

Sustainable Agriculture: A Review of Challenges Facing the South African Agricultural Sector

S. L. Middelberg

*School of Accounting Sciences, North-West University, Potchefstroom Campus,
Private Bag X 6001, Potchefstroom, 2520, South Africa
Telephone: (018) 299 4428, E-mail: sanlie.middelberg@nwu.ac.za*

KEYWORDS Food Security. Biofuels. Climate Change. Sustainable Agriculture. Land Redistribution. South Africa

ABSTRACT This review paper considers the various challenges facing the South African agricultural sector against the background that agricultural sectors globally are pressurised to provide *food security* for the estimated nine billion people in 2050, while simultaneously addressing *climate change*. The use of agricultural land to produce crops for the production of *biofuels* and the impact of *land redistribution* in South Africa on food security are contemplated. It is recommended that the South African government should develop an integrated strategy to address these challenges. Furthermore, sustainable agricultural practices, such as organic and conservation agriculture, should be considered as alternatives to conventional agricultural practices.

INTRODUCTION

The lack of food security constitutes a global crisis and has become a key strategic issue in many countries (Labadarios et al. 2011; Ramabulana 2011; Abu 2012). Global food production must increase by 70% between 2007 and 2050, and by almost 100% in developing countries, in order to feed an estimated population of 9 billion people in 2050 (Food and Agricultural Organization of the United Nations 2011a). South Africa, as a developing country, also plays a vital role in not only providing food security for the present, but also to assist producers to substantially increase production to the future required levels. Producers globally face a number of challenges, such as i) providing *food security* (Abu 2012), ii) addressing climate change by changing agricultural practices (Walker and Schulze 2007; Rivington et al. 2013), iii) becoming a potential competitor for agricultural land in terms of growing crops for *biofuels* (Gregory and George 2011), and iv) in South Africa, the contentious issue of land redistribution (Mearns 2011; O'Laughlin et al. 2013). These challenges pressurise producers to increase yields using agricultural practices that do not negatively impact the environment, while simultaneously feeding the growing population and protecting the scarce natural resources. The 2012/13 to 2016/17 strategic plan of the Department of Agriculture, Forestry and Fisheries (DAFF) indicates that food security remains a

vital focus area for the Department against the background of the increasing global population, the effects of climate change and the gradual decrease of natural resources (DAFF 2012). The importance of the study is therefore to review the challenges facing the agricultural sector and recommend remedial action to ensure the sector functions optimally. The peripheral audience is governmental policy-makers, agri-producers, fellow researchers and agricultural consumers.

This article aims to analyse the challenges facing the South African agricultural sector in terms of its sustainability challenges. Document analysis will be used as a research method, which is a qualitative research technique used to evaluate and review academic research articles and reports, governmental policies and strategies, and opinions to determine trends and patterns that emerge from the data (Blumberg et al. 2008; Bowen 2009). A number of recent articles and research reports consider a single challenge faced by the agricultural sector including the challenges of food security in South Africa and Nigeria (Abu 2012) and land reform (also referred to as land redistribution) in South Africa (Aliber and Cousins 2013; O'Laughlin et al. 2013; Toit 2013). This article however provides a comprehensive review from a holistic perspective of the strategic challenges faced by the agricultural sector as a whole.

This article is divided into four content parts. The first part highlights the research objectives, while the second part considers the key chal-

lenges facing the South African agricultural sector. The third part considers possible solutions to some of these challenges, such as implementing sustainable agricultural practices. Finally, the article is concluded with conclusion and recommendations.

Research Objective

The objective of this article is to analyse the challenges facing the South African agricultural sector in terms of its sustainability challenges and consider possible solutions to some of these challenges.

Challenges Faced by the South African Agricultural Sector

As mentioned earlier, several major challenges are facing the South African agricultural sector, and the primary stakeholders affected by these challenges include the i) agri-producers, ii) agricultural consumers, iii) the government and iv) the environment. Each of these stakeholders can influence the level of impact these challenges may have, for example the agricultural practices of producers can influence the level of food security. Similarly, governmental initiatives and policies play a vital role in providing food security.

Food Security at Affordable Prices

The first key aspect to consider is that of food security. Food security can be defined as i) the access to nutritionally adequate food at *affordable* prices, ii) is culturally accepted, and iii) can be accessed through non-emergency means at all times (Ramabulana 2011). According to a 2011 Food and Agricultural Organization of the United Nations (FAO) report, 839 million people in developing countries are undernourished, of which 218 million live in countries of sub-Saharan Africa, which includes South Africa (Food and Agricultural Organization of the United Nations 2011a).

Contributing to the local agricultural sustainability concerns is the fact that South Africa has an official unemployment rate of 25.5% (third quarter of 2012) and an estimated population of 50.59 million (Statistics South Africa 2013). A Food Security division, forming part of the South African Department of Agriculture, Forestry and

Fisheries, publishes a bi-monthly report on the South African food security status and an Integrated Food Security Strategy was published in 2002 (Abu 2012; DAFF 2012). According to research conducted by Labadarios et al. (2011), food insecurity in South Africa has decreased from 1999 to 2008 due to i) the implementation and enforcement of governmental policies addressed to reduce food insecurity, and ii) social grants that have increased women's purchasing power and access to food. However, according to Labadarios et al. (2011), measures have to be implemented by the South African government to improve the high level of food insecurity in poorer households.

When considering the above, it is imperative that the South African government should implement measures to support agri-producers to provide nutritionally adequate food at affordable prices to the South African population.

Climate Change

The second key aspect to consider is that of climate change. Although globally producers have succeeded in providing in the growing supply of food products, conventional agricultural practices are held responsible for various environmental problems such as decelerating soil fertility and the decline in biodiversity (Smit et al. 2009; Reddy 2010; Singh and Grover 2011; Rivington et al. 2013). In the recent past, the costs of current food production practices to the environment and whether these practices are sustainable have been questioned (Gregory and George 2011). However, the non-financial benefits of adopting more environmentally friendly production methods, such as positive environmental outcomes and health benefits to consumers (Greer et al. 2008), cannot easily be expressed in monetary terms.

Scientists from the Universities of Yale and Columbia in the USA, in collaboration with the World Economic Forum, issue a biennial report that measures 132 countries' environmental performance indices (EPIs). These indicators indicate a country's environmental health and ecosystem vitality. The 2012 report has indicated that South Africa is ranked 128th of 132 countries and that the natural environment has deteriorated (EPI 2012).

Research has been conducted by Walker and Schulze (2007) on the impact of climate change

on the sustainability of agro-ecosystems and food security in the main maize producing area in *South Africa*. Their results indicated that there are soil organic losses, reduced crop growth and yields begin to decline if temperatures increase and rainfall reduces. In South Africa, the impact of climate change and the resultant negative influence on food security is therefore considered a major issue of concern in agricultural sustainability.

Biofuels

The third aspect to consider is that of biofuel production. Biofuels have been simultaneously upheld as a method to reduce the impact of the use of fossil fuels and as a risk to food security due to it being a potential competitor for agricultural land used to grow crops for food consumption (Gregory and George 2011). South Africa imports approximately 60% of its crude oil and is also a net importer of finished fuel products. The minister of Agriculture, Forestry and Fisheries, Tina Jimat-Petterson, has recently announced that the government will fund a R2 billion (US\$ 258 million) plant to convert sugar beet and grain sorghum into ethanol. The development of the plant will give the biofuels industry a major boost (Roelf 2012). Soybeans, on the other hand, are the only field crop produced in sufficient quantities that the South African industrial biofuel strategy identifies as a potential bio-diesel feedstock (Sparks et al. 2011).

Furthermore, the South African government has committed to comply with the framework of the Renewable Energy White Paper, which stipulates the production of renewable energy including a portion of which has to come from the production of biofuels (Meyer et al. 2008; Sparks et al. 2011).

It can be concluded that the South African government should support the production of renewable energy to reduce the impact of climate change, but without comprising food security over the long term.

Land Redistribution in South Africa

The final issue considered in this article is the aspect of land redistribution. In 1994, the South African government launched a three-component Land Reform Programme (LRP) with the aim to distribute 30% of the country's agri-

cultural land from white landowners to black people (Valente 2009; Mearns 2011). This land redistribution is one of the three components of LRP; with land restitution and land tenure reform being the other two. Land redistribution requires individuals, groups or communities to take initiative to approach the Department of Land Affairs for grants to purchase a targeted or identified piece of land (Mearns 2011).

Research conducted by Valente (2009) on the impact of land redistribution on food insecurity found that on average land grant recipients were far more food insecure than their comparable non-participants. However, factors have been identified that will prove valuable in the successful implementation of land redistribution agricultural projects, namely i) *flexibility* should be built into the planning process of land reform projects, ii) the Department of Land Affairs and Department of Agriculture should provide continued *support* to ensure profitability and viability of the project, and iii) intergovernmental *collaboration* is required (Jacobs et al. 2003; Hall 2007; Mearns 2011).

When considering the above, it can be concluded that the successful implementation of land redistribution agricultural projects should proceed with careful consideration that food security is not compromised due to lack of governmental support.

Agricultural Practices

The agricultural sector is often considered as being part of the solution to mitigate climate change through agricultural practices that build soil fertility, promote the injudicious use of crop and livestock chemicals and improve carbon sequestration (Food and Agricultural Organization of the United Nations 2011b). Sustainable agricultural practices therefore play a vital role in addressing many of the challenges faced by producers. It has therefore become important to differentiate between *conventional* agricultural practices and *sustainable* agricultural practices against a background of organic and conservation agriculture.

Conventional Agricultural Practices vs Sustainable Agricultural Practices

Historically, conventional agricultural practices tremendously increased the yields per hect-

are, while simultaneously lowering labour requirements through the use of chemical, cultural and irrigation interventions (Auerbach 2011). In the last few years, these practices have been widely criticised and alarming statistics, such as that agriculture itself combined with conventional practices globally causes approximately one-third of the total greenhouse gas (GHGs) emissions, have been published (Food and Agricultural Organization of the United Nations 2011b).

On the other hand, the sustainability of agriculture using sustainable agricultural practices has been a global topic of interest and discussion. Sustainable agriculture is defined as an agricultural system combining sustainable agricultural practices, while simultaneously discontinuing or reducing the use of agricultural practices harmful to the environment (D'Souza et al. 1993). According to Horne (2010), a paradigm shift towards the sustainable agricultural model away from the conventional model is underway in the USA with consumers requesting that food be produced differently for which they are willing to pay a premium.

Considerable research has been conducted in searching for solutions to the challenges faced globally by agricultural sectors. This includes research on numerous sustainable agricultural practices, of which organic (Kenanođlu and Karahan 2002; Sánchez-Alonso 2009; Smit et al. 2009; Singh and Grover 2011; Dholakia and Shukul 2012; Singh and Grover 2012) and conservation agricultural practices (Nkala et al. 2011; Erenstein et al. 2012) are some of the most well-known.

Organic Agriculture

The FAO defines *organic agriculture* as a holistic production management system that enhances and promotes agro-ecosystem health by avoiding the use of synthetic fertilisers, genetically modified organisms and pesticides. The result is a reduction in soil, air and water pollution and the optimisation of the health of interdependent communities of plants, animals and people (Food and Agricultural Organization of the United Nations 2012). The concept is also defined by the International Federation for Organic Agriculture Movement (IFOAM) as a production system that sustains the health of soils, ecosystems and people. As such, it relies on ecological processes, biodiversity and cycles

adapted to local conditions, rather than the use of fertilisers and pesticides with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved (IFOAM 2012). The United States Department of Agriculture's (USDA) National Organics Standards Board (NOSB) defines organic agriculture as an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on the minimal use of off-farm inputs and management practices that restore, maintain and enhance ecological harmony (USDA 2012).

An agricultural producer considering converting from conventional to organic agricultural practices, should know that certification is required for products marketed as organic. Although organic agriculture production has increased globally, certification and accreditation interfere with the continuous growth (Xie et al. 2010). Some of the international certifiers, particularly Ecocert International and the UK Soil Association, established themselves in South Africa in the early 1990s, when some producers converted to organic production, a move made viable through export market opportunities offered by companies such as EOSTA and Organic Farm Foods (Barrow 2006). South African organic producers are not beneficiaries of organic agricultural subsidies and certification is seen by many as an additional financial burden not always economically justifiable for individual producers (Barrow 2006). In countries such as Norway and Denmark, and similarly in the USA, producers receive governmental support during their conversion to organic practices (Jacobsen 2003; Orlund 2003).

Status Globally

During the United Nations Climate Change Conference held in Copenhagen in December 2009, an initiative named the Round Table on Organic Agriculture and Climate Change (RTOACC) was launched and is dedicated to increase the understanding and quantifying the role that organic agriculture can play in climate change mitigation and adaptation. This initiative is supported by the FAO (Food and Agricultural Organization of the United Nations 2011b). The IFOAM and the Research Institute

of Organic Agriculture (FiBL) annually publish a survey on certified agriculture worldwide. The results of the 2011 survey, using data as at the end of 2009, indicate that there are 37.2 million hectares of organic agricultural land. This represents 0.9% of the world's agricultural land. When compared to the previous survey, organic land increased by 2 million hectares or 6%. The largest areas of organic agricultural land are found in Oceania (12.2 million hectares), Europe (9.3 million hectares), and Latin America (8.6 million hectares). The countries with the most organic agricultural land are Australia, Argentina, and the United States. In 2009, there were 1.8 million producers, representing an increase of 31% since 2008 (Willer 2011). In Africa, there are slightly more than 1 million hectares of certified organic agricultural land, which constitutes approximately 3% of the world's organic agricultural land. Uganda, Tunisia and Ethiopia are the countries in Africa with the largest organic agricultural land.

It can therefore be concluded that organic production holds an increasingly important position in the global agricultural sectors.

Status in South Africa

Within the South African context, the FiBL and IFOAM survey indicated that South Africa has 59,562 hectares of certified organic agricultural land (Willer 2011) and is represented by approximately 250 producers (Anon 2011). A national policy on organic production has been developed by the Department of Agriculture, Forestry and Fisheries and a discussion paper has been issued for comment by the public (DAFF 2011). This document highlights the problems facing the organic sector and also the reason for the implementation of a policy on organic production. Some of these reasons include: i) protection of consumers against practices of labelling conventionally produced products as organic, ii) environmental benefits of organic production including the enhancement of soil structures, conservation of water and the enhancement of sustained biodiversity, iii) health benefits of consuming organic foodstuffs instead of the permitted more than 500 additives for use, and iv) the role organic production has on addressing climate change. The purpose of this policy is to create a broad framework for the development of a prosperous organic sector that

is both globally competitive and supports the local government's commitment towards food security, improved health and nutrition and job creation (DAFF 2012).

When considering the above-mentioned, it can be concluded that organic agricultural practices are growing in popularity, but that the industry faces its own challenges. These include the cost of certification and accreditation. In South Africa, organic produce can only be afforded by a select few able to afford the premium of such produce.

Conservation Agriculture

According to the FAO, conservation agriculture revolves around three core principles, namely i) minimal soil disturbance, ii) permanent soil cover, and iii) a rational use of crop rotations (Nkala et al. 2011; Erenstein et al. 2012) and is increasingly advocated as essential for soil health and sustainable agriculture (Harrington and Erenstein 2005; Food and Agricultural Organization of the United Nations 2007). Nic Opperman, the director of natural resources at Agri South Africa, a prominent agricultural producer organisation in South Africa, is advising its members to practise conservation farming to mitigate the increasing threats associated with climate change and to ensure food security (Greve 2012).

Recent empirical evidence suggests that conservation agricultural practices have many positive benefits, including improved soil fertility, an increase in the water-holding capacity of soil, increased soil biodiversity and resilience to greenhouse gas mitigation (Pisante et al. 2010; Aulakh et al. 2012). Conservation agriculture has the potential to enhance food security in the developing world (Derpsch and Friedrich 2009).

CONCLUSION

This study concludes that the agricultural sector faces a number of challenges of which providing food security while mitigating climate change through sustainable agricultural practices is the most important. The study contributes to current knowledge by providing a holistic review of these challenges faced by the South African agricultural sector and furthermore suggesting practical recommendations to address these challenges.

RECOMMENDATIONS

The recommendations suggested to address these challenges are that collaboration between the relevant South African governmental departments should be encouraged to develop an *integrated strategy* addressing the following aspects: i) *food security*, by providing support to producers enabling them to supply nutritionally adequate food at affordable prices, ii) introduction of *sustainable agricultural practices* by offering incentives in the form of subsidies to producers converting from conventional agricultural practices to sustainable agricultural practices, iii) production of renewable energy through biofuels without comprising food security, and iv) the successful implementation of land redistribution agricultural projects through collaborated governmental support. These observations and recommendations are in agreement with what recent research on each individual identified challenge recommended. Furthermore, organic agriculture, although a solution to climate change, serves a niche market in South Africa, a market that can afford to pay a premium for such products. This is not a solution to provide long-term food security to the local market. Conservation agricultural practices, however, do have the potential to provide food security for the developing world while simultaneously reducing the negative impact of agricultural practices on the environment.

REFERENCES

- Abu O 2012. Food security in Nigeria and South Africa: Policies and challenges. *Journal of Human Ecology*, 38(1): 31-35.
- Aliber M, Cousins B 2013. Livelihoods after land reform in South Africa. *Journal of Agrarian Change*, 13(1): 140-165.
- Anon 2011. Konrad Hauptfleisch: Ray of Hope in SA's Organic Certification Saga. Business Day. From <<http://www.businessday.co.za/articles/Content.aspx?id=146446>> (Retrieved February 6, 2012).
- Auerbach R 2011. Climate-Smart Organic Farming for Food and Water Security. *Paper Presented at the 17th Conference of the Parties Side Event in Durban, South Africa, December 1, 2011.*
- Aulakh MS, Manchanda JS, Garg AK, Kumar S, Dercon G et al. 2012. Crop production and nutrient use efficiency of conservation agriculture for soybean-wheat rotation in the Indo-Gangetic Plains of North-western India. *Soil and Tillage Research*, 120: 50-60.
- Barrow S 2006. South African Organic Market Study. From <www.epopa.info> (Retrieved January 31, 2012).
- Blumberg B, Cooper DR, Schindler PS 2008. *Business Research Methods*. 2nd European Edition. London: McGraw-Hill.
- Bowen GA 2009. Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2): 27-40.
- DAFF (Department of Agriculture, Forestry and Fisheries) 2011. National Policy on Organic Production. 7th Draft. From <<http://www.nda.agric.za/doiDev/sideMenu/plantProduction/doc/NationalPolicyOrganicFarmingDraft7.pdf>> (Retrieved February 6, 2012).
- DAFF (Department of Agriculture, Forestry and Fisheries) 2012. Strategic Plan for the Department of Agriculture, Forestry and Fisheries: 2012/13 to 2016/17. From <<http://www.daff.gov.za/doiDev/topMenu/StratPlan201213-201617.pdf>> (Retrieved April 26, 2012).
- D'Souza G, Cyphers D, Phipps T 1993. Factors affecting the adoption of sustainable agricultural practices. *Agricultural Resource Economics Review*, 22(2): 159-165.
- Derpsch R, Friedrich T 2009. Global overview of conservation agriculture adoption. In: *Lead Papers 4th World Congress on Conservation Agriculture*. World Congress on Conservation Agriculture, New Delhi.
- Dholakia J, Shukul, M 2012. Organic food: An assessment of knowledge of homemakers and influencing reasons to buy/not to buy. *Journal of Human Ecology*, 37(3): 221-227.
- EPI (Environmental Performance Index) 2012. 2012 EPI and Pilot Trend EPI. From <www.epi.yale.edu> (Retrieved February 6, 2012).
- Erenstein O, Sayre K, Wall P, Hellin J, Dixon J 2012. Conservation agriculture in maize- and wheat-based systems in the (sub)tropics: Lessons from adaptation initiatives in South Asia, Mexico, and Southern Africa. *Journal of Sustainable Agriculture*, 36: 180-206.
- Food and Agriculture Organization of the United Nations 2005. Fertilizer Use by Crop in South Africa. From <<http://www.fao.org/docrep/008/y5998e/y5998e00.htm#Contents>> (Retrieved February 14, 2012).
- Food and Agriculture Organization of the United Nations 2011a. The State of Food Insecurity in the World 2004: Monitoring Progress towards the World Food Summit and Millennium Development Goals. From <<http://www.fao.org/docrep/014/i2330e/i2330e00.htm>> (Retrieved February 22, 2012).
- Food and Agriculture Organization of the United Nations. 2011b. Organic Agriculture and Climate Change Mitigation: A Report of the Round Table on Organic Agriculture and Climate Change. From <<http://www.fao.org/docrep/015/i2537e/i2537e00.pdf>> (Retrieved February 6, 2012).
- Food and Agriculture Organization of the United Nations. 2012. What Does "Organic Agriculture" Mean? From <www.fao.org/organicag> (Retrieved February 1, 2012).

- Greer G, Kaye-Blake W, Zellman E, Parsonson-Ensor C 2008. Comparison of the financial performance of organic and conventional farms. *Journal of Organic Systems*, 3(2): 18-28.
- Gregory PJ, George TS 2011. Feeding nine billion: The challenge to sustainable crop production. *Journal of Experimental Botany*, 62(15): 5233-5239.
- Greve N 2012. Group Advocates Conservation Agriculture for Food Security. From <<http://www.engineeringnews.co.za/article/group-advocates-conservation-agriculture-for-food-security-2012-01-27>> (Retrieved April 26, 2012).
- Hall R 2007. Transforming rural South Africa? Taking stock of land reform. In: R Hall, L Ntsebeza (Eds.): *The Land Question in South Africa: The Challenges of Transformation and Redistribution*. Cape Town: HSRC (Human Sciences Research Council) Press.
- Harrington L, Erenstein O 2005. Conservation agriculture and resource conserving technologies: A global perspective. *Agromeridian*, 1(1): 32-43.
- Horne JE 2010. Ensuring a sustainable, enduring agriculture. *Agriculture and Resource Economics Review*, 39(3): 396-398.
- Ifoam (International Federation of Organic Agriculture Movement) 2012. Definition of Organic Agriculture. From <http://ifoam.org/growing_organic/definitions/doa/index.html> (Retrieved February 6, 2012)
- Jacobs P, Lahiff E, Hall R 2003. Land Redistribution: Evaluating Land and Agrarian Reform in South Africa. *Occasional Paper No.1*. Programme for Land and Agrarian Studies, University of the Western Cape, Cape Town.
- Jacobsen L 2003. Do Support Payments for Organic Farming Achieve Environmental Goals Efficiently? In: *Organic Agriculture: Sustainability, Markets and Policies*. Organisation for Economic Co-operation and Development. UK: CABI Publishing, pp.345-364.
- Kenanođlu Z, Karahan O 2002. Policy implementations for organic agriculture in Turkey. *British Food Journal*, 104(3/4/5): 300-318.
- Labadarios D, Mchiza ZJ, Steyn NP, Gericke G, Maunder EMW et al. 2011. Food security in South Africa: A review of national surveys. *Bulletin of the World Health Organization*, 89: 891-899.
- Mearns K F 2011. Ekaluka farmers' association and the land reform programme: Expectations and success factors. *Development Southern Africa*, 28(2): 241-254.
- Meyer F, Strauss PG, Funke T 2008. Modelling the impacts of macro-economic variables on the South African biofuels industry. *Agrekon*, 47(3): 327-345.
- Nkala P, Mango N, Zikhali P 2011. Conservation agriculture and livelihoods of smallholder farmers in Central Mozambique. *Journal of Sustainable Agriculture*, 35: 757-779.
- O'Laughlin B, Bernstein H, Cousins B, Peters PE 2013. Introduction: Agrarian change, rural poverty and land reform in South Africa since 1994. *Journal of Agrarian Change*, 13(1): 1-15.
- Orlund K 2003. Norwegian experience with conversion and support payments for organic farming. In: *Organic Agriculture: Sustainability, Markets and Policies*. Organisation for Economic Co-operation and development. UK: CABI Publishing, pp. 337-344.
- Pisante M, Corsi S, Kassam A, Friedrich T 2010. The challenge of agricultural sustainability of Asia and Europe. *Transit Stud Rev*, 17: 662-667.
- Ramabulana TR 2011. The rise of South African agribusiness: The good, the bad and the ugly. *Agrekon*, 50(2): 102-110.
- Rivington M, Matthews KB, Buchan K, Miller DG, Bellocchi G et al. 2013. Climate change impacts and adaptation scope for agriculture indicated by agro-meteorological metrics. *Agricultural Systems*, 114: 15-31.
- Roelf W 2012. SAfrica Sees \$258 mln Ethanol Plant by 2014. From <<http://www.reuters.com/article/2012/02/20/safrica-biofuels-idUSL5E8DH 2XP 201202 20>> (Retrieved February 21, 2012)
- Sánchez-Alonso S 2009. Enhancing availability of learning resources on organic agriculture and agroecology. *The Electronic Library*, 27(5): 792-813.
- Singh IP, Grover DK 2011. Economic viability of organic farming: An empirical experience of wheat cultivation in Punjab. *Agricultural Economics Research Review*, 24: 275-281.
- Smit AH, Driessen PJ, Glasbergen P 2009. Conversion to organic dairy production in the Netherlands: Opportunities and constraints. *Rural Sociology*, 74(3): 383-411.
- Sparks GD, Ortman GF, Lagrange L 2011. An economic evaluation of soybean-based biodiesel production on commercial farms in KwaZulu-Natal, South Africa. *Agrekon*, 50(3): 68-89.
- Statistics South Africa 2013. Unemployment Rate 2012. From <<http://www.statssa.gov.za/default.asp>> (Retrieved January 23, 2013).
- Toit A 2013. Real acts, imagined landscapes: Reflections on the discourses of land reform in South Africa after 1994. *Journal of Agrarian Change*, 13(1): 16-22.
- USDA (United States Department of Agriculture) 2012. What is Organic Production? From <<http://www.nal.usda.gov/afsic/pubs/ofp/ofp.shtml>> (Retrieved February 7, 2012).
- Valente C 2009. The food (in)security of land redistribution in South Africa: Micro-econometric evidence from national data. *World Development*, 37(9): 1540-1553.
- Walker NJ, Schulze RE 2008. Climate change impacts on agro-ecosystem sustainability across three climate regions in the maize belt of South Africa. *Agriculture, Ecosystems and Environment*, 124(2008): 114-124.
- Willer H 2011 Organic Agriculture Worldwide: Key Results from the Global Survey on Organic Agriculture 2011. *Paper presented at 17th Organic World Congress* in Namyangju City, Gyeonggi Province, Korea, September 28 to October 1, 2011.
- Xie B, Tingyou L, Qian Y 2010. Organic certification and the market: Organic exports from and imports to China. *British Food Journal*, 113(10): 1200-1216.