agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

National Agricultural
Marketing Council
Promoting market access for South African agriculture

Markets and Economic Research Centre and Directorate of International Trade

TRADEPROBE

Issue 60/November 2015

This issue of *TradeProbe* covers the following topics:

- **Trade profile for medicinal plants (HS 1211)**
- **South African profile for the beef industry**
- **Trade between South Africa and West and Central Africa (WCA) for the AFF Trade Review**
- **The hidden reality facing African governments in the tripartite FTA engagements – adjustment cost associated with the proposals**
- **Agriculture and environmental management: Rethinking the value-add of agriculture in terms of contribution to the public good**
- **Geospatial technology: The future of agricultural planning?**

TRADE PROFILE FOR MEDICINAL PLANTS (HS 1211)

Background

Since ancient times, human beings have instinctively looked for drugs from nature in search of rescue, or to cure various diseases. These natural drugs are better known as medicinal plants. The term 'medicinal plants' is used when referring to a wide variety of plants, consisting of certain chemicals necessary for the treatment of ailments and diseases. Medicinal plants play a significant role in the survival of human beings. These plants have always been used by humans, although the method of use has evolved over the years. There are various types of medicinal plants available, including the ginseng root, coca leaf, poppy straw, pyrethrum, liquorice root, and many others.

Production of Medicinal Plants

Medicinal plants can be produced in two ways, with the most popular method being through wild harvesting (collecting from wild sources), followed by cultivation in agrarian systems. Asian countries such as China and India are the foremost producers of medicinal plants. Although there is limited research with regard to the production of medicinal plants in South Africa, the country is also an exporter of medicinal plant, but on a much smaller scale.

World Trade in Medicinal Plants

Table 1 lists the world's leading exporters of medicinal plants in 2014. China was the leading exporter of medicinal plants in 2014, accounting for 34.9% of the world's exports. Canada, as the second largest exporter of medicinal plants, experienced the most significant growth, from R1,7 million to R2.7 million between 2013 and 2014. Although the data revealed that global exports have been increasing, South Africa experienced a negative growth rate of -17% between 2013 and 2014.

Table 1: World's leading exporters of medicinal plants

		Value in Rand (Billions)		Growth Value (%)
Rank	**Exporter**	**2013**	**2014**	**2013-2014**
World Exports		**32**	**39**	**20**
1	China	12	14	19
2	Canada	2	3	51
3	India	2	2,6	30
4	USA	2	2	12
5	Germany	1.4	2	22
6	Hong Kong	12	1.4	24
7	Egypt	1	1.4	34
8	Korea,	1	1.2	15
9	Spain	0.6	0.7	22
10	Singapore	0.9	0.7	-19

Source: ITC, Trademap (2015)

Table 2 lists the world leading importers of medicinal plants in 2014. From a global perspective, imports of medicinal plants grew by 21%, reaching R36 million in 2014. Hong Kong, China was the leading importer of medicinal plants, making up 11.3% of global imports. According to the data, the USA was the second largest importer of medicinal plants, with imports amounting to R4 million in 2014, followed by Japan and Germany with an import value of R3 million respectively. South Africa was ranked number 61 on the list of medicinal plant importers.

Table 2: World's leading importers of medicinal plants

		Value in Rand (Billions)		Growth Rate (%)
Rank	**Importers**	**2013**	**2014**	**2013-2014**
World Imports		**29.8**	**36**	**21**
1	Hong Kong	4	4	8
2	USA	3	4	18
3	Japan	3	3	28
4	Germany	2.3	3	29
5	China	2	2	14
6	Singapore	2	2	4
7	Taipei, Chinese	1	1	30
8	Viet Nam	0.2		0
9	France	0.92	1	21
10	Korea,	0.9	1	18

Source: ITC, Trademap (2015)

South African Trade in Medicinal Plants

Figure 1 presents South Africa's trade in medicinal plants over the past five years. It is evident that South Africa exports more medicinal plants than it imports (thereby becoming a net exporter). Furthermore, South African imports and exports were not stable between 2010 and 2014. It is important to note that imports have been increasing at a much faster rate than exports, resulting in a decline in the terms of trade surplus (reducing the positive trade balance).

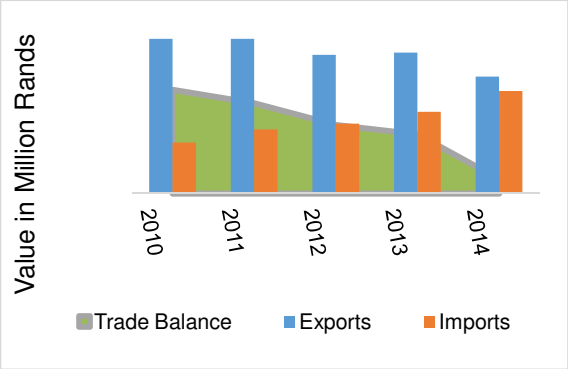


Figure 1: Exports, Imports and Trade Balance.
Source: Own Calculations Based on Statistics from Trade Map (2015)

Figure 2 represents the main markets for South African medicinal plants. In 2014, South Africa exported ginseng root, coca leaf, and other plants or parts of plants used in perfumery or pharmaceuticals, or for insecticidal, fungicidal or similar purposes. It is clear that the vast majority of South African medicinal plant exports go to European countries (i.e. Germany, Denmark, the UK, and the Netherlands). This can be attributed to the fact that the European Union (EU) is South Africa's largest trading partner, due to the EU and SA Trade Development and Co-operation Agreement (TDCA). Collectively, the above-mentioned countries accounted for 79% of South African medicinal plant exports, with the USA accounting for the remaining 21%.

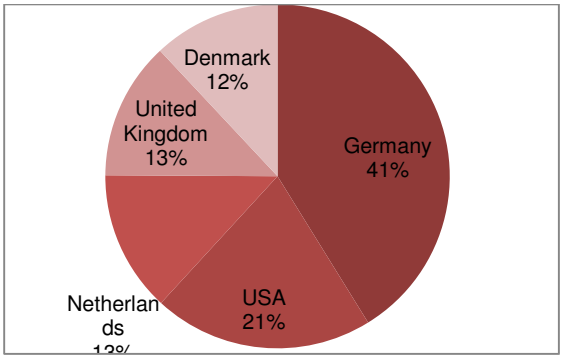


Figure 2: Main Markets for South African medicinal plant exports
Source: Own Calculations Based on Statistics from Trade Map (2015)

Figure 3 below is an illustration of the main markets supplying medicinal plants to South Africa. It is evident that South Africa obtains most (24%) of its medicinal plants from China. This could be attributed to the fact that China was the world's leading exporter of medicinal plants in 2014. It is clear that the Asian countries dominated exports to South Africa in 2014, with India being the second largest exporter to South Africa with a market share of 23%, followed by Turkey with a market share of 21%.

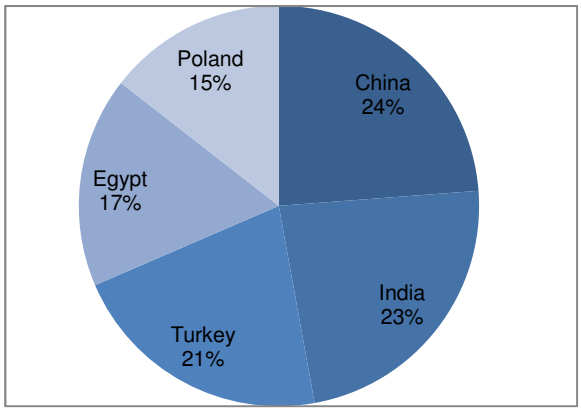


Figure 3: Main markets for South African medicinal plant imports.
Source: Own Calculations Based on Statistics from Trade Map (2015)

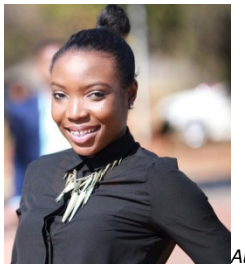
Joining the Dots

We can thus conclude that medicinal plants are widely exported by Asian countries. Although South Africa is not a major exporter of medicinal plants on a global platform, the country exports a considerable quantity of medicinal plants to its largest trading partner, namely the EU. South African medicinal plant exports have experienced a slight drop over the past five years, while imports, on the other hand, have been rising sharply. From a global perspective, imports of medicinal plants showed an annual growth rate of 33% between 2010 and 2014. Therefore, South Africa should take advantage of the increasing global demand for this product and expand its export base accordingly.

References

Petrovska, B.B. 2012. Historical review of medicinal plants usage. *Pharmacognosy Review*.

Yaniv, Z. & Bachrach, U. 2005. *Handbook of medicinal plants*. Binghamton: Haworth Press.



Author: Thumo Neluvhalani is a research intern at the National Agricultural Marketing Council. Her research work focuses on the links between agriculture and environmental management. She can be contacted at tneluvhalani@namc.ca.za or (012) 341 1115.

PROFILE OF THE SOUTH AFRICAN BEEF INDUSTRY

The cattle industry plays an important role in the agricultural sector, with a total contribution of R22 billion in 2014 (DAFF, 2015). Furthermore, this industry has been playing an important role beyond the generation of the income for the sector, as a most valuable asset, with cattle being used as collateral for credit. The cattle industry is estimated to amount to about 13.70 million head of cattle (population), with about 80% being beef cattle and the remaining 20% dairy cattle (DAFF, 2012). Beef producers consist of different farmers who are commercial beef producers, emerging black beef producers and communal beef producers.

The number of commercial beef-producing farmers in the country is estimated at approximately 50 000, with 240 000 emerging farmers and 3 million communal farmers. There are approximately 70 feedlots in South Africa and 495 abattoirs. Spies (2011) reported that abattoirs and feedlots are distributed throughout the country, with feedlots mainly located near major cities such as Johannesburg, Pretoria, Durban and Cape Town. Abattoirs are primarily located in the Gauteng, Free State and Western Cape provinces. The beef industry is a major employer, with 500 000 employees and 2 125 000 people dependent on the livestock industry for their livelihoods (DAFF, 2012).

South African Beef Production

Beef is produced in all the provinces, with Mpumalanga having the largest share at 23%, followed y the Free State, Gauteng, Kwazulu-Natal and the North West Province at 19%, 14%, 12% and 11% respectively[1]. The number of cattle slaughtered in the country did not remain stable between 2000 and 2014. There was an increase from 2.9 million heads of cattle slaughtered in 2011 to 3.2 million in 2012 (see **Figure 4**). The changing weather conditions had little impact on the South African beef industry in terms of production (BFAP, 2015).

The number of cattle slaughtered affirmed the instability in beef meat production, with a notable increase in beef production recently. In 2014, the total figure was reported to be about 982 thousand tons, with an average growth of 3% between 2000 and 2014 (see **Figure 4**).

[1] This needs to be understood in terms of the distribution of slaughterhouses as opposed to the natural endowment in terms of having large numbers of animals.

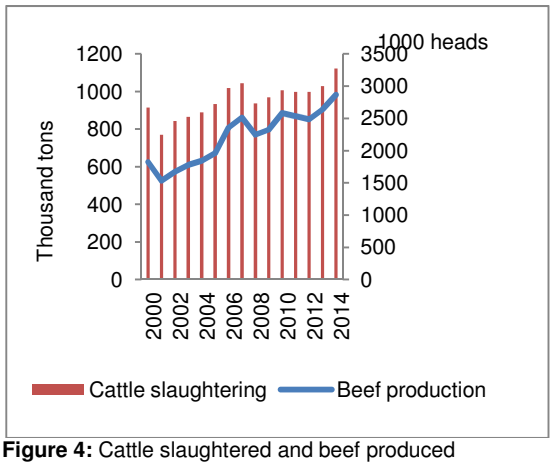


Figure 4: Cattle slaughtered and beef produced
Source: Quentec (2015)

Figure 5 represents the production, consumption and average price of beef in the South Africa. It has been noted that beef production and consumption has remained relatively stable in recent years. The industry has been striving to ensure that the needs of the country's consumers are met through investment in infrastructure among communal and emerging farmers.

Thanks to ongoing efforts to increase beef production in the country, BFAP (2015) reported that the demand for beef is projected to increase by almost 28% in the next decade, resulting in almost 200 thousand tons of additional beef consumption by 2024. It has also been noted that beef prices increased sharply in 2014. With the projected increase in demand, drought conditions in the country and production costs will put increasing pressure on the performance of the beef industry.

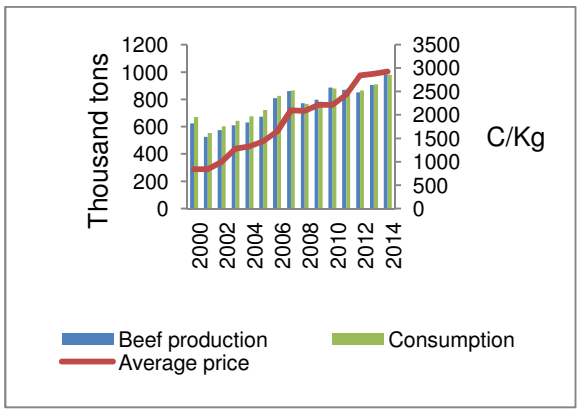


Figure 5 Beef production, consumption and average price
Source: Quentec (2015)

South African Beef Trade (HS 0201 and 0202 combined)

Figure 6 shows the trade trends of South African beef meat between 2010 and 2014. It is evident that the country was a net importer of beef products between 2010 and 2013, with an improvement in 2014. The growth in beef meat exports into the world was fuelled by bio-security measures put in place in the country to control the occurrence of

animal diseases and the investment in infrastructure amongst emerging and communal producers. It was reported that beef exports and imports amounted to a total of R1.13 billion and R704 million respectively in 2014.

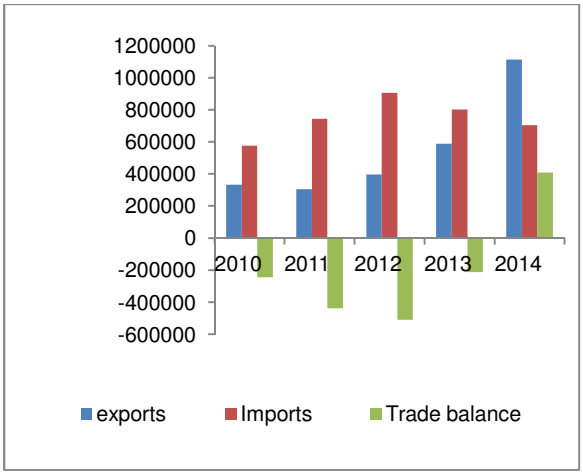


Figure 6: South African trade performance
Source: Trademap

South African Trade

Figure 7 presents the main markets for South African beef into the world. Mozambique has been showing a significant increase in demand for South African beef exports, from R39 million in 2010 to R166 million in 2014. Kuwait and Swaziland have shown an interesting trend in terms of increased growth in demand for exports from South Africa. Swaziland has long been the largest market for South African beef. It has been noted that most of South Africa's markets are located within the SADC region, given the advantage of the preference among the member countries.

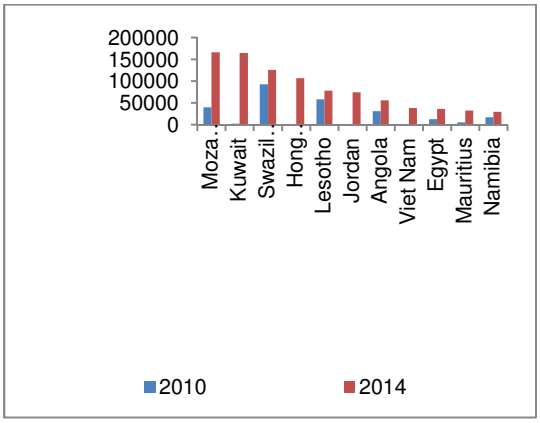


Figure 7: Main markets for South African exports
Source: Trademap

Figure 8 indicates that South African imports are mostly from four countries, namely Botswana, Namibia, Australia and Uruguay. With Australia exporting beef meat products worth a total of R321 million in 2014, it remains the leading supplier for South Africa. New Zealand, Namibia and Uruguay exported a total of R312 million, R35 million and R26 million respectively in 2014.

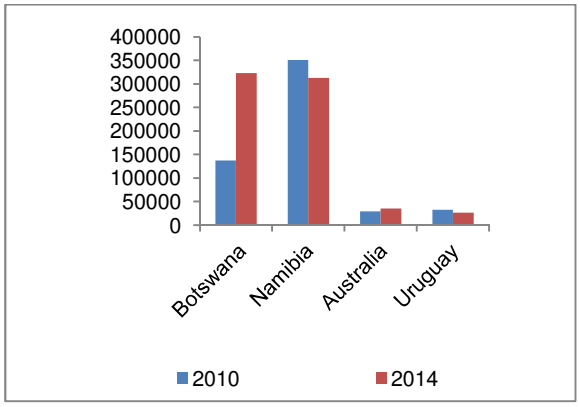


Figure 8: Main suppliers of imports
Source: Trademap

SWOT Analysis of the Beef Industry

The beef industry plays an important role in food security in the country, while also making a contribution towards the agricultural GDP. Investments in the industry through feedlot structures are improving the production of beef meat in the country. In 2014, increased growth in exports coming from the country was noted. Therefore there is an opportunity for this industry to exploit lucrative markets such as the Asian and African markets (see **Figure 9, Appendix B**).

Concluding Remarks

In conclusion, it has been noted that there has been recent growth in both production and exports in the beef industry. The resistance to drought in the region has not affected the production of beef, while the investment in infrastructure among emerging producers has improved growth in the beef industry. It is recommended that in order to improve the country's export performance for beef, there should be investment in awareness in terms of international requirements.

Author: Yolanda Potelwa is an economist at the NAMC. Her work includes trade research under the MERC Division. Currently, she is working on issues relating to non-tariff measures (NTMs), more particularly SPS issues in the fruit industry. She can be reached at: YPotelwa@namc.co.za or +27 (0) 12 341 1115.
The article was co-authored by Thumo Neluvhalani is a Research Intern at the National Agricultural Marketing Council

TRADE BETWEEN SOUTH AFRICA AND WEST AND CENTRAL AFRICA (WCA) FOR THE AFF TRADE REVIEW

Introduction

The objective of these articles is to assess agricultural trade performance in WCA, with specific reference TO South Africa as a bilateral trading country. WCA is the combination of West and Central Africa with overlapping members of the Regional Economic Communities, which include the Economic Community of West Africa States (COWAS), Economic Community of Central African States (ECCAS), Community of Sahel-Saharan States (CEN-SAD), West African Economic and Monetary Union (UEMOA), and Central African Economic and Monetary Community (CEMAC).

There are 23[2] countries in our definition of WCA. These countries have been aggregated into a single Regional Economic Community (REC) to avoid the problem of overlapping members, as happened among several recognised RECs in West and Central Africa. Note that Morocco, Algeria and Tunisia were excluded from our WCA REC on the basis that they are North African countries and have a distinctly different trade profile from our WCA group.

Overview of Agriculture, Forestry and Fisheries Trade between WCA and South Africa

Agricultural Sector

South Africa's average agricultural exports to WCA amounted to R3.6 billion, accounting for about 3.4% of South Africa's exports to the world markets. Nigeria was ranked as the largest market destination for South Africa's agricultural exports into WCA, with an average total value of R1.1 billion. Nigeria is followed by Ghana, Cameroon, Mali and Gabon with a share of 0.5%, 0.2%, 0.2% and 0.2% respectively (see Table 1). South Africa's agricultural exports into this REC were largely dominated by apples, cigars, food preparation, and juices during the period under review.

Table 3: South Africa's exports to WCA

	Value in R' millions		
Importers	**2011**	**2012**	**2014**
World	**73589**	**91981**	**104801**
WCA imports	**2257**	**3000**	**3603**
Nigeria	645	1046	1467
Ghana	415	546	549
Cameroon	256	231	255
Mali	216	153	227
Gabon	85	141	184
Senegal	100	157	164
Congo	64	127	139
Benin	200	179	117

Source: Trademap

[2] These are Nigeria, Ghana, Liberia, Ivory Coast (Côte d'Ivoire), Senegal, Benin, Guinea, Burkina Faso, Mali, Niger, Togo, Sierra Leone, Cape Verde, Guinea-Bissau, Gambia, Mauritania, Gabon, Equatorial Guinea, Cameroon, São Tomé e Príncipe, Central African Republic, Chad and the Congo.

On the other hand, the average imports from WCA amounted to R256 million of total South African agricultural imports. It has been noted that imports from WCA increased at an average rate of 34% between 2012 and 2014. Cote d'Ivoire was the largest supplier of agricultural products into South Africa, at an average of R170 million between 2012 and 2014. Benin, Nigeria and Ghana were among the top suppliers of agricultural imports, with a total of R84 million, R27 million and R11 million respectively. The products mostly imported by South Africa included cocoa paste, oil-cake, ginger and cocoa butter from WCA.

Table 4: South Africa's imports from WCA

	Value in R' millions		
Exporters	**2012**	**2013**	**2014**
World	**62271**	**66894**	**69715**
WCA exports	**179**	**236**	**354**
Côte d'Ivoire	133	161	218
Benin	11	40	84
Nigeria	19	23	27
Ghana	5	3	11
Congo	0	0	9
Togo	1	1	3
Cameroon	2	3	1
Guinea	0.01	1	0.5

Source: Trademap

Forestry Sector

Table 5 shows that South Africa's average total forestry exports to WCA were R652 million between 2012 and 2014, which constitutes 2.9% of total South African exports to the world. Nigeria was the largest market destination with an average total of R326 million, followed by Ghana with an average total of R108 million and Cote d'Ivoire at R45 million (see **Table 5, Appendix A**).

South Africa's average total forestry imports from WCA amounted to R183 million, commanding a share of 1% of South Africa's total forestry imports from the world. Gabon was the largest supplier with an average total of R126 million, equivalent to a 0.7% share from a world perspective. Ghana, Cote d'Ivoire and Cameroon were among the top suppliers of forestry products to South Africa, collectively showing an average total of R52 million (see **Table 5, Appendix A**).

Fisheries Sector

Table 6 shows South Africa's fisheries exports to WCA, with an average total of R95 million between 2012 and 2014, commanding a share of 0.5% of total exports to the world. Cameroon is ranked as the largest market within the region, with an average total of R65 million, followed by the Congo with an average of R14 million and Equatorial Guinea with an average of R5 million. Frozen fish, smoked fish and whole fish were the top products exported by South Africa into WCA in 2014, collectively amounting to R68 million.

Table 6: Main market destinations for forestry in WCA

	Value in R' millions		
Importers	**2012**	**2013**	**2014**
SA's total exports	**4343**	**4984**	**6083**
WCA	**121**	**87**	**76**
Cameroon	98	52	45
Congo	9	17	16
Equatorial Guinea	4	7	4
Nigeria	5	4	4
Ghana	4	2	4
Benin	0	2	2
Côte d'Ivoire	0	0	1

Source: Trademap

South Africa's fishery imports from WCA amounted to an average of R13.3 million between 2012 and 2014, commanding a share of 0.5%. Gambia was the largest supplier of fishery imports from WCA, with an average of R7 million, followed by Mauritania with an average of R2 million and Senegal with an average of R3 million. Frozen fish, crustaceans and fish fillets were the top three products imported by South Africa from WCA, collectively amounting to R22 million in 2014.

Table 7: Main suppliers from WCA to SA

	Value in R' millions		
Exporters	**2012**	**2013**	**2014**
SA's total imports	**4157**	**4606**	**4560.6**
WCA exports	**7**	**9**	**24**
Gambia	5	4	12
Mauritania	0	0	6
Senegal	2	2	5
Nigeria	0.2	2.3	0.4

Source: Trademap (2015)

SA-WCA AFF TRADE ANALYSIS

Figure 10 below shows that South Africa's total AFF exports to WCA increased between 2004 and 2014, with an average growth of 13% per year. It has been noted that the growth in exports occurred at the same rate as SA's AFF exports into the world. This indication South Africa exports growth was influence by exchange rate and diversification of the market in the world. During the period under review, South Africa's total AFF imports from WCA remained lower than AFF exports to WCA from South Africa. South Africa's AFF trade balance with WCA for the period under review depicts a positive growth in value and a decline in the trade balance.

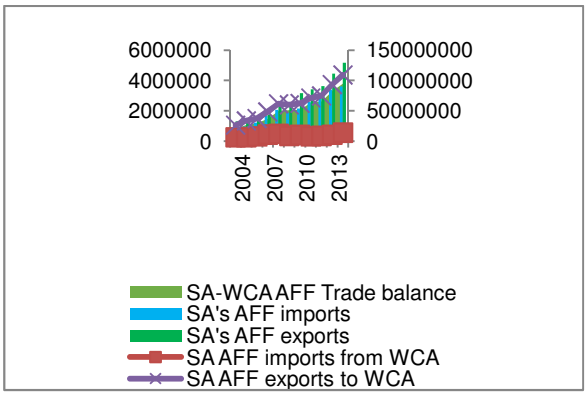


Figure 10: Trade analysis of SA-WCA

Source: Trademap

Concluding Remarks

In conclusion, WCA is the lowest ranked trader with South Africa, given AFF exports and share, despite notable growth in exports and imports of 8% and 13% respectively between 2004 and 2014. This is a lucrative market in terms of the African Union Commission's objective to increase trade on the continent.

Author: Yolanda Potelwa is an economist at the NAMC. Her work includes trade research under the MERC Division. Currently, she is working on issues relating to non-tariff measures (NTMs), more particularly SPS issues in the fruit industry. She can be reached at: YPotelwa@namc.co.za or +27 (0) 12 341 1115.

THE HIDDEN REALITY FACING AFRICAN GOVERNMENTS IN THE TRIPARTITE FTA ENGAGEMENTS – ADJUSTMENT COSTS ASSOCIATED WITH THE PROPOSALS

Introduction

This article attempts to outline the reasons why governments do not get to agree/sign quicker on what appears to be logically obvious from the trade economics point of view (that free trade areas are mostly desirable, as they supposedly lead to welfare gains). In the most simplistic version (partial equilibrium effects), trade theories argue that either subsidies or tariffs are ultimately a social cost (dead weight loss) to any economy. Neoclassical trade theory only justifies government interventions on special cases, such as the infant industry protection, to mention but one.

Even general equilibrium models, where a number of behavioural issues are captured, seem to agree that free movement of goods and services is the way to go (in the long run). The part of the puzzle that does not seem to attract attention is the structural change (institutions) as a result of freer

trade, which is arguably the source of gains, but a cost in the short run.

There is relatively few analytical writings (compared to the long-run gains) on the associated cost of trade policy decisions (including the estimated duration), the extent of unemployment (be it temporal) and the requisite policies to fast-track the adjustment period.

Policy decision-makers tend to spend a lot of their time on the short-term effects, mostly losses to be brought about by FTA. These include the budgetary implications associated with temporal unemployment surges, as well as drops in the performance of the economy. Then, if the total welfare effects of liberalisation decisions were to subtract the adjustment costs, a more realist picture would emerge, which would meaningfully reduce the expected welfare gains.

Continental Tripartite Free-Trade Area

The European Parliament (2015) noted that the continental free trade area stands to integrate the African regional groups, namely COMESA, SADC and EAC, covering 26 countries stretching from Egypt (North) to South Africa (South). The combined population of the affected regions is about 625 million people, with a combined gross domestic product to the tune of $1 trillion (58% of the total continental size).

Africa's integration has always been a priority (Draper *et al*., 2007) or part of the interests of African governments and the donor community (currently referred to as developmental partners). This can be traced back to the Lagos Plan of Action (of the early 1980s), the main aim of which was the creation of the African Economic Community as early as 1980, led by the United Nations Economic Commission for Africa (UNECA) in collaboration with the African Union (AU) – then known as the Organisation for African Unity (OAU). However, in the recent past (1991), the Abuja Treaty was signed, as was the Constitutive Act of the African Union. The approach proposed in the Abuja Treaty was to use the existing regional blocks as the building blocks for the continental free trade area (mainly proposed as a modality of taking the continental FTA to reality).

About 25 years after the signing of the Lagos Plan of Action and 14 years after the signing of the Abuja Treaty, the African continent has no fewer than 14 regional groups with a minimum of two members each, and interestingly each country (with the exception of Mozambique) belongs to two or more of these (the Spaghetti Bowl Problem), as presented in **Figure 11** (see **Appendix B**). The number of groups is presenting a challenge, considering the political commitments and institutional arrangements that are additional costs to intra-Africa trade. In this regard, Hartzenberg *et al.* (2015) argue that the continental free trade area forms the basis for Africa's regional integration, as well as continent-wide integration.

Adjustment Cost to Free Trade Area

The traditional measurement approach of the welfare effects of trade policy changes (such as tariff changes) encapsulates the comparison of the welfare levels before and after the policy change (Francois *et al*., 2011). In the process of relocating factors of production, a number of activities happen. International resource competition may lead to unemployment or reduced wages for the employed. This justifies the sceptical nature of the policy-makers' approach to liberalisation talks (the offensive and defensive approach to such talks). If the anticipated gains from liberalisation are sufficiently smaller than the estimated adjustment costs, then that liberalisation would lead to a net welfare loss.

In developed countries, liberalisation talks affect government revenue (losses in cases of tariff reduction or removal). Tariff revenue constitutes a reasonable amount of the countries' budgets. While in developed countries the government income's share accounted for by tariff revenue is minimal, in less developed countries, especially in Africa, where tariff revenue as a percentage of government income is high, then adjustment cost concerns associated with liberalisation are high (should be high). The reduction in government revenue (decrease tariff money) can lead to public sector expenditure adjustments as they relate to social safety nets (government social grants) and macro-economic stability (ensuring that inflation rates and interest rate hikes are minimised).

In theoretical terms, it is argued that tariff revenue losses are supposedly replaceable, considering taxes on incomes, profits, property and capital tax. As much as the cost of adjustment needs to be considered, however, it need not be overestimated.

In arguing that adjustment costs are induced by liberalisation, Cordoba *et al, undated.* state that economies are constantly adjusting to non-policy (affecting the method of operations) effects such as oil prices (and grain prices) and technological change (at times, the associated adjustment costs caused by non-policy effects).

Depending on the rate of growth of a country, tariff reduction may not necessarily lead to a decline in the growth of a sector; however, the rate of growth may slow (resource relocation challenge). Outlined in **Table 8 (Appendix A)** are a number of the labour and capital costs for the private sector, as well as government-related adjustment costs.

Closing Remarks

The important matter of finding the alternative sources of government revenue following tariff revenue losses is not a simple as it can be stated in a document (real life challenge). The matter of stating the benefits associated with adjustment costs need not be oversimplified, while the associated adjustment costs need not be overestimated. The reality is that an economy does not move from one equilibrium position to another automatically following policy changes. It also

needs to be noted that other major changes are happening monthly, and economies are adjusting to them.

References

Cardoba, SF, Laird, S., Maur JC., Serena JM. (Undated). Adjustment costs and trade liberalisation, Chapter 2 available online at http://www.unctad.info/upload/TAB/docs/TechCooperation/fullreport-version14nov-p076-095.pdf

Hartzenberg, T. & Mwanza, W. (2015). Review of SADC's market integration agenda: Opportunities and challenges for regional industrial development, *TIPS Annual Workshop.*

Laird, S. & Codoba, S.F. (2006). Coping with trade reforms: A developing-country perspective on the WTO Industrial Tariff Negotiations. McMillan.
European Parliament (2015).

Francois, J.; Jansen, M. & Peters, R. (2011). *Trade, adjustment costs and assistance: The labour market dynamics.*

Author: **Mr Bonani Nyhodo** is the manager for trade research at the National Agricultural Marketing Council. His research work focuses on trade analysis and GTAP modelling. He can be contacted at Bonani@namc.co.za or +27 (0) 12 341 1115.

AGRICULTURE AND ENVIRONMENTAL MANAGEMENT: RETHINKING THE VALUE-ADD OF AGRICULTURE IN TERMS OF CONTRIBUTION TO THE PUBLIC GOOD

Introduction

In generic terms, public goods are defined as those goods that are both 'non-rival,' i.e. any number of consumers can utilise the good without affecting the utility enjoyed from individual consumption, as well as 'non-excludable,' i.e. once the good is produced, nobody can be prevented from consuming it.[3] As it does not give effect to either of these principles, a piece of cake may be considered as an example of a private good. If the cake is consumed by one individual, it ceases to be available to others. Once the baker has produced it, patrons can be prevented from consuming it unless they have paid.[4] By contrast, an effective local police force constitutes a public good. All those residing within the jurisdiction of that police force can enjoy physical security on the streets simultaneously. Once security is established, it is available for all law-abiding citizens to enjoy.[5]

The concept of public goods is linked to the economic notions of externalities and market failure.[6] An externality refers to a situation where a firm's actions have unintended or unwanted side effects. These side effects may be positive or negative in nature. Positive externalities refer to consequences that benefit third parties that would otherwise not be associated with the firm's product, while negative externalities cause harm.[7]

In the agricultural sense, the concept of public goods provides a means of describing the socio-environmental goods and services derived from agriculture and forestry that are not delivered through the market.[8]

Markets do not function properly for public goods, because their characteristics mean that there is no clear incentive for individuals to pay for them.[9] Equally there is little incentive for anyone to provide them, as those who might engage in doing so would not be rewarded. This means that public goods run the risk of under-supply.[10] As a result, where there is a demand from society for a particular public good that is not provided in sufficient quantity, then public intervention in the form of policies is needed to secure a desirable level of provision in line with these demands.[11] Where the market does not function to meet demand, public policy is needed instead to incentivise the necessary action. This requires either the setting of clear standards as a baseline for admissible action or, in many cases, committing public funds to incentivise supply.[12] In the example of the police force highlighted above, funds are generated through compulsory taxation.

Externalities and Agriculture

Poverty reduction and sustainable land management are two objectives that most African countries strive to achieve simultaneously. In designing policies to achieve these objectives concurrently, a clear understanding of their linkage is crucial. However, there is only limited empirical

[3] http://web.worldbank.org/WBSITE/EXTERNAL/EXTOED/EXTANNREVDEVEFFE/EXT2008ANNREVDEVEFFE/0,,contentMDK:21903365~menuPK:5397143~pagePK:64829573~piPK:64829550~theSitePK:4683541,00.html

[4] ibid.

[5] ibid.

[6] http://www.fao.org/docrep/004/y6000e/y6000e13.htm (visited 31 October 2015)

[7] ibid.

[8] http://www.ieep.eu/work-areas/agriculture-and-land-management/sustainable-land-use/delivering-public-goods/

[9] http://enrd.ec.europa.eu/enrd-static/fms/pdf/260BDE6D-0066-3464-FD34-E3BB6AD3BB51.pdf

[10] ibid.

[11] ibid.

[12] ibid.

evidence to demonstrate the linkage between poverty and land management in Africa.

Food insecurity affects more than one billion people worldwide. Sustainable and inclusive growth, political stability and effective international co-operation are all at risk in a world of pervasive food insecurity. Seven years of global economic turmoil and rising food prices have increased the vulnerability of the poor in developing countries, where social protection systems are often inadequate or completely absent. APC countries have made food security an urgent concern. Sustainable agricultural development is crucial to achieving food security, especially in countries where the majority of the population depend on farming and agriculture.

Farmland biodiversity: Historically, many wild plants and animals have coexisted alongside food production. However, as agriculture has intensified, today farmland biodiversity depends heavily on areas of low-intensity management, or on unfarmed features around the farm, such as uncultivated strips between crops, walls or hedges, farm tracks, ditches and ponds. These places provide food, shelter and breeding sites for birds, mammals and insects, and the conditions for native flowers and other plants to grow. Farmland biodiversity also includes the rich genetic diversity of local breeds of farm animals and varieties of crops, many of them highly adapted to the soils, vegetation and climate of their region.[13]

Only seven percent of South Africa's living landscapes are conserved. As such, a significant number of the country's critical species and ecosystems occur on productive agricultural land outside of government-owned and management-protected areas. For example, the last of the Renosterveld vegetation type exists as fragments scattered among the Cape wheat fields and winelands.[14]

As such, in recent years, landowners have become more aware of biodiversity and its value (to them and to society), and hence are more willing to set aside portions of priority biodiversity on their land for conservation. One successful approach that is a win-win situation for both the conservation sector and landowners is the biodiversity stewardship approach. To assist in this process, conservation authorities have developed incentives for landowners who set aside land to protect biodiversity.

Water quality and availability: The use of fertilisers, herbicides and pesticides to enhance agricultural production is commonplace, but can have a major impact on the quality of both surface and groundwater. Finding ways of reducing the amount of nitrates, phosphates and agro-chemicals that end up in rivers and aquifers will protect drinking-water sources and contribute to the biodiversity of rivers and wetlands. As agriculture is a major user of water, especially for the irrigation of high-value crops, fruit and vegetables in the drier parts of Europe, it is at the centre of efforts to ensure more efficient and sustainable water use, helping to safeguard supplies for everyone.[15]

Soil functionality: Soil is the basis of all food production. Well-functioning soil has good structure and sufficient organic matter, and is resilient to erosion by wind or water. Most agricultural practices impact upon soil functionality in some way, but soil functionality can be preserved through the use of appropriate farming methods.[16]

Climate stability – increasing carbon storage and reducing greenhouse gas emissions: Removing some of the accumulated CO2 from the atmosphere is important for stabilising the world's climate. Plants accumulate CO2 very effectively, and farming methods that maintain permanent vegetation cover and return plant waste to the soil are a good way of 'mopping-up' carbon. In fact, permanent grasslands store nearly as much carbon as forests. As well as improving storage of carbon, agriculture can also play an important role in reducing the emissions of greenhouse gases that are responsible for global warming – not only CO2, but also methane and nitrous oxide.

Resilience to flooding and fire: In central and southern Member States in particular, well-grazed vegetation can be an important barrier to the spread of forest fires, and reduce the fire risk in permanent crops such as olive groves. The capacity of farmlands to absorb excess rainfall and store floodwater will be increasingly important as climate change increases the risk of flooding in urban areas.

Agricultural landscapes: Farming has shaped the distinctive rural landscapes of Europe for thousands of years and continues to do so. These range from alpine pastures to terraced landscapes, to dehesas, orchards and flood plains to mosaic landscapes of mixed arable and grass fields. Many cherished patterns of land use and locally distinctive landscape features are no longer essential to modern farming methods, but still need management if these kinds of cultural landscapes are to be maintained. Protecting the diversity of agricultural landscapes plays a key role in

[13] http://enrd.ec.europa.eu/enrd-static/fms/pdf/260BDE6D-0066-3464-FD34-E3BB6AD3BB51.pdf [13] ibid.

[13] ibid.

[13] ibid.

[13] http://enrd.ec.europa.eu/enrd-static/fms/pdf/260BDE6D-0066-3464-FD34-E3BB6AD3BB51.pdf

[14] http://www.wwf.org.za/what_we_do/land/our_partners/stewardship2/better_land_management2/

[15] http://enrd.ec.europa.eu/enrd-static/fms/pdf/260BDE6D-0066-3464-FD34-E3BB6AD3BB51.pdf

[16] ibid.

safeguarding the attractiveness of rural areas as a place to live in or for tourism.[17]

Rural vitality: Rural areas in the EU-27 exhibit huge differences in land use, population, prosperity, language, cultural heritage and traditions. Rural vitality involves having the job opportunities, minimum level of services and infrastructure as well as human capacity and good social networks to sustain and promote these values in order to ensure the long-term viability and attractiveness of rural areas as places to live, work and visit. The land, the character of the surrounding landscape, climate and other natural factors all serve to shape the customs, traditions and identity of rural areas. Agriculture can help to sustain rural vitality through the role that the farming population and associated rural activities and traditions play in rural areas. Linkages work both ways. Where rural areas remain economically and socially vibrant, this can also help to support the continuation of economic activities such as agriculture and forestry, which in turn are important in providing environmental public goods upon which many sectors – such as rural tourism and recreation – depend.[18]

Food security: While food is a private good, it is also true that markets do not ensure the availability of food at any time in any place. Deliberate action is needed, therefore, to secure food supply in the long term at the European or global level. Retaining the capacity to produce food sustainably into the future through appropriate husbandry of land and other resources and the maintenance of the necessary skills, is critical for achieving this.[19]

All types of farming can provide public goods if the land is managed appropriately. However there are significant differences in the type and amount of public goods that can be provided by different types of farms and farming systems.

Extensively managed livestock farms, mixed systems with both livestock and crops, permanent crops with more traditional management and organic farms tend to deliver the greatest range of public goods. This is because they tend to be managed using lower levels of fertiliser and pesticides or with lower livestock densities, contain a high proportion of semi-natural vegetation and landscape features, and the farmed area is often intermixed with a diversity of different types of land cover such as scrub or woodland. However, more productive types of farming can also provide public goods, for example through the use of new technologies to improve soil and water management and to reduce greenhouse gas emissions or through the introduction of farming practices that support biodiversity in more intensive agricultural landscapes. A whole range of aspects of farm management have an impact on the delivery of environmental public goods, including:[20]

- The pattern of cropping and stocking, intensity of land management and specific farming practices;
- The structural features of a farm, including field size and farm scale; and
- The management of water courses, natural features, groundwater resources and forests, not only on the farm itself but also as part of the wider landscape.

In terms of day-to-day farm management activities, there is a whole range of farming practices that can help provide public goods. These can be divided into two broad types.

Firstly, there are those practices which are inherently better for the environment overall, for example practices that use minimal tillage, low levels of inputs and retain semi-natural vegetation, as well as the use of technologies that improve the efficient use of resources such as precision farming techniques or drip irrigation. Secondly, there are those practices that address matters of a specific environmental interest, for example creating buffer strips of natural vegetation around ploughed fields, leaving small areas unsown in arable fields to encourage nesting skylarks (Alaudia arvensis) as found in Europe or leaving areas of semi-natural habitats unfarmed to provide habitat for wildlife to flourish. Many of these management practices provide several environmental public goods simultaneously. Some of the most widely beneficial practices include:[21]

- Maintaining field boundaries such as hedges, terraces or stone walls as important elements of the landscape, but which also provide habitats for wildlife, can help prevent soil erosion and can help control natural events such as flooding and landslides.
- Extensive grazing practices, including maintaining transhumance practices and regular herding of cattle or sheep onto fresh pastures to avoid under-grazing or overgrazing. Extensive grazing creates important components of many agricultural landscapes, is associated with high levels of biodiversity and permanent pasture performs an important role in storing carbon.
- Rotating crops, including incorporating a proportion of fallow land, green cover and/or overwintered stubbles within the crop rotation, which provide important habitats and food for mammals, birds and insects as well as helping to maintain soil fertility by minimising the loss of nutrients.

[17] ibid.

[18] ibid.

[19] ibid.

[20] ibid.

[21] ibid.

- Maintaining flood and water meadows, which provide excellent habitats for wildlife, maintain the fertility of the soil, as well as helping to prevent flooding in downstream urban areas.

South Africa

Land productivity is intricately linked to social, political and environmental issues and for this reason South Africa has implemented an integrated approach to sustainable land management. This is being implemented through a number of different programmes aimed at both resource management and socio economic development. The Constitution of the Republic of South Africa, Act No. 108 of 1996, places a duty on government to ensure equitable land distribution among South Africans, thereby addressing the injustices and consequences of the racially segregated 1913 Land Act. The land and agricultural reform process promises to increase equity and job creation amongst South Africans, stimulating economic and social development.[22]

On 29 May 2015, the Preservation and Development of Agricultural Land Bill was submitted for comment.[23]

The purpose of the Bill is, as an accompanying discussion document stresses, to enhance food security; limit any further loss of high potential cropping land to mining, residential, and other non-agricultural uses; prevent the fragmentation of farms into uneconomical units; and ensure that agricultural land is used optimally, so as to maintain and increase agricultural output and employment.[24]

Opponents of the Bill argued that "these important objectives could be met in very much better ways." As stated, opponents contested the need to end the freehold ownership of agricultural land, as the Bill seems to envisage, in order for these goals to be fulfilled. On the contrary, the further erosion of property rights heralded by the Bill is likely to limit food security, reduce rural jobs, and worsen poverty and hunger. Even if some of these outcomes may be avoided, the Bill will at the very least, restrict the normal competencies of land ownership, tie farmers up in onerous and costly red tape, and reduce incentives for direct investment in agricultural land. It could make it harder for farmers to raise working capital and so restrict farming production to the point where South Africa might lose its current food security.

Issues regarding state capacity were also stressed.[25] In addition, issues encountered in other areas of the world, such as India, remain unaddressed.

The Global Picture: Lessons from India's Green Revolution

From the 1960s to 1980s, the "Green Revolution" in Asia and Latin America – a sweeping effort to transform farming methods and improve staple crops such as maize, wheat, and rice – helped to double food production and saved hundreds of millions of lives.[26]

Many governments and donors subsequently shifted their attention to other concerns, believing that the problem of inadequate food supply in the developing world had been solved. This was not the case in Sub-Saharan Africa, however, where some Green Revolution approaches were tried but failed.[27]

Meanwhile, in the intervening years, population growth, rising incomes, dwindling natural resources, and a changing climate have caused food prices to rise and agricultural productivity has once again become strained.[28]

Many of those affected are smallholder farmers. Three-quarters of the world's poorest people get their food and income by farming small plots of land about the size of a football field. Most of them barely get by – struggling with unproductive soil, plant diseases, pests, and drought. Their livestock are frequently weak or sick. Reliable markets for their products and good information about pricing are hard to come by, and government policies rarely serve their interests well.[29]

These factors, in turn, put millions of families at risk for poverty and hunger as well as malnutrition – the world's most serious health problem and the single biggest contributor to child mortality. At the same time, one consequence of the first Green Revolution – excessive fertilizer use leading to water pollution – underscores the importance of sustainability to safeguard both environmental and human health.[30]

However, the Green Revolution cannot be regarded as a complete failure, either.[31]

[22] http://www.un.org/esa/agenda21/natlinfo/countr/safrica/land.pdf

[23] http://irr.org.za/reports-and-publications/submissions-on-proposed-legislation/irr-full-submission-on-the-preservation-and-development-of-agricultural-land-framework-bill-2013-29-may-2015

[24] Department of Agriculture, Forestry, and Fisheries, Discussion Document on the Preservation and Development of Agricultural Land, Document No 19.P.2/PD-ALF, 2014, pp9, 11-12.

[25] http://hsf.org.za/media/documents/submission-in-response-to-the-draft-policy-and-bill-on-the-preservation-and-development-of-agricultural-land-framework

[26] http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development

[27] ibid.

[28] ibid.

[29] ibid.

[30] ibid.

[31] http://study.com/academy/lesson/what-is-the-green-revolution-definition-benefits-and-issues.html

One person who is famous for his involvement in the Green Revolution is the scientist Norman Borlaug. In the 1940s, Norman Borlaug developed a strain of wheat that could resist diseases, was short, which reduced damage by wind, and could produce large seed heads and high yields. He introduced this variety of wheat in Mexico and within twenty years the production of wheat had tripled. This allowed for the production of more food for people in Mexico and also made it possible for Mexico to export their wheat and sell it in other countries. Norman Borlaug helped introduce this high-yield variety of wheat to other countries in need of increased food production, and he eventually won a Nobel Peace Prize for his work with developing high-yield crops and for helping prevent starvation in many developing countries.[32]

In addition to producing larger quantities of food, the Green Revolution was also beneficial because it made it possible to grow more crops on roughly the same amount of land with a similar amount of effort. This reduced production costs and also resulted in cheaper prices for food in the market.[33]

The ability to grow more food on the same amount of land was also beneficial to the environment because it meant that less forest or natural land needed to be converted to farmland to produce more food. This is demonstrated by the fact that from 1961 to 2008, as the human population increased by 100% and the production of food rose by 150%, the amount of forests and natural land converted to farm only increased by 10%. The natural land that is currently not needed for agricultural land is safe for the time being, and can be utilized by animals and plants for their natural habitat.[34]

Alternative and Concurrent Approaches: Conservation Agriculture

Conservation agriculture (CA) can be defined by a statement given by the Food and Agricultural Organization of the United Nations as "a concept for resource-saving agricultural crop production that strives to achieve acceptable profits together with high and sustained production levels while concurrently conserving the environment."

Agriculture, according to the New Standard Encyclopaedia, is "one of the most important sectors in the economies of most nations".[35] At the same time, conservation is the use of resources in a manner that safely maintains a resource that can be used by humans. Conservation has become critical, because the global population has increased over the years and more food needs to be produced every year.[36] Sometimes referred to as "agricultural environmental management," conservation agriculture may be sanctioned and funded through conservation programmes promulgated through agricultural legislation, such as the US Farm Bill.

The Food and Agricultural Organization of the United Nations (FAO) has determined that CA has three key principles that producers (farmers) can proceed through in the process of CA. These three principles outline what conservationists and producers believe can be done to conserve what we use for a longer period of time.[37]

The first key principle in CA is practising minimum mechanical soil disturbance, which is essential to maintaining minerals within the soil, stopping erosion, and preventing water loss from occurring within the soil. In the past agriculture has looked at soil tillage as a main process in the introduction of new crops to an area. It was believed that tilling the soil would increase fertility within the soil through mineralization that takes place in the soil. Also, tilling of soil can cause severe erosion and crusting, which leads to a decrease in soil fertility. Today tillage is seen as destroying organic matter that can be found within the soil cover. No-till farming has caught on as a process that can save soil organic levels for a longer period and still allow the soil to be productive for longer periods. Additionally, the process of tilling can increase time and labour for producing that crop.[38]

When no-till practices are followed, the producer sees a reduction in production costs for a certain crop. Tillage of the ground requires more money in order to fuel tractors or to provide feed for the animals pulling the plough. The producer sees a reduction in labour because he or she does not have to be in the fields as long as a conventional farmer.[39]

The second key principle in CA is much like the first in dealing with protecting the soil. The principle of managing the top soil to create a permanent organic soil cover can allow for growth of organisms within the soil structure. This growth will break down the mulch that is left on the soil surface. The breaking down of this mulch will produce a high organic matter level, which will act as a fertilizer for the soil surface. If CA practices were used for many years and enough organic matter was being built up at the surface, then a layer of mulch would start to form. This layer helps prevent soil erosion from taking place and ruining the soil's profile or layout.

According to the article "The role of conservation agriculture and sustainable agriculture", the layer of

[32] Ibid.

[33] ibid.

[34] ibid.

[35] New Standard 1992.

[36] ibid.

[37] http://www.unep.org/training/programmes/Instructor%20Version/Part_2/Activities/Human_Societies/Agriculture/Supplemental/What_is_Conservation_Agriculture.pdf

[38] ibid.

[39] ibid.

mulch that is built up over time will become like a buffer zone between soil and mulch and this will help reduce wind and water erosion. With this comes the protection of the soil's surface when rain falls on the ground. Land that is not protected by a layer of mulch is left open to the elements. This type of ground cover also helps keep the temperature and moisture levels of the soil at a higher level rather than if it were tilled every year.[40]

The third principle is the practice of crop rotation with more than two species. According to an article published in the *Physiological Transactions of the Royal Society* titled "The role of conservation agriculture and sustainable agriculture," crop rotation can be used best as a disease control against other preferred crops. This process will not allow pests such as insects and weeds to be set into a rotation with specific crops. Rotational crops will act as a natural insecticide and herbicide against specific crops. Not allowing insects or weeds to establish a pattern will help to eliminate problems with yield reduction and infestations within fields. Crop rotation can also help build up soil infrastructure. Establishing crops in a rotation allows for an extensive build-up of rooting zones, which will allow for better water infiltration.

Organic molecules in the soil break down into phosphates, nitrates and other beneficial elements which are thus better absorbed by plants. Ploughing increases the amount of oxygen in the soil and increases the aerobic processes, hastening the breakdown of organic material. Thus more nutrients are available for the next crop but, at the same time, the soil is depleted more quickly of its nutrient reserves.[41]

Author: Ms Stephanie van Walt is a senior economist at the National Agricultural Marketing Council. Her research work focuses on food laws and food security issues. She can be contacted at Stephanie@namc.co.za or +2712 341 1115.

Geospatial Technology: The Future of Agricultural Planning?

Introduction

The term "geospatial technologies" is used to describe the range of modern tools contributing to the geographic mapping and analysis of the earth and human societies.[42] These technologies have been evolving in some form since the first maps were drawn in prehistoric times. In the 19th century, the long-important schools of cartography and mapmaking were joined by aerial photography as early cameras were sent aloft on balloons and pigeons, and then on airplanes during the 20th century. The science and art of photographic interpretation and mapmaking was accelerated during the Second World War, and during the Cold War it took on new dimensions with the advent of satellites and computers.

Satellites have allowed for images of the earth's surface and human activities therein with certain limitations. Computers have allowed for the storage and transfer of imagery together with the development of associated digital software, maps, and data sets on socioeconomic and environmental phenomena, collectively called geographic information systems (GIS). An important aspect of GIS is its ability to assemble the range of geospatial data into a layered set of maps, which allow complex themes to be analysed and then communicated to wider audiences. This 'layering' is enabled by the fact that all such data includes information on its precise location on the surface of the earth, hence the term 'geospatial'.

Especially in the last decade, these technologies have evolved into a network of national security, scientific, and commercially operated satellites complemented by powerful desktop GIS. In addition, aerial remote sensing platforms, including unmanned aerial vehicles, e.g. the 'GlobalHawk' reconnaissance drone, are seeing increased non-military use as well. High-quality hardware and data is now available to new audiences such as universities, corporations, and non-governmental organisations. The fields and sectors deploying these technologies are currently growing at a rapid pace, informing decision makers on topics such as industrial engineering, biodiversity conservation, forest fire suppression, agricultural monitoring, humanitarian relief, and much more.[43]

Application in Agriculture: Global View

Agriculture is not just the world's largest employer and largest industry; it is a way of life for an overwhelmingly large number of people around the world. All major countries of the world depend on agriculture in one way or another. The fact that agriculture employs more than one billion people globally and generates over USD 1.3 trillion dollars worth of food annually. Pasture and cropland occupy around 50% of habitable land and provide habitat and food for a multitude of species. Agriculture contributed a mere 6% to global GDP in 2013. The contribution, however, differs from region to region and continent to continent. In the developing economies, agriculture constitutes a

[40] ibid.

[41] ibid.

[42] http://www.aaas.org/content/what-are-geospatial-technologies

[43] Ibid.

high proportion of GDP and even higher percentage of workforce. Seen from the context of climate change, agriculture can be an important source for reducing carbon emissions and helping vulnerable people adapt to climate change.[44]

The focus of the report is analysis on four regions: Asia-Pacific, Europe, South Asia and North America. Within those regions a number of countries are selected. The section on Europe deals with Germany, Switzerland, the Netherlands, Spain, Denmark and Belgium. The section on Asia-Pacific is concerned with Indonesia, Malaysia, Philippines, Japan and Australia. In South Asia one country is covered: India and in North America two: Mexico and the United States. The analysis is the combined result of responses to questionnaires, interviews and general intelligence gathering. It is important to distinguish between the agri-food sector and the 'primary' sector of agriculture. The latter has a much lower contribution to GDP and is the focus of this analysis, although parts of the more general agri-food sector will be taken into account when they are relevant for geospatial technology.[45]

The improved use of ICT in agriculture plays an important role in raising agricultural production and productivity up to the desired level: an increase of 50% of agricultural production is required by 2050. This has to be achieved in a sustainable way, while taking into account adaptation to and mitigation of the possible consequences of climate change.[46]

Trends and International Competitiveness

Several trends can be identified:

- Increased use of automated machinery. This machinery will be lighter than the traditional equipment, resulting in energy savings.
- Application of sensing with a focus on plant specific information (down to 2 centimetre accuracy). Sensing will provide information on crop development (or the status of forage for livestock), fertilizer requirement, water use, pesticide application (based on early detection of pests and diseases), weed control, soil moisture, soil structure and nutrient management. Most likely a combination of satellite information and of data obtained from UAVs will be used.
- More efficient and effective management of assets and operations and avoidance of mistakes and redundancy in operations.
- Integrated supply chain management and geo-tracking and tracing are other future trends, including reduction of post-harvest loss.
- Increased sophistication of agricultural information systems that benefit both farmers and government by providing evaluation of land suitability, a basis for taxation, insurance and compliance with regulations, monitoring of yields and support to agricultural extension.
- Use of improved and refined market information for both farmers and traders. Through either e-commerce or m-commerce the farmer will be informed about prices and markets.

Open data, access to data and capability of handling of big data will be very important. Closely associated with this is the compatibility of systems. Too often farmers still have to improvise to make devices work the way they want to and to use them in a connected way for general farm management. Companies that are able to provide integrated and workable solutions will have a definite advantage.

South African Initiatives

The AGCommons (Agricultural Geospatial Commons) Programme aims to improve the livelihoods of smallholder farmers in Sub-Saharan Africa through better research, intervention and decisions brought about by making location-specific information, analyses and tools more accessible.[47]

AGCommons is being developed as an Africa-based service bureau, providing geo-spatial information technology services to extend the reach and impact of existing agricultural initiatives working across the food value chain to improve the productivity and incomes of smallholder farmers. These services are provided through a "commons" approach that allows the open sharing of location-specific information. This encourages users to move away from the personal, ad-hoc management of geospatial information in favour of automated and secure data management services, sharing, and long-term archiving of data and associated metadata.[48]

AGCommons operations and services are now established with a base in Nairobi, Kenya. The technical infrastructure to deliver the initial set of geospatial services, including the ability to host and visualize spatial information, includes:[49]

- A platform for the storage, discovery, analysis and long-term curation of geospatial agricultural data (or metadata) in a coherent network of repositories.
- Advocacy for institutional and individual change towards an open systems approach to the uptake of research results and agricultural data in general.
- Ad hoc specialised data services such as:
- Data Source Discovery – particularly poorly documented or unknown data sources, and profiling these sources to understand their content and structure;
- Data cleansing to ensure quality, accuracy, and completeness; and

[44] http://geospatialmedia.net/report/Agriculture_Final_Report1.pdf

[45] ibid.

[46] ibid.

[47] http://ictkm.cgiar.org/what-we-do/spatial-information/

[48] ibid.

[49] ibid.

- Integration/harmonisation to maintain a consistent view of data across all systems within a location-based framework.
- Agricultural Information and Technology Services (AITS) that provide customised, localised, personalised, timely and accurate information to agricultural development organisations and groups working with farmers all along the food value chain, as well as providing the same directly to farmers where possible and appropriate. Some of the agricultural information services AGCommons has begun to develop include:
- Weather information up to five days in advance
- Crop advisory tips sourced from the National Agriculture Research Systems (NARS) and/or CGIAR Centres
- Agricultural input supply directory
- Detailed farming information on a variety of crops including staples such as cereals and pulses, among others
- Detailed smallholder dairy husbandry practices
- Pest incidence forecast
- Commodity prices – price updates and arrival information of select commodities from relevant markets
- Customised applications and tools developed on the basis of client partners' requirements. Sample tools already available include:
- A unified data integration platform for agricultural data that tracks the performance of indicators that can be monitored within the various sectors in agriculture.
- Location-intelligent custom web platforms to support data access and sharing.

For more information on the available services, please visit: AGCommons Services

The Programme established working relationships with existing service providers and works within the community to build capacities that are currently in short supply locally.

To jumpstart the effort in December 2008, AGCommons identified and implemented five Quick Win projects that can have real impact on the ground, deliver needed solutions in a relatively short time and offer the potential for scaling up benefits to farmers. Completed in 2009, these projects tested various models on the ground and involved different technologies and links with end-users: working directly with farmers, collaborating at the research level, and creating access to valuable data sets for use on the farmers' behalf.[50]

AGCommons was launched by the Bill & Melinda Gates Foundation as part of their Geospatial Technology Programme. It is led by the ICT-KM Program of the Consultative Group on International Agricultural Research (CGIAR).[51]

Author: Ms Stephanie van Walt is a senior economist at the National Agricultural Marketing Council. Her research work focuses on food laws and food security issues. She can be contacted at Stephanie@namc.co.za or +2712 341 1115.

[50] ibid.

[51] Ibid.

Appendix A

Table 5: Forestry trade between WCA and SA

	Value in R' million for SA exports				Value in R' million for SAs imports		
Importers	**2012**	**2012**	**2012**	**Exporters**	**2012**	**2013**	**2014**
World	**17179**	**19262**	**23669**	**World**	**15299**	**18200**	**20015**
WCA exports	**613**	**649**	**695**	**WCA imports**	**172**	**185**	**192**
Nigeria	273	311	389	Gabon	123	120	137
Ghana	121	98	106	Côte d'Ivoire	10	19	21
Côte d'Ivoire	53	36	46	Ghana	26	30	20
Cameroon	22	63	43	Cameroon	9	12	11
Senegal	24	25	22	Congo	0.4	1.3	3
Gabon	15	19	16	Nigeria	0.8	1.3	0.6
Benin	16	28	13	Senegal	0.03	0	0.33
Equatorial Guinea	0	0	13	Liberia	0.00	0.02	0.04
Congo	43	39	9	CAR	0.17	0.13	0.04

Source: Trademap

Table 8: Components of adjustment cost expectations from TFTA

Adjustment Costs	Private sector	Labour	- Unemployment (opportunity costs) - Lower wage levels - Obsolesce of skills (skills specificity) - Retraining costs - Rent seeking - Personal (psychological) costs
		Capital	- Opportunity cost of underutilised capital - Cost of capital write-offs (obsolesce capital) - Capital transition costs
	Public Sector		- Social safety net (unemployment benefits) - Reduced tariff revenue (reduction in government income) - Trade reform implementation costs (customs costs) - Removal of special treatments (preferential agreement) - Costs on non-trade issues such as food security - Safeguarding of macroeconomic stability (inflation and interest rates)

Source: Laird *et al.* (2006)

Appendix B

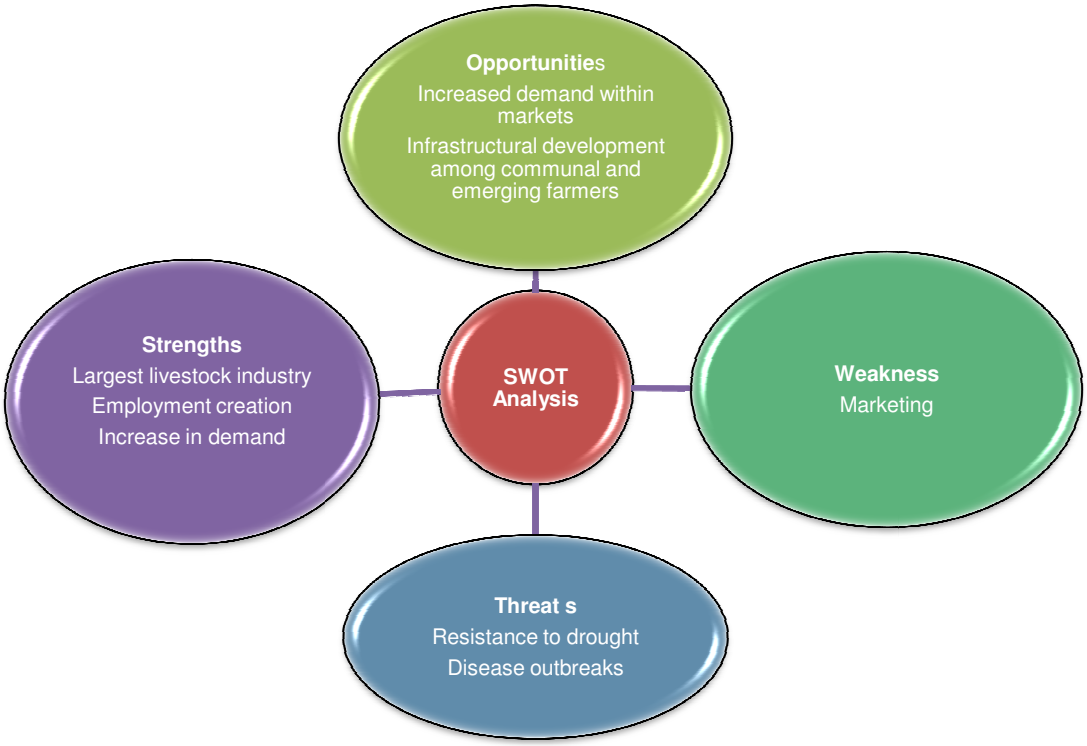


Figure 9: SWOT analysis for the South African beef industry
Source: Authors

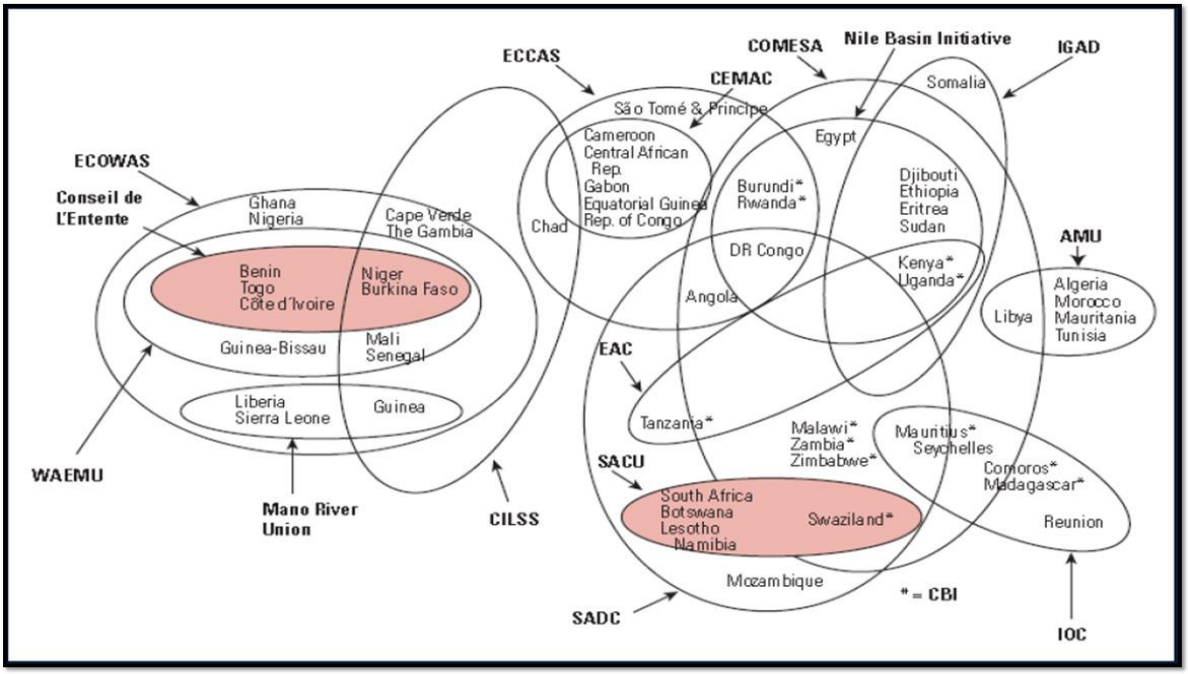


Figure 41: Africa's regional groupings and member countries (Spaghetti Bowl Problem)

For correspondence:
Bonani Nyhodo
bonani@namc.co.za
+27 (0) 12 341 1115

***Disclaimer**:*

Although everything has been done to ensure the accuracy of the information in this TradeProbe, neither the NAMC nor the DAFF accepts any responsibility for the accuracy of this publication or the opinions contained therein. Neither the NAMC nor the DAFF will be held accountable for the consequences of any actions taken on the basis of this information.