Conclusions

The low wheat grain yields in the WWW systems at both Langsweg and Tygervalkhoyd highlight the risk involved in practicing monoculture wheat cropping. The low yield potential and the zero till system could be the result of 1) bad farm practices as the weeds are easily killed by both weeds and 2) ineffective control of grass weeds as well as the use of herbicides during the planting process is not possible with the zero till (stair wheel) planter.

These short term data do not show dramatic differences in yield and quality due to tillage practice or crop sequence, indicating that the use of till will not negatively influence either yield or quality grain relative to conventional tillage practices or conventional tillage practices.

In some years and certain crop sequences, however, no-till results in significantly improved yields and crop yields due to reduced bioglyph pressures, socio-economic pressures and climate change (Blignaut & van Heerden, 2009). To address this challenge we need to critically examine the relationship between management, water use efficiency, water allocations and alternatives to increasing the supply of water. Such alternatives may include water transfers, water recycling, desalination, rainwater harvesting and unconventional water.

In terms of the agriculture and water interface, the ultimate aim is to maintain food security in the face of increasing urban populations and heightened economic growth. To achieve this aim it’s critical that the agriculture, water and sustainable development be better understood. Water resources implications for food security and the structure of agriculture and constrains the potential for agricultural development. For a full understanding of water availability for urban development is frequently prioritised over supplying water for agriculture (de Faria, Wilchons, Rockstrom, Kemp-Benedict, Ehrigavama, Gardon, Hovan, Hoogen, Huber, Lees & Karberg, 2007). In South Africa, agriculture, as the largest user of water, is faced with competition from urban water users. This may encourage water allocations away from the agricultural sector through markets or reallocations. The implications for rural development of allocating water away from the agriculture sector needs to be critically examined.

2. The Interface between Agriculture, Water & Climate Change

In May 2011, the 1st African Agriculture and Water Dialogue was held in Johannesburg. The aim of the African Water Dialogue was to create a platform where agriculture, the private sector, government and climate change exports from South Africa could come together to share knowledge and solutions. The shared experience and expertise could assist in addressing Africa’s challenges in terms of the interface between agriculture, water and sustainable development. In adaptation to the dialogue, expert knowledge and experience from within Africa was shared. The dialogue served to highlight the importance of the interface between management, water agriculture and climate change. It is within this interface, and its implications for food security and rural development, that the research challenges of the future will be.

At this dialogue, Prof Robyn Barnard highlighted shortcomings of the current understanding of the potential impacts on agriculture of climate change (Barnard, 2011). There is a lack of geophysical biogeography in de Freitas and Sherwood for observed changes, with marked scarcity in developing countries. There is also a scarcity of information about what is happening at the grassroots level. What we do know, based on the 2007 Inter Governmental Panel on Climate Change (IPCC) report, is that it is estimated that by 2020 250 million people will be exposed to water stress and that in some African countries rain-fed agriculture may be reduced by up to 50% (Barnard, 2011).

South Africa will also be exposed to water stress, while remaining bulk water supply augments which are becoming prohibitively costly in both environmental and economic terms. In the face of this challenge we need to explore alternative sources of water, which may include the reuse of water, demand reduction through storage and rainwater harvesting. The dialogue also offered an opportunity for Prof Raubenheimer to present research done by Potchefstroom University’s Mikaelion for rainwater harvesting. Fog water harvesting can be regarded as an unconventional source of water, but it may be an important one – especially in its ability to supplement drinking water (Raubenheimer, 2011). The research suggests that fog water can be a valuable and affordable alternative source of water in regions of high altitude. In such regions fog water harvesting can provide sufficient quantities of water to sustain effective farming. If fog water is harvested, fog water can be used for safe drinking water and household gardening, however fog water harvesting contribution to rural livelihoods would be in terms of providing supplementary drinking water (Raubenheimer, 2011).

We also need changes in water, land and crop management, while overcoming financial, human and physical barriers. Ultimately, improved efficiency is required. We need an innovative management process that promotes climate resilience. In terms of conservation agriculture, we need crop rotation, minimum soil disturbance, permanent organic soil cover, retention of crop residue and water management. Keeping soil cover is of critical importance.

It was highlighted at the dialogue that climate change impacts are expressed primarily in its impact on hydrological cycles. Therefore, this is where serious attention and commitment should be focused. Water resource management encompasses the entire rainfall to root canopy – capture, storage, management, precipitation, drainage and applying the right quantity of water to roots at the right time. Managing all these aspects correctly is critical for productivity and efficiency, and doing so successfully will allow farmers to adapt and change climate change.

In terms of agricultural water use efficiency, David Love from the Agricultural Research Council (ARC) argued at the discussion that there are more crops per drop, more uses per drop, more use per drop and better livelihoods per drop (Love, 2011). To achieve this, more coordination is needed between agricultural planning, water planning and land use. Furthermore, government needs to realise the critical importance of maintaining food security. The improvement of the efficiency of agricultural water use will be critical to the sustainability of food security and the understanding of the status quo of water use efficiency within agriculture, accompanied by the recognition that agriculture is a strategic water user in terms of food security and rural livelihoods (Love, 2011).

3. Water Resource Management for Sustainable Development

Within the revised National Water Resources Strategy, emphasis will be placed on addressing the lack of awareness in the value of water, while putting in place appropriate water conservation and water demand management practices. The aim will be to place water at centre of integrated development planning, which will require the assurance of adequate water supply to support sustainable development.

In pursuit of these aims, water pricing is regarded as an important component of demand management, while water reallocations between rural and urban water users is new territory for South Africa (125.8 billion cubic meters). Lack of understanding of water use in agriculture is a key constraint to sustainable water resource management. Better understanding of the water requirements of crops crops requires accurate information on water use, water requirements, the differences in preferences between users, financial concepts within agriculture and the full extent of opportunity costs. This information is simply unavailable, and thus decisions made on sustainable water resource management are premature at best.

Agrifood price is an attractive policy tool due to its apparent ease of implementation, but international experience with this policy tool is mixed (Dinor, Rosegrant & Mezines-D, 1997, Melde & Berff, 2007, Montagnon, 2007). The main reason for the difficulties associated with pricing crops is that the demand for water may not decline as the water price is increased due to, for example, requirements of crops. There is a thus a danger that increasing water user charges may decrease agricultural production, while providing limited water savings.

In this study was conducted by Tania Gill & Cecilia Punt (2010) that attempts to trace the impact of increasing the irrigation water user charge to save water and the impact thereof on the economy. This policy option is compared to the alternative of reallocated water to the domestic and industrial sector. A brief outline of the study and results will be provided in this section.

1.3.1 Model, Data and scenarios

The study is macroeconomic in nature and makes use of Computational General Equilibrium (CGE) modelling. More specifically, a CGE model and Social Accounting Matrix (SAM) developed by Hassan, Thourou, Roe, Diao, Chumi and Tour (2008). CGE models are a useful tool for the macroeconomic analysis of fiscal shocks (such as an increase in the water user charge). Results are useful as for those seeking to implement the policy options for water use impact on water demand.

Two sets of scenarios are investigated. In the first set of scenarios a 50% increase in the water user charge from a base of 2.00/kl is introduced under different assumptions. In the first scenario irrigation water has to be used, while the second scenario allows for irrigation water to remain unused. In the second set of scenarios a 10% increase in the price of irrigated agriculture this water to the domestic and industrial sector are run as separate scenarios in order to separate the effects.

1.3.2 Results

For all scenarios the overall impact on national well-being, agricultural production, employment and household well-being is negative, and the rural poor are more heavily affected than the urban poor. If all irrigation water has to be used there is a general trend of water moving from low to high value crops. If all irrigation water remains unused moved to high value crops in addition to a decline in the scope of irrigated agriculture. The amount of unused water would be between 4 and 5 million cubic meters (125.8 billion cubic meters). The unused water in the Western Cape be of no use, but, it is not clear to what extent this water can remain unused or whether there is another way to make use of the water.

Of particular concern is the overall decline in production of field crops, which is driven by a decline in the production of irrigated field crops. Less field crops are produced and a higher proportion of field crop production is on dryland. This is accompanied by an increase in the prices of field crops.
and increased field crop imports. Taken together, there is an adverse impact on rural livelihoods, food security and the risk profile of agriculture. A further concern about the productivity of food and feed crops is the need that dryland agriculture may become less resilient in the face of climate change.

In the case of irrigation water restrictions and reallocation, the nature of the impact is similar to that of scenario 2, but the impact is more severe. A negative impact on household welfare and employment is likely when irrigation water is reallocated, and the flow of domestic and industrial sectors declines. The result is that domestic employers could be more easily affected by absorption. However, the overall impact on national welfare, agricultural production and household welfare is still negative. Agriculture remains an important employer of unskilled labour, and jobs in this sector may not be readily absorbed elsewhere.

3.1.3 Implications for Rural Development

The results in section 3.1.2 are similar to those of Van Zyl & Vink (1997) in their study of the effects of water policies on the farm sector in the Western Cape in which scenarios were investigated dealing with agricultural water restrictions and increased water user charges. The ultimate message that emerges from this is that agriculture is a strategic water user in terms of national and rural development. The South African government wants to see a 10% reduction in water use in agriculture, while simultaneously seeing an increase in agricultural employment and without increasing food prices beyond the average level of inflation. The results suggest that this may be unlikely if water pricing and reallocations are employed as tools to achieve this in the event that water is used efficiently in agriculture. One of the key points to take from this study is therefore to consider the impacts of water policies on agriculture’s water use efficiency and on agriculture’s ability to absorb increasing costs. Until the nature of water use and agriculture are more clearly understood, these policy options should be approached with caution.

The constraint that reducing water available to agriculture may prove to be employment creation in agriculture deserves particular attention. South Africa’s New Growth Path places a strong emphasis on job creation, and agriculture may have an important role to play. Particular emphasis has been placed on achieving rural development through job creation (Department of Rural Development and Land Reform, 2010). Agricultural extension services are seen as a sector that has the ability to absorb unskilled labour and therefore the potential for job creation in agriculture should be thoroughly investigated.

Natural resource management was investigated by the Bureau for Food and Agricultural Policy (BFAP) in their 2011 Agricultural Baseline. BFAP argues that the critical constraint of job creation in agriculture is the availability of natural resources (arable land, water) for the expansion of production. The institution finds that a conservative estimate of potential irrigation expansion is 145 000 ha (groundwater is not taken into consideration). BFAP proceeds to attempt to determine how much potential available resources can be best utilized to maximize employment growth. This is done by considering growing agricultural industries that are labour intensive and thus have high growth potential. The findings suggest that winning agricultural industries can contribute approximately 200 000 direct employment opportunities with 100 000 jobs downstream in the value chain (BFAP, 2011).

An important caveat is that potential employment creation in agriculture must be investigated in light of the apparent job shedding in agriculture - there has been a reduction in permanent employment in agriculture between 2001 and 2007, accompanied by an increase in seasonal employment (Iacobs, 2009). Based on the Labour Force Survey (LFS) employment in agriculture appears to have declined from 5 154 803 workers in March 2001 to 4 672 429 workers in March 2007. The more recent Quarterly Labour Force Surveys (QLFS) of 2008-2009 confirm this decline. Job shedding in agriculture, with employment declining from 800 004 workers in the first quarter of 2000 to 604 275 in the first quarter of 2011. The structure of employment in agriculture must therefore be further investigated and better understood.

4. Conclusion

Economic development, population growth and climate change all increase the demand for water and the need to manage water resources more effectively. Water management needs to be accompanied by a search for alternative sources of water, improved land management and improved productivity. Water management tools need to be evaluated critically to ensure policy coherence in terms of achieving developmental goals. To assist in the selection of the right management tools we need accurate information on water use efficiency, water use requirements, the importance of agriculture to rural development, the potential impact of climate change, the structure of agricultural employment and water and agriculture presents us with a critical interface for rural development; therefore agriculture should be identified as a strategic water user in the pursuit of national and rural development goals.

References


