high	899	579	3,523	2,039,817	46	320	7.0	790,336	2,470
Cucumber	yes	yes	high	478	438	7,907	3,463,266	1	40	40.0	218,806	5,470
Avocado	yes	yes	high	242	242	7,749	1,875,258	-	-	-	-	-
Cauliflower	yes	yes	high	441	335	3,406	1,141,010	4	106	26.5	251,756	2,375
Beetroot	yes	yes	medium	680	475	1,930	916,750	13	205	15.8	276,922	1,351
Sweet Potato	yes	yes	low	647	439	2,932	1,287,148	8	208	26.0	426,415	2,050
Naartjie	yes	yes	high	547	502	1,799	903,098	6	45	7.5	55,318	1,229
Peppers	yes	yes	high	518	434	8,711	3,780,574	6	84	14.0	514,638	6,127
Gem Squash	yes	yes	low	508	361	2,993	1,080,473	8	147	18.4	307,311	2,091
Total				78,089	55,169	2,075	114,470,436	695	22,920	33	32,834,190	1,433

Table 4.2 a

* Table Grapes are locally produced export products.
Local production figures were however not readily available.

At a national level, one sees from the quantities of home-grown and imported fruits and vegetables the substantial proportion taken up by imported produce. The figures for domestic (commercial) horticulture also reveal the generally lower costs of domestic production. But it is not clear whether the locally produced products differ from the imported goods in terms of quality and whether this could explain the discrepancy in the selling prices. Furthermore, the stringent question of access to the formal markets presents itself here, i.e. access to the corresponding distribution structures currently dominated by South African companies. As far as the region under review is concerned this cost-benefit analysis, which was not differentiated according to growing areas, allows only limited conclusions to be drawn. But as will be shown in Chapter 3.1, it is indeed possible to identify market and cultivation potential in Central Northern Namibia for several of the product groups listed here, both for the subsistence economy and for commercial activities.

Older studies show that in Central Northern Namibia there is a certain degree of trade in live-stock and meat: on the basis of Liagre (2000), it is possible to distinguish between small-scale producers (subsistence, small-scale trade in rural areas) and commercial suppliers in the region. The latter pursue trading activities over medium (50 to several 100 km) and long distances right down to Cape Town/South Africa. These streams of commerce generally embrace middlemen and processing business; characterised by industrial processes subject to strict controls due to things such as the veterinary fence, the Namibian MEATCO (slaughter, processing, distribution) is usually involved in trading activities with South Africa. Whereas according to Liagre (2000) the meat (above all beef) offered at the open market in Ombalantu (Omusati Region) stems primarily from the southern Angolan regions of Cunene, Namibe and Huila, at the open market in Oshakati (Oshana Region) one finds meat on sale, 78% of which comes from Central

Northern Namibia. In addition, the interviews conducted reveal that the market in Oshakati is currently offering primarily crops, fruits and vegetables from Etunda.⁶

When it comes to the small-scale producers, some interviewees are critical of their inadequate collaboration with wholesalers and further service providers in the region, making any extension of market-based activities appear initially difficult. Nonetheless, individual products (see below) are credited with increasing marketing potential, also because of their current strong presence at the market in Oshakati.

Generally speaking, the interviewees ascertain that the point of market saturation has not yet been reached at the Namibian food markets. If it becomes possible, for instance via water storage, to extend the growing period beyond the rainy season, this could lead to a – most welcome – stabilisation of the markets. After all, the political goal is to increase Namibian agricultural production and become less dependent on (South African) imports. Whereas in recent years it has been possible to increase the market share of Namibian products at formal markets from 7 to 30% (Brock 2007), the political target was set at 50%. Not taken into account here are trading activities at informal markets (open markets), as these are not registered in the official statistics. Individual interviewees estimate that a turnover of around 10% of the trade done at the formal markets takes place at informal markets. The significance of the competition between formal and informal markets is currently deemed to be of negligible significance; the marketing routes that exist are very different and barely influence each other at all. With a future saturation of the market, this complementary co-existence could well shift and lead to local competition in the long-term.

Even if the main political goal is to reduce imports of staple foods, market developments in the neighbouring countries are still relevant. At the moment, a large amount of the food consumed in Namibia is imported from South Africa (EPO 2004). At the same time, interviewees did not subscribe to the idea that with the emergent agricultural production in neighbouring Angola the local markets in Central Northern Namibia are being increasingly supplied with such products. Assumptions are in fact to the contrary: in Namibia food can be produced at a cheaper cost than in Angola, which means that Angola represents a market for Namibian agricultural produce, particularly potatoes, rather than the other way round. In this respect, Knutsen (2003: 575) also points out that Angolan customers are welcome at Namibian markets, since they buy in bulk and pay in US\$.⁷

2.3 Conditions for urban agriculture

In recent years, the discussion on the regional economic effects of water-based activities is increasingly taking up the phenomenon of inner-city agriculture (cf. Streiffeler 2001, Brown 2006, Oboubie et al. 2007, Halweil/Nierenberg 2007). Forms of urban agriculture are not a strictly southern feature. Yet by international comparison they do, without doubt, play the great-

⁶ Etunda is an irrigation project within the scope of the Green Scheme Policy that combines large and small-scale agriculture. Some more background information can be obtained from NPC (2006: 184ff.).

⁷ Knutsen (2003: 575ff.) further shows that Angola (and the Dem. Republic of Congo) constitute interesting export markets for Namibia. Another perspective besides the sale of products in these countries is the management of construction projects in Angola or Namibian-owned production plants in Congo; this of course does not embrace the agricultural focus of CuveWaters, but concerns instead the construction sector and the manufacturing industry (above all garment factories).

est role in the countries south of the Sahara in terms of their importance as a source of income and food (cf. Maxwell et al. 1998, Streiffeler 2001, Halweil/Nierenberg 2007). In what was initially a simple definition, urban agriculture can be described “as the practice of farming within the boundaries of towns and cities” (Obosu-Mensah 1999: 11). One finds a slightly more precise description from Obuobie et al., in whose opinion “urban and peri-urban agriculture can be broadly defined as the production, processing and distribution of foodstuff from crop and animal production, fish, ornamentals and flowers within and around urban areas” (2006: 1). Mougeot ultimately distinguishes between different forms of urban agriculture resulting from the six distinct dimensions: “types of economic activities, food/non-food product categories, intra-urban and peri-urban, types of areas where it is practised, types of production systems and product destination” (Mougeot 2004: 2).

Most studies differentiate between three types of urban agriculture that also make up the key distinguishing grid for the context treated here: firstly there is the type of *inner-city agriculture* practised on fallow land that happens to be available. The enabling basis for this form is mostly a specific characteristic of African urbanisation, namely the polycentric structure of many agglomerations, in which building development thins out the further one moves away from the city centre. The use of *domestic gardens* (urban gardening) differs from inner-city agriculture in that these are used primarily for growing fruit and vegetable for the family’s own needs and less for the urban markets as is largely the case with inner-city and peri-urban agriculture. This form is also widespread in African towns given its advantages over the other variants in that a domestic garden offers a certain amount of protection from theft and does away with journey time which in turn eases the work burden. And last but not least, one finds *peri-urban agriculture*. As can already be seen from the name, the areas used here are on the outskirts of towns; they are mostly former villages that in the course of town expansion gradually became peri-urban space on the edge of the respective agglomerations. Peri-urban borders are partly subject to varying definition, but the general consensus is gradually settling on an area of up to 40 kilometres away from the city centre that can be described as peri-urban (cf. Obuobie et al. 2006: 2).

In what follows, we shall concentrate mainly on inner-city agriculture, as it is here that the greatest potential for economic effects is to be expected, bearing in mind the general question at stake in this paper, namely that of water-based forms of generating income. A general overview of urban agriculture in African towns by way of introduction is followed by a brief inventory of the current potential for urban agriculture in Central Northern Namibia with reference to relevant publications.

Farming in the shadow of the city

The heading ‘Farming in the shadow of the city’ refers to the name of a study carried out by the research institute IFPRI (International Food Policy Research Institute) in 1998 on urban agriculture in African towns (cf. Maxwell et al. 1998). The title was intended to express how, for a long time, the ‘urban agriculture’ phenomenon found itself in the shadow of the more overarching phenomenon of southern urbanisation processes, which meant it attracted little in the way of scientific attention. This situation is remarkable on two counts: firstly the significance of the urban agriculture for safeguarding food supply in large parts of Africa, Asia and Latin America is beyond question. A United Nations study published in 1996 reached the conclusion that as much as a third of foodstuffs consumed by and in towns stems from urban production (UNDP 1996: 26). If one looks at each study individually, impressive figures for the potential of urban food production can be cited for virtually all towns in the so-called ‘development regions’ (for

an overview cf. Halweil/Nierenberger 2007, Brown 2006: 213f.): in Daressalam (Tanzania) 60% percent of the milk sold in the inner city is also produced there, in Yaoundé (Cameroon), 70% percent of the vegetables and in Havana (Cuba) even an estimated 90% percent of the food consumed stem from urban agriculture.

Besides safeguarding the food supply, urban agriculture also has a significant role to play as a workplace: over 800 million people enjoy a steady income from urban agricultural activities (cf. RUAFA 2006: 3). In terms of the regional economy, it is also important to emphasise that the relationship between rural and urban production is complementary in nature, because whereas urban agriculture concentrates mainly on easily perishable varieties of fruit and vegetables, less perishable products such as rice, potatoes and onions come from the rural areas (cf. Streiffeler 2001: 166).

For a long time, scientific literature paid little attention to this significance of urban agriculture, in particular for southern regions. In a 2001 review, Streiffeler cites just two studies for the 1980s that were explicitly devoted to this topic (Streiffeler 2001: 162), but the 1990s also stand out by virtue of evident neglect in this respect. Particularly worth mentioning here are the works of Drescher (1998), Mougeot (1993) and Maxwell et al. (1998). Several reasons can be given for this merely marginal scientific treatment. An explanation for these “unseen gardens” (Drescher 1996: 6) may be that urban agriculture is largely attributable to the ‘informal’ sector, which itself enjoyed very little attention for a long period. Furthermore, the neglect of the subject is an expression of a view that long dominated the political development of many institutions and that concentrated all too closely on the rural regions in the quest to achieve food security for urban areas. On the whole, it is fair to say that the majority of relevant studies come to the unanimous conclusion that urban agriculture improves both the access to and quality of food in the supply areas as well as having a proven effect on the regional economy.

The following points are worth emphasising with regard to the economic effects: the vast majority of town-dwellers involved in agriculture, whether within their own domestic gardens or a free-standing plot, produce for their own needs; a mere third of the farmers produce directly for sale at markets (UNDP 1996, RUAFA 2006, Halweil/Nierenberg 2007). Nonetheless, most studies dealing explicitly with the economic potential of urban agriculture refer to its economic expandability. This positive outlook mostly comes down to three aspects. Firstly, the profit opportunities outlined above appear to offer a chance to those town-dwellers without work or any chance of acquiring job qualifications. Secondly, the general belief is that urban agricultural businesses are able to supply urban markets more reliably and above all more inexpensively than production locations far removed from the town. And thirdly, this applies to those urban areas in which supermarkets are withdrawing to an increasing degree from the city centres in favour of the more lucrative suburbs, leaving only fast-food restaurants remaining in some districts. Such areas offer good conditions for farmers’ markets, community-supported food cooperatives, etc.

Besides the positive effects of urban agriculture named here, there are two serious downsides to the concept. On the one hand, urban agriculture makes an important contribution on the road to an improved food situation and an ecologically sustainable organisation of urban areas. On the other hand, it inevitably requires a resource that couldn’t be in any shorter supply in the southern towns – water. Although the farmers, men and women alike, do their utmost to make effective use of all water resources and to use local streams and rivers for irrigation as well as storing rain water, they often have no choice but to resort to urban waste water. Eight-five percent of urban effluents flow back into the environment untreated and 50% of the urban cultivable land

is worked with these domestic effluents (cf. Obuobie et al. 2006: 3). On top of the scant availability of irrigation water in general, another aspect that makes effluents such an attractive source of water is their wealth of natural nutrients at low cost. But this is precisely where the problem lies: such effluents also contain a whole range of pathogens capable of surviving on the fields for a long time and representing a serious threat to public health. In Accra, for example, 200 000 people eat lettuce grown on urban agricultural land irrigated in this way on a daily basis – a figure that shows just how quickly irrigation-driven epidemics could spread if the worst came to the worst (cf. *ibid.*: 7). Livestock farming, which likewise exists as a form of urban agriculture, represents a further health hazard. Even fundamental proponents of urban agriculture see the very close proximity of humans and livestock as one of the greatest challenges to be faced over the next few years (cf. Halweil/Nierenberg 2007: 149).

Urban agriculture in Namibia

Whereas West and East Africa can be considered relatively well researched in terms of urban agriculture, there is a distinct shortage of relevant studies available for Namibia. A glance at the literature quickly reveals that there are indeed a whole series of minor studies and projects devoted to the subject of urban agriculture, but only one more comprehensive piece of research, namely “The status of urban and peri-urban agriculture, Windhoek and Oshakati, Namibia” (Dima et al. 2002), commissioned by the FAO in 2002. This means that, all things considered, only “very little information ... on this type of farming in Namibia” (Dima/Ogunmokun 2004: 36) exists. An estimation of the economic potential is further hampered by the fact that some results of the few studies to hand are highly contradictory. Whereas, for example, Ogunmokun, referring to the FAO study for the urban areas of Windhoek and Oshakati, assumes that over 70% of the households are involved in some form of urban agriculture (cf. Ogunmokun 2005: 2), Frayne works on the basis of a mere 4% for Windhoek, even though he does establish that “general observation in the area supports the fact that, although it is limited in incidence and scale, UA [Urban Agriculture] is evident in Windhoek“ (Frayne 2005: 39).

On the whole, urban agriculture is discussed very much in the context of Namibian processes of urbanisation, which, despite certain commonalities with other regions in Africa, also manifest significant differences. Given the fact that Namibia was administered by the Republic of South Africa until 1990, and in view of the restrictive migration policy imposed by this administration, the onset of the urbanisation process in Namibia happened appreciably later than on the rest of the African continent. In the mid-1990s, for instance, agglomerations in neighbouring countries such as Durban and Cape Town in South Africa or Harare in Zimbabwe had more inhabitants than the whole of Namibia, in which more than 70% of the population lived in rural areas. For 15 years now, however, Namibia, too, has been experiencing an ongoing urbanisation process: the current rate of urbanisation is around 4.5% a year, with natural population growth standing at 3.1%. Between 1981 and 1991, some towns saw truly incredible levels of growth: Windhoek grew by 46%, towns such as Rundu in the Okavango region by 911% (cf. Dima et al. 2002: 12).

Whereas the delayed onset of this socio-geographical reorganisation compared to the rest of the African continent is specific to Namibia, the economic development associated with it tends to be in line with the general African ‘trend’. The World Bank report on the state of Africa published in 2000 under the title “Can Africa Claim the 21st Century?” does not give much cause for hope with regard to African economic development: “Despite gains in the second half of the 1990s, Sub-Saharan Africa enters the 21st century with many of the world’s poorest countries. Average income per capita is lower than at the end of the 1960s. Incomes, assets, and access to

essential services are unequally distributed. And the region contains a growing share of the world's absolute poor, who have little power to influence the allocation of resources" (World Bank 2000: 1).

In the estimation of Dima et al., general irrigation agriculture in northern Namibia only got underway in 1968 with the construction of the Kunene River water pipeline, and urban agriculture was a form of agricultural technique largely 'imported' into the northern states of Namibia by refugees from Angola in 1975 (cf. Dima et al. 2002: 17). It is also important to note here that of all the differentiated types of urban agriculture mentioned above, domestic gardens represent the dominant form in practice (cf. Ogunmokun 2005: 5). For Ogunmokun the main reason for this is a "lack of policy on urban agriculture" (ibid.), as a consequence of which "those who use open spaces for urban agriculture do so illegally" (ibid.). As in other regions of Africa, this neglect of 'urban agriculture' by urban planning implies a perception deficit whereby forms of urban agriculture are considered a manifestation not particularly 'in keeping with' the urban landscape. Part of this picture also seems to be that urban farmers often receive no active support from the municipal authorities: "None of the urban farmers in Windhoek and Oshakati get any help, information or advice from the extension services. When contacted, the extension officers responsible ... claim that their sphere of responsibilities is limited to the rural areas and not to the urban areas." (Dima et al. 2002: 52). There also appears to be a problem with municipal supervision of urban gardening projects, whose roots are demographic more than anything else: Namibia's demographic situation is essentially characterised by "a complex system of cyclical or reciprocal migration between rural and urban areas" (Frayne 2005: 43). This keeps leading to high fluctuation among municipal employees, possibly also amongst those officials qualified to train urban farmers. This means that many towns are no longer prepared to invest time and money in maintaining the post of an 'urban extension officer' (cf. Ogunmokun 2005: 3).

Against such a backdrop, virtually all studies agree that any reinforcement of the urban agricultural sector can only be achieved via an integrated approach that makes a point of including the key players in the configuration process: "Any successful project should aim at fully utilising existing structures and institutions" (Ogunmokun 2005: 7). This means that in developing a basic strategy for the promotion of economy-oriented forms of urban agriculture it is vital to involve various *municipal departments* (Urban Planning, Social Welfare, Water Affairs) as well as different ministries (Ministry of Agriculture, Water and Forestry, Ministry of Health and Social Services, Ministry of Women's Affairs) and community-based organisations. Of course the private households and their members still count amongst the key players here. For this reason it seems as indispensable as ever to gain "an insight into how individual members of households or communities are occupied within their social milieu" (Dima et al. 2002: 13), "before introducing new innovations to the communities" (ibid.).

This situation is continuing to grow in significance not least due to the legal aspects of land ownership. After all, when it comes to land access, there are manifest differences between, say, Windhoek and Oshakati (for more detail cf. Waegerle 2007): whereas 66% of the agricultural area in the capital was allotted by the respective local authorities responsible, 51% of the urban agricultural area in Oshakati was allocated by traditional 'headmen', leading the FAO report to conclude in this respect: "In fact, this concurrent allocation of plots by headmen who claimed traditional authority to the land is a major bottleneck to the effective planning of Oshakati by the Local Council Authority who do not recognize the traditional authority but also could not easily dislodge the plot owners" (Dima et al. 2002: 22). Here again, a basic precondition for the implementation of economically viable forms of urban agriculture seems to be serious consideration of the specific possibilities for accessing resources. The prevailing state of heterogeneity

contributes substantially to the emergence of usage conflicts in which different forms of *legitimate* claims to ownership exist (Randeria 2006: 232; see also Werner 2007).

Looking at the motivation behind urban gardening, they initially appear to be dominated by what are very clearly non-monetary aspects. Virtually all farmers⁸ practise urban gardening with the intention of improving the nutritional status of their own family. The additionally grown food evidently continues to play an important role in stabilising social networks in that surplus produce is often gifted to family members and close friends. Part of this surplus produce frequently finds its way back in the form of ‘urban-rural food transfers’ (Frayne 2005: 39) to those rural areas from which most of the urban farmers both in Oshakati and Windhoek originate (cf. Dima/Ogunmokun 2004: 37): in a survey of 315 households carried out in 2000, for example, only 5% said they had no relations in the countryside (cf. Frayne 2005: 42).

By way of contrast, a mere 17% of Oshakati’s inhabitants say they wish to generate additional income via agricultural activities (Dima et al. 2002: 34). Where not only products for subsistence but also market produce is grown, tomatoes, beans, water melons and sweet potatoes seem to be the products with the best prospects, although rarely cultivated at present “because markets for high value crops are not yet developed or readily accessible” (Nantanga et al. 2007: 6). The successful implementation of economically viable urban agriculture thus calls for a “comprehensive economic assessment” that attempts “to determine the cost of production, price trends, and the return to the producer” (Dima et al. 2002: 78) for the varieties of fruit and vegetable in question. A regional economic potential analysis of this kind appears particularly meaningful for Namibia considering the sales difficulties on two fronts: firstly, as already mentioned, the Namibian food market is dominated almost exclusively (80–90%) by South African supply chains (Dima/Ogunmokun 2004: 36), secondly, it would appear that Namibian consumers also tend to prefer South African produce to Namibian products (cf. Ogunmokun 2005: 12).

Furthermore, all observers agree that “being the driest country in sub-Saharan Africa, water is the main limiting factor to any form of land husbandry” (Ogunmokun 2005: 5; cf. also Frayne 2005: 38). And so, given this background, one of the key lines of argument in the FAO report is that “any organization venturing into any urban agriculture project in Namibia should first ensure that there would be a reliable and cheap source of water” (Ogunmokun 2005: 5). Following substantial price increases imposed by Namwater in recent years, rainwater represents the central source of water for agricultural activity in domestic gardens; this applies particularly to Oshakati, where a mere 48% of domestic gardens are partly watered with tap water (cf. Dima et al. 2002: 11). Another striking feature is that, in contrast to many other regions of Africa, urban farmers seem to take a sceptical to negative view of using wastewater, although rejection is more marked in Windhoek (77%) than in Oshakati (43%) (cf. *ibid.*: 40). Such an appraisal does, however, match the results of socio-empirical surveys conducted within the scope of the Cuve-Waters project, where evaluation of water quality revealed that (organic) effluents were viewed negatively by a clear majority (cf. Cuve Waters Project 2008a). Here again, the FAO report concludes that “producers would be discouraged from venturing into vegetable and fruit production unless they are assured a reliable and cheap source of water” (Dima et al. 2002: 77).

On the whole, it is fair to say from looking at the studies named here that urban agriculture does not play any real role as a direct source of income, but that, in view of widespread unemployment, particularly in Oshakati, a fundamentally positive view is taken of expanding urban agri-

⁸ From a gender point of view, it can be established for the region surrounding Oshakati, around 58% of people involved in urban agriculture are women (cf. Dima/Ogunmokun 2004: 36).

culture more strongly geared to production for market: “Many producers are willing to expand their plots if they are assisted with some inputs, similarly those with no gardens have expressed interest to start vegetable gardens, if they are provided with space and initial capital” (Dima et al. 2002: 15). The third crucial factor besides water and access to land appears to be the options available for financing agricultural activities. As in other development contexts, the micro-credit model, involving few obstacles for applicants, is very much favoured and many people that this could prove to be a decisive step towards the economic independence of farmers: for instance, a mere 4% of people living in Oshakati have access to credit (cf. Ogunmokun 2005: 28).

Finally, the problems involved in implementing economically viable urban agriculture can be summed up as follows: “Shortage of water, incidences of pests and diseases, lack of capital, frequent droughts, lack of information, markets and theft of products” (Dima et al. 2002: 77).

3 Potentials for water-based activities

The assumption behind the studies is that additional water in the region would give rise to a broadening of water usage and thus promote improvement to the domestic food supply and form the basis for an additional source of income. This means that the situation is considered at two levels: firstly, attention is given to forms of subsistence-oriented production aimed at reducing poverty. Secondly, questions are raised about opportunities and conditions for initiating local economic cycles. Here it is important to differentiate between (agricultural) use of the additional water on the one hand and the maintenance and/or expansion of water infrastructures on the other hand. The idea is to use (small-holding) agricultural production and (local) trade with this produce to generate an income which, despite costs for the requisite water deployment (e.g. irrigation and appropriate infrastructures), represent a financial improvement for the producing individuals and households. In looking at the regional economic effects of new water use options, the overall focus thus rests on the reduction of poverty and the creation of jobs. Furthermore, a distinction is made between such effects arising from the use of additional water in agriculture and other business areas (Chapter 3.1), urban agriculture (Chapter 3.2), and the operation and maintenance of infrastructure (Chapter 3.3).

3.1 New water-use options

This section deals with the new options for water use in Central Northern Namibia becoming conceivable with new water technologies. It includes pointers and appraisals on implementability gleaned from expert interviews. One fundamentally striking aspect was that many of the interviews considered commercial activities, for example agricultural production for Namibia’s local informal markets, but especially for its formal markets, to play a major role.

The point of departure for economic activities in general and urban agriculture in particular as described above shows that while starting points for a positive development do exist, one must reckon with barriers when it comes to initiating (new) economic cycles and any kind of agricultural activities. It is possible to build on existing forms of a subsistence economy just as it is possible to build on existing ‘alternative strategies’ for generating income. But other barriers apart from a shortage of water resources are expected among the interviewees concerning the usage of waste water for irrigation purposes against the background of current policies in the sectors water, agriculture and land.

Working on this basis, the following presents a bundle of conceivable and to a certain extent promising economic activities relating to the use of additional supplies of water. In other words, it does not take into account that water from existing infrastructures (pipelines, boreholes, etc.) will be replaced by water generated with the help of new technologies without changes in water usage.

Crop production and feedlots

It is possible to distinguish with respect to crop production between commercial activities geared to marketing on the one hand and subsistence farming activities geared to family self-sufficiency on the other hand (see also Chapter 3.2 on the latter). The interview results indicate in particular that the prevailing situation in rural areas and the institutional structure established there (extension officers) represent a good starting point for agricultural activities. Nonetheless, effective exploitation of this offer is not always guaranteed and problems arise with the marketing side. A series of *high-demand products*⁹ were named in the interviews in connection with commercial marketing¹⁰ and subsistence farming activities:

- as high value crops, fruits and vegetables enjoy a higher (financial) yield and demand than other crops; they thus seem to be more promising
 - lettuce, mushrooms etc. (in hydroponics)
 - green mielies/green maize, tomatoes, onions
 - carrots (very high demand)
 - potatoes (high demand in Central Northern Namibia with export potentials to Angola)
 - cow peas, cassava (not traditionally consumed in Central Northern Namibia, but with export potential to Angola, where there is not enough planting material)
- processed goods (meat, pork, dairy, juice)
- production of seedlings for resale

Besides seeds and seedlings, land and labour, any evaluation of what it costs to produce these goods must also take into account (a) irrigation costs and (b) infrastructural costs for transport and storage of produce. Potatoes, as an example, prove that they can compete with good produce from South Africa: one interviewee places production costs in South Africa at 25N\$, with an additional 20N\$ going on transport to Central Northern Namibia. He compares this to 28N\$ for local production with far lower transport costs. A feasible production volume of 12 to 15 tons is assumed for Central Northern Namibia.

On the subject of irrigation costs, it is generally observed that more efficient methods of irrigation are needed, bearing in mind the key importance here of investment costs and how the local population are able to access these methods. Simple methods should also be examined, for instance planting fruit trees in bowl-like clay pots to allow for better water retention; the pots could then be produced locally, thus creating a further sphere of economic activity.

⁹ Attempts with peppers and tobacco failed in North Western Namibia; no reasons for this could be named in the interview.

¹⁰ It should be remembered that Namibia has so-called controlled crops (with price as well as import/export regulations); white maize and wheat have already been included in this regime, while mahangu is in the process of being included. Meat prices are also regulated institutionally.

Looking at the kind of sums required to *reduce poverty*, a benefit of 20N\$ a day is considered adequate by an interviewee. It is important not to forget the need for capacity-building measures in this context, for example with regard to type of cultivation, irrigation methods and use of fertilisers and pesticides. This applies both to subsistence production and small-scale production for informal markets.

Smallholder production for formal markets possesses only limited potential and a number of aggravating factors are given particular mention in the interviews. Problems in meeting delivery obligations, poor soil quality and seasonal climatic fluctuations represent major obstacles. There are also reports of a lack of labour, administrative burdens (above all taxation), lack of capital resources (that can't be obtained even through loans) and difficult access to fertilisers and pesticides as well as a constant power supply (pumpage). The interviewees thus conclude that larger production units are required for formal markets and that these could be achieved through mergers into hitherto barely existent cooperative structures and/or through corporate organisation. Once commercial structures are up and running, as in the case of the Etunda Irrigation Scheme, it is then reasonable to expect further smallholder activities to become established in and around the area, along with an expanding infrastructure (schools, clinics, etc.). It is anticipated that these spill-over effects will in turn create new impetus for developing wealth and reducing poverty.

And yet some scepticism was voiced amongst the interviewees regarding the acceptability of and lack of due thought given to the deployment of (purified) effluents. Taking up the potential risk of using purified waste water for food production, the discussion turned to the use of such water for *cattle watering* and above all the production of *fodder*. The interview partners assume there to be greater acceptance here. This line of thought is also justified by the fact that by growing animal feed, the quality of both the animals' health and the soil could be improved. It would make for more sustainable grazing patterns, which in turn would mean a better yield from the sale of the cattle. Furthermore, it would provide food for small livestock (above all poultry), which makes an important food contribution in the form of meat and eggs. Other interviewees, however, rated these suggestions as less efficient, anticipating insufficient added value from this form of water usage and the use of fields for growing fodder as compared to the cultivation of cereals or high-value crops.

Agricultural trade

The interviews revealed the existence of initial structures for the marketing of agricultural goods. For example, 'small traders' are established at local markets and, with their very good knowledge of and ability to evaluate the market demand, represent an important target group for measures undertaken in the CuveWaters project. At national level, however, the marketing structures for commercial produce are rated unsatisfactory. People tell of initiatives intended to compensate this shortcoming such as the creation of a national wholesale market in Windhoek and market hubs at further trading centres with logistic advantages. Despite there having been plans to put such infrastructures in place for several years now and even though appropriate preliminary work is in progress, there are reports of failed implementation. Another starting point for political initiatives is the notion of raising the market share for Namibian products in the food sector. The current lack of infrastructural back-up is seen by interviewees as a main reason for the dominance of South African imports when it comes to food supply. The South African trade structures are so well developed that there are cases of crops produced in Namibia being bought up and indirectly re-imported into the country. This means that the commercial part of the Etunda project is also included in South African trade structures.

Any future improvement in market structures and distribution channels within Namibia could lead to a modified evaluation of the competition between formal and informal markets. It has been shown above that there is hardly any competition between these two market forms at present. With the intensified development of formal distribution channels (e.g. logistics, but also supermarket chains), informal markets may well come under competitive pressure, particularly when distributors operating on a national scale are able to offer produce more cheaply than local producers at the informal markets. However, on the basis of the interviews conducted it is impossible to estimate the time horizon within which these developments can realistically be expected to take place.

Other businesses

It became clear in the interviews that there are further consequences to be expected from a strengthening of the water-use options discussed above. These do not result from an improvement in the water situation per se, but are instead rated as spill-over effects and are seen by interviewees to lie in the economic, infrastructural sector. The following anticipated developments are named:

- up and downstream industries (e.g. mill, trade with fertilisers/pesticides¹¹, small traders for informal markets)
- training and consultancy for subject-specific transfer of knowledge
- clay pot production for irrigation of fruit trees
- schools, clinic, supermarkets and other infrastructures that come with increasing population within an area
- breweries for cuca shops
- short-term (seasonal) job opportunities (e.g. supporting seeding and harvesting, esp. in female-headed households)

It is worth mentioning that knowledge transfer is here interpreted less in terms of a marketable or commercially available service and far more as the passing on of knowledge and advice by individuals or indeed as forms of co-operation. On this basis, the interviewees see little hope of realisation or success for the option of setting up a training centre to improve agriculture practice, e.g. crop rotation, use of pesticides and fertilisers in subsistence farming and small-hold marketing gardening. Facilities offering advice from case to case and imparting the requisite expertise (training & capacity building) appear the more suitable way of transferring and imparting knowledge. Furthermore, the experts interviewed see a need for special incentives in order to initiate services connected with the so-called washing house (e.g. laundry). Possible incentives structures did not however feature in the interviews. There is thus a considerable demand for concepts and processes to support realisation of the water use options and sound out conceivable – positive and negative – spill-over effects (impact assessment).

¹¹ An important precondition for stepping up the sale of fertilisers and pesticides is improved training for the dealers.

3.2 Urban agriculture

In what follows, the interim results from the research of the literature along with the key findings from the expert interviews on urban agriculture are collated in order to gain an initial appraisal of the regional economic potential of urban agricultural activities. Based on the relevant publications cited in Chapter 2.3, the reasons for the supposedly low distribution of urban agricultural activities compared to other African regions must remain open: it is initially conceivable that for diverse reasons urban agriculture really doesn't have any real role to play in Namibia. This may be due to relatively unfavourable conditions (fluctuation between flooding and extreme aridity, difficult soil conditions); or perhaps the South African dominance in the food market nips any urban agricultural market activity in the bud. The other possibility, however, might be that although notable activities do exist, these have so far rarely been the subject of comprehensive research. Appraisals pointing to this latter scenario are that on the one hand "small scale irrigation ... has a huge potential" (Nantanga et al. 2007: 8), but on the other hand "it is important to note that no data on the costs and benefits of small scale irrigation ... could be obtained" (ibid.: 9).

On collating the results from the research on the literature with those from the interviews, it becomes possible to trace an ambivalent picture as far as the potential of urban agriculture is concerned: despite the emergence of thoroughly positive points of departure, conversely it also becomes clear that there are a whole series of obstacles to overcome on the road to developing the regional economic potential of this business form. Referring back to the general economic conditions (see Chapter 2.1) outlined in the first section of this paper, it is fair to say that water availability and soil quality along with the lack of local economic cycles not only limit the economic development in the agricultural sector in general but also imply serious hurdles for the spread of urban agriculture.

In principle, however, it is nonetheless possible to draw a positive conclusion from the interviews conducted, since almost all interviewees were fundamentally positive in appraising the potential of urban agriculture. Their appraisal referred both to urban agricultural activities confined to safeguarding subsistence as well as to activities geared more to the generation of income. Given the marginality of this business form and the scant scientific literature available, a result of this kind was not necessarily to be expected. Particularly surprising was the virtually unqualified positive perception of urban agriculture at urban level. Most astonishing was the fact that various departments would expressly support activities of this kind. Recent years have seen a definite change in attitude here throughout the whole of Namibia – people are viewing urban agriculture less and less as a contradiction to the overall concept of a 'modern' African town and are increasingly appreciating its development potential. As a result, Windhoek has recently relaxed its strict ban on urban agriculture, while Swakopmund City Council has explicitly included urban agriculture as an item in its town planning and regional economic considerations.

But the fact remains that, despite such positive appraisals, the merely marginal role played by this business form in current regional economic development can hardly be called a coincidence. In other words: although most experts consider urban agricultural activities to possess plenty of scope for development and strong regional economic potential, there are still countless projects in which the attempt at sustainable implementation has failed. Against the backdrop of these experiences, but also bearing in mind the success stories, the main critical factors or pre-conditions in connection with the sustainable implementation of urban agricultural activities are collated below on the basis of the interview findings:

- Land tenure reforms have also taken place in Namibia and are also somewhat complex in part, but compared to other African countries, access to land seems a negligible phenomenon when it comes to setting up urban agricultural activities (cf. also Waegerle 2007 for more detail). The current land reform does in fact provide a relatively stable degree of legal certainty, and the more traditional land rights prevailing in Central Northern Namibia do not present any real hurdles either.
- The successful implementation of urban agricultural activities, whether it be in the form of backyard gardening, communal garden or a more commercial variant, stand and fall with the provision of an inexpensive source of water – all experts interviewed are agreed on this, which means that comparatively readily available tap water is too expensive to launch such a project with any degree of success. The main alternatives under consideration are rain water and effluents.
- Furthermore, many projects have failed due to lack of knowledge and agricultural expertise. The opportunities and preconditions for a successful ‘skill transfer’ thus definitely constitute one of those factors that determine the success or failure of implementing urban agricultural activities on a broader scale. From this point of view, a central plot of land allowing a bundled transfer of knowledge appears to be the most promising variant.
- As for a sales market, experts are virtually unanimous in assuming that under certain conditions local products from urban agriculture could be marketed with success. The financial resources exist, as do the corresponding consumers to buy the inexpensive products. At the same time, however, consumers evidently have only low awareness of local products – ultimately also due to poorly developed local market structures. The domination of the Namibian food market by South African products also plays a role here. With this background, local production can only be successful under two conditions: it must be produced more cheaply and to a comparable standard. When it comes to supplying local markets, a key problem has repeatedly been the strain placed sooner or later on collaboration due to the fluctuations in quantity delivered by producers: with the larger food markets only wishing to trade on the basis of guaranteed quantities, this has naturally led to contracts being cancelled. The issue of successfully marketing the products is actually a crucial success factor, and appropriate advertising campaigns could indeed raise consumer awareness of local products. But the competition from South Africa represents a major obstacle when it comes to setting up local market structures, not least because the products are heavily subsidised by South Africa, and production costs in Namibia (particularly labour and water) are relatively high. This explains why several experts believe that only luxury consumer goods or foods of a quality that represents a key purchase incentive to consumers would have any chance of success. Taking a cue from economically thriving initiatives such as the Chinese production locations near Goreangab and Avis (both Khomas Region), their success does not seem to rest solely on effective knowledge transfer, but above all on the fact that with the establishment of a whole series of Chinese food markets, it has also been possible to secure the corresponding sales markets. To a large extent, products are grown that cater for the demand of Chinese consumers.
- The phenomenon described as ‘communal gardens’ is viewed critically by virtually all interviewees. Almost all previous projects aimed at implementing urban agriculture were more or less based on such communal gardens – and the overwhelming majority failed. One main reason given for the failure of these projects ultimately concerned the, in market based terms, unfair reward: as a rule, the start of each project was met with enthusiasm from the

entire community. Subsequently, however, one always saw the prompt emergence of motivated and less motivated groups. But at the close of the season, everybody demanded that the yield be distributed by person rather than by the personal effort invested. A further reason could lie in the unclear distribution of responsibility, a particular problem when it comes to maintaining important technical equipment (such as pumps, irrigation system, compost works). Nonetheless, several experts expressly called for the communal garden idea not to be discarded purely because of past failures. Variants in which general activities are organised collectively but where it is still possible to identify the individuals responsible for success do stand a chance of success. It is important to give careful prior consideration to which fruit and vegetable varieties would be worth growing. In Central Northern Namibia, for instance, successful projects involving the production of date palms are underway. These have the advantage of being able to withstand conditions of extreme aridity and being ideally suited to the native soils. Although aubergines were also successfully cultivated, they failed to sell since they do not feature in local 'taste'. On the whole it is also important to look at more recent calculations for water consumption and yield in order to identify suitable growing varieties. Generally speaking, one has to apply the seemingly banal yet, in development contexts, often forgotten piece of wisdom that the project's only chance of success is to fully appreciate the overall context. This means that consideration must also be given to the local ownership and power relations, culturally and regionally rooted nutrition and food preferences, local climate and soil conditions, sales possibilities, etc. Looking at the communal garden's long history of failed initiatives, one has to say that these have tended to collapse due to injustice of access and distribution of yield.

- When it comes to the participation of stakeholders, opinion is highly divided: whereas some emphasise the importance of comprehensive integration, others believe that although important, the significance of stakeholders is overrated. It is ultimately the 'ordinary' people involved and the basic prevailing conditions that are more crucial. It is thus vital to develop a framework for suitable structures with which to promote the flow of information, participation and decision-making. This framework must enable the participation of different players at different levels, which in turn calls for process reliability and openness.
- A further critical factor was mentioned that again possibly causes more problems than issues more responsive to technical solutions, such as nutrient-poor soils or scant water resources. It concerns the culture of people living in Central Northern Namibia, which traditionally revolves around livestock farming. Agriculture has always played very much of a secondary role in this tradition. With the exception of former civil war refugees from Angola, no-one has so far made any systematic attempt at urban agriculture. One main reason is perhaps the aforementioned cultural background, which not only neglects agricultural activities, but has of course also prevented knowledge about this form of cultivation from being acquired. In trying to implement urban agricultural activity, there are thus two critical problems to solve: firstly, one has to initiate an economic activity that runs counter to the prevailing cultural habits and way of life; secondly, there is the issue of knowledge transfer, which has already been addressed and which takes on especially strong significance here. Whereas the later could be dealt with via skilful management, the former represents a greater hurdle: basically speaking, the influence of cultural contexts raises the question as to what degree and with what means cultural constraints can be changed in order to bring about an appropriate 'mind shift. Closely connected to this is the problem of how underlying everyday routines can be cracked open and re-established in the form of newly configured routines.

- An integrated concept, for example with the scope to allow personal, independent initiatives to be included in the planning (such as the compost works of the FAO project at the Katatura Youth Centre, Windhoek), still appears to be an important prerequisite for success.
- Furthermore, the smooth-functioning (family) supply networks of the North possibly mean that urban agricultural activities hold little attraction. Many inhabitants have access to efficient supply networks in neighbouring rural areas, so that when it comes to foods such as mahangu and wild spinach, provisions are largely covered by rural products. Other basic foodstuffs would be tomatoes and onions, but these are imported at very low cost from South Africa.

On the whole, it is fair to include urban agriculture in saying that the realisation of regional economic potential depends very substantially on the effective securing of the basic conditions required for these activities. In summary, improved living conditions and the parallel creation of jobs represent an important goal.

3.3 Building and operation of infrastructure

Besides using water made available through new infrastructural elements, further regional economic potential can be generated by operating and expanding water technologies over and above the first installations. Overall, it is striking to note that the experts interviewed devoted little attention, even when prompted, to the potential of the installations. They did, however, point out (as previously seen in other areas) the particular need for suitable organisational models if plant maintenance and hence long-term availability of output from the new water technologies is to be secured.

Looking beyond the results of the interviews and based on the alternative technologies forming a focus of the CuveWaters project, it is possible to identify different business segments and opportunities. This primarily embraces measures to secure the technical and economic side of operating existing installations in the long term and includes services such as maintenance, repairs and cleaning, but also accounting and the supervision of income and expenditure. Such expenses are incurred for any household connections required, particularly sanitary installations, but above all for all communally used installations. This includes such things as the washing house, the desalination systems, installations for managed aquifer recharge, along with the concomitant distribution pipes and vacuum effluent collection. Of particular importance in ensuring operability and the sustainable use of infrastructures is the building of financial reserves to cover major repairs and above all the cost of replacement parts. Only if this is accomplished one can speak of self-supporting, cost-effective structures in the long term. Given the current socio-economic conditions in Central Northern Namibia, this represents a considerable challenge. The question of balancing out users' ability and willingness to pay on the one hand and the financial means required to maintain the infrastructures in the long term arises, along with that of State participation in this expenditure. Operational and financing models will have to be sought for the new water technologies and it will be up to them to find the answer to this.

It is possible to identify further business areas with a view to spreading further the (hopefully successfully) implemented water technologies tried and tested under the specific conditions of Central Northern Namibia. These lie on the one hand in the field of general construction services, but it is also important to look for models that allow the diffusion of individual technologies to further locations in Namibia or even in southern Africa. In this regard, the interviews imply that the requisite knowledge and skills are available thanks to the generally good labour

situation in the Namibian construction industry, particularly for brick building (e.g. storage containers). This means that the country already has access to important expertise for specific installation parts; other technical areas call for specific forms of knowledge transfer and capacity building.

4 Conclusions

The key finding from the expert interviews is that the water technologies themselves provide only limited regional economic impetus. This emphasises the fact that the development, integration and conveyance of water use options that fulfil the criteria for efficient, sustainable use of water are vital to accomplishing the goals of the CuveWaters project and comparable endeavours. An idea to initiate regional economic cycles focussing on water is particularly vital to enable income generation and find ways of reducing poverty beyond income and perhaps to be found in subsistence farming. It will become crucial to provide socio-economic sensitive measures flanking the technical implementation processes (incl. gender awareness, behavioural and cultural dimensions etc.). The interviews conducted did in fact throw up a series of ideas, pointers and empirical values worthy of consideration. Incentives for sustainable use of water offered by new technologies, the need to secure open development and establish clear-cut organisation and financing models as well as securing ownership and offer support at the local level water play a special role here.

Incentives for sustainable use

The above evaluations have demonstrated in numerous contexts that the current frameworks often fail to offer sufficient incentives to use the (additional) water made available by the new water technologies. In a way, this water is competing with existing sources of water – particularly with regard to supply costs or, rather, the price paid by the end-user. This was also shown by social empirical studies carried out as part of the CuveWaters project with inhabitants of the prospective sites: there it was established that “community representatives were all interested in piloting the technologies introduced to them by the CuveWaters team members. All participants of the workshops expressed their willingness to help with construction of infrastructure and volunteered or could identify people to be trained in the various associated tasks.” (CuveWaters Project 2008a). But at the same time it became clear that people find access to water costing less than the current prices at communal water points or private taps the most attractive, i.e. they seek low-priced alternatives.¹² The end-users thus focus less on the changed opportunities for use and concentrate far more on the financial considerations. And yet, given the basic water shortage there is also a general sense of having to consider very carefully how the water can be efficiently utilised. Crop rotation, the cultivated plants grown, irrigation methods, and also production methods used for processed products play a role in this respect. At the same time, however, possible alternatives need to be weighed up against local needs and demand, as the discussion of high-demand products illustrated above.

¹² This is also apparent if one considers that in some cases inhabitants cover large distances to get to earth dams, the canal, hand-dug wells or borrow pits to access free water (CuveWaters Project 2008a).

Open development due to overlapping components

A fundamental and important insight gleaned from the studies conducted is that urban agriculture projects in particular, but presumably also those concerned with other water use options, must ‘spread the load’. A decentralised structure needs to be created so that if one component or module fails, it does not jeopardise the entire project. The Namibian Development Corporation, for example, launched an initiative based on several pillars: part of this initiative was supported via co-operation with local government, another part corresponded more to what one might describe as a public-private partnership, and the third lot was run on a purely commercial basis by an entrepreneur. From such a perspective, important factors determining development are thus the individuals along with their skills and/or commitment. Many interviewees believe that allowances should be made for the development potential represented by these individuals instead of attempting to heave the entire group from one level of development to the next. This view is equally applicable to the integration of stakeholders: in view of the high fluctuation affecting local authority staff, it is important to secure project support from several individuals. This could then prevent prior agreements from narrowing the scope for adjustment to unforeseen eventualities.

Organisation and financing models

Alongside the co-operative structures there is the question of suitable organisational structures and financing models. The interviews reveal a shift in the various relevant policy areas, from donor- and subsidy-oriented policies to approaches aimed at breaking even in terms of the cost of measures taken. This would seem to apply both to infrastructural proposals and agricultural programmes. At the same time, the National Development Plan 2 (NPC without year) indicates that development plans be largely carried out via measures supervised and financed by government. The latter attracts criticism, particularly from (foreign) development agencies, as it means a loss of inducement structures that would otherwise help perpetuate ideas in the making. A particularly critical eye should be cast on community-based development programmes in this respect, although Namibian organisations (especially those involved in community-based natural resource management/conservancies) emphasise that the committee structures often deployed here actually do work well in some areas (e.g. care takers), thus finding acceptance amongst the population.

All in all, an ‘enabling environment’ is shown to be necessary for long-term development processes, an environment that combines incentives with a good cost-benefit ratio at both the individual or business level as well as at regional level. As already seen, the interviewees suggest very different ways of securing this balance:

- 1) Community-based (firmly established at the local level and incorporating those concerned, hence a high level of participation and interest can be expected);
- 2) Market oriented (economic incentives and competition as strong regulatory forces; those who commit to measures also benefit from them’)

The comments on subsistence versus commercial water use are also linked to this distinction. Whereas the interviewees tend to associate activities rooted in the local community more with the struggle against poverty, commercially oriented activities are linked with economic growth, whose impact on the alleviation of poverty is merely a knock-on effect (jobs, income, etc.). Another related aspect is the question as to who can participate in economic development and

the profits (financial and social) that go with it.¹³ Eligibility criteria with which to judge participation in the measures available would need developing here.

As for operation and maintenance of infrastructures, the interview discussions gave rise to the following outlines for three general modes:

- Community-based management organised in committees and receiving support on organisation, but above all on capacity building
- Impetus for individual businesses possibly in need of substantial capacity building
- Involvement of a Namibian commercial system operator with previous experience of water technologies who employs workers locally (e.g. caretaker)

For all three of the modes mentioned, there is the question of criteria by which to select the right partner for the individual tasks; these are bound to differ depending on the model. When it comes to initiating small businesses, national support programmes are available (above all microfinance programmes); the many programmes existing in Namibia are to be evaluated according to the actual model and circumstances (initial investments, bridging loans, etc.), as are other forms of credit directed, for instance, at state and/or private investors (World Bank, African Development Bank, KfW Entwicklungsbank etc.).

The question of how to finance the initial outlay for new technologies crops up again and again in the interviews. The assumption is often that the users will not be in a position to bear this cost, but should be responsible for covering the running costs. The latter principle essentially went unquestioned as a mainstay element in breaking even on cost, although people's ability and willingness to pay was questioned. The options for initiating small business cycles all relating to water as discussed in the interviews and via which the cost of the water and any (financial) benefit remains at household level was welcomed in principle but – as the above summary of results shows – challenged in terms of feasibility. The way that different finance partners collaborating on development overlap between those responsible at state, regional and/or urban level in order to support the local population represents a crucial issue here.

Securing ownership

The immediate question to be considered after who finances the water infrastructures, and within which model, is that of setting up installations and securing ownership thereof. This is of relevance both to water installations and (agri-)economic activities. The study reveals a need for local forms of collaboration which often failed in the past for organisational reasons. The interviewees named the following (partly contradictory) preconditions that need to be created in order to prevent renewed failure:

- Early involvement of stakeholders, users, opinion leaders, partners (e.g. potential operating companies) besides administrative players in order to strengthen the demand-side approach and thus create ownership
- Visualised options (available choices with basis for decision making)
- Clear statements on the financing of investments and cost coverage models (who has to pay and for what?)

¹³ Over and above the interview results, it can only be presumed that approaches based purely on free-market premises will only serve to further widen the gap between rich and poor.

- Incentives for long-term engagement at local level along with prospects of positive developments in financial, provisional, educational, social or other terms
- Deciding on a business model and on how to recruit strong partners (partial contradiction with the first two)
- Taking socially marginalised groups (for instance individuals with impaired physical mobility, HIV patients) and women seriously as a target group, although this presumes empowerment within existing gender-specific hierarchies, above all in conducting negotiations

These preconditions should thus be seen very much in the context of organisation and financing models. After all, there are many facets to ownership: who takes responsibility for initial investment in and installation of technical systems? Who owns the systems (e.g. water treatment plant or irrigation facilities) once they have been installed? Who is responsible for operation? Who is responsible for ensuring that the systems remain in good condition during everyday use? On what basis is benefit sharing (among individuals/groups) regulated?

These questions of ownership emphasise the importance of identifying suitable target groups for implementing this project at the different levels. Several interviews touched on the need to avoid an overly heterogeneous group of ‘involvees’ if one is to avoid being confronted by a highly diverse set of interests, more often than not the cause of mutual distrust. Of ultimate relevance here, besides the composition of the group, is the mobilisation of those concerned. Namely the countless failed projects shared one recurrent experience: men in particular do not seem to find the prospect of an improved income in the medium term sufficiently motivating. One can only speculate about the reasons for this: some put it down to a fundamentally gender-specific irresponsible attitude on the part of these men, whilst others name serious alcohol problems or the undeveloped ability to think ahead in economic matters. One important reason certainly lies in the traditional gender roles that still structure society today, where men tended to play be work migrants, leaving the women to take care of subsistence at home.

Support, ownership and capacity building at local level

The interviewees also referred to shortcomings in the organisation of local committees and local management as shown by experiences thus far. Explicit support structures are called for here. They need to reveal incentives and (social) benefits, and require mechanisms via which to guarantee just distribution of decision-making powers at local level (a vital factor here is that people develop their own criteria for making decisions). One can then expect the population to respond in the long term to the impulses created in this way by being prepared to pay for services (e.g. for water) or devoting their labour and time to the cause. Participation enabling household or family needs and skills to be communicated at various levels, plays just as important a role here as the provision of incentives for consolidating the situation (particularly regarding ownership). However, according to several interviewees, some major factors are jeopardising the success of such structures: training and capacity-building measures, particularly when it comes to water supply, are often geared too heavily towards technology. Social connotations, gender relations and existing forms of co-operation and collaboration are neglected. A further problem is the excessive burden placed on (highly committed) individuals within the committees, a frequent turnover of those within these structures (due to migration, HIV/Aids), and the distribution and perception of responsibility. And yet despite these problems, experience shows that users themselves constitute an appropriate level for local management of measures and installations.

This can be demonstrated using the example of the communal gardens, from which important conclusions can be drawn when it comes to strengthening developments at local level: even though proved to be an unsuccessful model in many cases, it is nonetheless important to obtain mutual commitment for this concept from those involved. This appears vital in that while the requisite infrastructure and allied costs could be made available from third-party funds and the yield allocated on an individual basis, sustainable implementation of the supporting structures in the long term can only be assured if the group itself shares the cost of subsequent investment. This being so, it might be worth focusing on groups of individuals sharing a mutual 'fate' (population groups with restricted physical mobility, single women, HIV/Aids-infected people, former prison detainees, etc.). A further selection criterion could be proof of past engagement in small-scale farming. There are two advantages of proceeding along these lines: on the one hand, other people feel motivated to participate by the obvious success of experienced farmers, and on the other hand, those who have already been involved in crop growing on their own initiative generally prove willing to take on responsibility. An important lesson learned from the failed 'communal garden' projects seems to be that there is a need to establish clear-cut ownerships structures and legal rights. This may even go as far as to say that the person doing the growing has just one plant (for example a fruit tree), but that any yield from this plant belongs to them alone.

Outlook

The question of the regional economic, poverty-reducing impact of new water use options has in many respects indicated discrepancies between what is desirable and what is possible, but that these do not represent insurmountable barriers. With the conclusions drawn here, an important foundation has been laid for the future work of CuveWaters, since important points have been identified that can now help promote the social grounding of technical innovations. A tautly balanced situation arises between national development goals and visions as apparent in the NDP and sectoral policies on the one hand, and the creation of local enabling environments on the other. However, discussions to date have also shown that the widening of water use options represents a small but valuable contribution in the quest to tackle current development problems in the region. As far as further implementation of new technologies within the CuveWaters project is concerned, open development and the ability to adapt will have an important role to play. The project activities should not in any way prevent the development of future options or dictate rigid action policies in the long term.

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Appendix: Interviewees

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N Kalili	Namibian Agronomic Board (NAB), Horticulture Officer
P DeWet	Namibian Development Corporation (NDC), Senior Manager Agriculture
S A Demas	National Planning Commission (NPC), Directorate of Development Planning
O Shilunga	Oshakati, Chief Development Officer, Oshakati
T Kakololo	Oshakati, Chief Health Inspector Oshakati
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- Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB), Stuttgart/Germany
- Technische Universität Darmstadt, Chair of Water Supply and Groundwater Protection (WAR Institute), Darmstadt/Germany

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