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THE NEXUS BETWEEN AGRICULTURE AND MINING SECTOR:

"SECURING FOOD FOR SOUTH AFRICA" 2014. PART 1

DIRECTORATE: MINERAL ECONOMICS

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THE NEXUS BETWEEN AGRICULTURE AND MINING SECTOR: "SECURING FOOD FOR SOUTH AFRICA" 2014 PART 1

DIRECTORATE: MINERAL ECONOMICS

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ABSTRACT

The mining sector is known for its negative impact on the agricultural sector. The co-existence of these sectors has resulted in battles over the use of the same resources and over the detrimental effects of mining activities on surrounding communities. However, all is not doom and gloom where these two sectors are involved. After the 2008 food price and threatening food insecurity crisis, ways to link the two sectors have even become quite significant in ensuring food security as well as economic growth. Policies are designed to address mining and agriculture with frameworks to mitigate the implications of mining on agriculture. The report aims to lay a foundation to unpack linkages between the two sectors for economic prosperity as well as food security. Key minerals used in agriculture are outlined e.g. minerals that can be used as fertilizers or for the production of fertilizers, as well as animal feed. The report will also outline different developmental activities that mining companies can engage in to support local communities' agricultural developments, which have a potential for job creation. The work will be done in two reports, Part 1, which will lay the background research on the two sectors, and outline key minerals needed for agricultural purpose. Part 2, which will focus on unpacking key issues in both sectors, and find possible linkages that emphasize the need for the co-existence of mining and agriculture.

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1. INTRODUCTION

The Agricultural and Mining sectors are amongst the key primary drivers of South Africa's economy as a result of the wealth of mineral resources and favourable agricultural conditions. The two sectors contribute significantly to the gross domestic product (GDP). However, their contribution has since been declining in the past few years. According to Media Club South Africa, the agricultural sector contributed 2.2 percent in 2013 while the mining sector contributed 9.2 percent during the same period. Despite the decline, these two sectors remain key in the lives of citizens of South Africa faced with food shortages. The mining industry produces minerals that can be used for agricultural purposes to produce food.

This report seeks to lay a foundation to unpacking the linkages between the mining and the agriculture industry in order to secure food in South Africa. The report will entail ground work that will lead to a detailed report on unpacking these linkages. Mining and agriculture are directly linked through agriculture's dependence on mined inputs, land and water resources, and workers. They are also indirectly linked where mining firms have improved infrastructure in a way that supports agricultural development. The outcomes of this interaction appear mixed. There is evidence that agriculture is growing in some areas as a result of mining and declining in others, depending on local circumstances surrounding the area. Modern agricultural activities depend on mined products used in fertilizers and animal feed supplements. These are minerals such as phosphate rock and sulphur.

The South African government has redirected funds to focus on the role of agriculture to secure food in the country. In the 2010/2011 financial year, food security was reprioritized as one of the top priorities for South African government (State of Nation Address, 2010). This is in line with South Africa's millennium development goal which aims to halve the proportion of people who go hungry over the period 1990 and 2015 and to halve poverty and unemployment by 2014. Government continued support will be provided to communities as well as engaging in food production and subsistence farming to promote food security.

In addition, the amendment of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) will allow for some minerals to be declared as key minerals. Key minerals will have input into the country's developmental imperatives, which include infrastructure development, energy security, food security and industrialisation. Phosphate rock, amongst other key minerals will be used to the maximum, to produce fertilizers for the production of

food for present and future purposes. The report will outline how phosphate is mined and its uses as a fertiliser as well as how it contributes into the agriculture industry.

2. AGRICULTURE AND MINING INDUSTRY

2.1. AGRICULTURE INDUSTRY

Farmers first settled in South Africa about 1700 years ago, and they introduced a new way of life to the southern parts of the continent. Farming was originally developed in Cameroon and Nigeria, between 2 000 and 4 000 years ago. People then started to spread eastwards and southwards, skirting the tropical forest, which did not provide the right environment for their crops and animals. Their movement was probably driven at least in part by search for new agricultural lands and iron-ore sources. Farming communities reached northern Angola and East Africa by the early centuries of the first millennium AD. People then continued to spread southwards into savanna environments with good grazing, arable soils and adequate rainfall for crops such as sorghum, millets, and various legumes and cucurbits.

Primary agriculture is an important sector in the South African economy and remains a significant provider of employment in rural areas, contributing about 7 percent toward South Africa's total employment. It is also a major earner of foreign exchange. The value of agricultural production in South Africa was R187.7 billion in 2013, while its contribution to the GDP was approximately R72 billion. The primary agricultural sector has grown by an average of approximately 9.9 percent per annum since 1970, while the total economy has grown by 12.9 percent per annum over the same period, resulting in a drop in agriculture's share of the GDP from 7.1 percent in 1970 to 2.6 percent in 2013.

The consumption expenditure on food for the year ended 31 December 2013 increased by 7.1 percent and amounted to R460.6 billion, against the R429, 9 billion of the previous year. Expenditure on all food items, except sugar, rose during 2013. Expenditure on meat increased by 8.8 percent, from R136 592 million to R148 625 million, bread and grain by 2.1 percent, from R118 001 million to R120 423 million and on fruit and vegetables by 11.4 percent, from R58 356 million to R65 033 million. Expenditure on sugar decreased by 2.6 percent, from R6 555 million in 2012 to R6 385 million in 2013. The figures above are indicative of the 2013 rise in demand for different food products. At the back of a rising population and rising food prices, the country is now faced with a food security challenge, and the agricultural sector will be key in overcoming this hurdle.

2.2. MINING INDUSTRY

South Africa produces a range of approximately 53 minerals, and accounts for a significant proportion of both world production and reserves. Mining and quarrying contributed 4.9 percent to GDP in 2013. The mining industry is about a century old but is very far from being fully tapped. The country is a treasure trove, with mineral deposits only matched by a few countries. Apart from its prolific mineral reserves, South Africa's strengths include a high level of technical and production expertise, as well as comprehensive research and development activities.

With the growth of South Africa's secondary and tertiary industries, as well as a decline in gold production, mining's contribution to South Africa's gross domestic product has declined over the past few decades. However, this may be offset by an increase in the downstream or beneficiated minerals industry, which the government has targeted as a growth sector.

The industry also feeds into many other important sectors by supplying minerals for further processing to create usable finished products. South Africa's mining industry is continually expanding and adapting to changing local and international world conditions, and remains a cornerstone of the economy, contributing significantly to economic activity, job creation and foreign exchange earnings.

The MPRDA has opened the doors to meaningful participation of black people in the exploration and exploitation of mineral resources. The Act enshrines equal access to mineral resources, irrespective of race, gender or creed. When the Act was passed, there was only one junior mining company and by mid-2008 they were 21.

3. MINERALS IN AGRICULTURAL ACTIVITIES

Minerals are used in agriculture through fertilisers or direct application. Mineral fertilisers are materials, either natural or manufactured, containing nutrients essential for the normal growth and development of plants. Plant nutrients are food for plants some of which are used directly for human food, others to feed animals, supply natural fibres or produce timber. Man and all animals depend entirely on plants to live and reproduce.

The three primary plant nutrients that are used in large quantities in fertilisers are nitrogen, phosphorus and potassium. Sulphur, calcium and magnesium are also required in substantial amounts. These nutrients are constituents of many plant components such as proteins, nucleic acids and chlorophyll and are essential for processes such as energy transfer, maintenance of internal pressure and enzyme action. Seven other elements are

required in small or trace quantities and are referred to as “micronutrients” or “trace elements”. Mineral fertilisers comprise naturally occurring elements which are essential to life.

Fertilisers are used in order to:

- supplement the natural soil nutrient supply to satisfy the demand of crops with a high yield potential and produce economically viable yields,
- compensate for the nutrients lost by the removal of plant products or by leaching or gaseous loss,
- improve favourable or to maintain good soil conditions for cropping.

The report will focus on phosphate fertilisers. The existence of a close relationship between fertiliser consumption levels and agricultural productivity has been established beyond doubt. Amongst the various agricultural inputs, fertilisers, perhaps next only to water, contribute the most to increasing agricultural production, hence their significance in food security.

4. SOUTH AFRICA’S PHOSPHATE INDUSTRY

4.1. OCURRENCE

There are three main types of phosphate rock deposits, igneous, sedimentary and modern and ancient guano accumulations, which have widely differing mineralogical, textural and chemical characteristics. Phosphate rock is formed in oceans in the form of calcium phosphate, called phosphorite. It is deposited in extensive layers that cover thousands of square miles. Ancient and modern guano are formed from bird droppings as well as rocks containing concentrations of the calcium phosphate mineral, apatite.Though all three types occur in South Africa, the igneous deposit at Phalaborwa is the major one currently being exploited. The most prevalent phosphate minerals in these rocks are species of apatite, i.e. calcium phosphate with quartz, calcite, dolomite, clay and iron oxide as gangue components. Igneous rock is often associated with carbonatites and/or alkalic intrusions and is generally low in phosphate concentration.

The 2 billion year old (Archean) Palaborwa Carbonatite Complex in Limpopo Province contains apatite bearing zones, which are the major sources of South African phosphate production. The apatite is relatively coarse grained, with a well-developed crystal structure, hard and practically insoluble in water and in weak acids such as citric acid. It is unsuitable as a direct application fertiliser and thus, must first be treated with strong acids. The total radioactivity of the Palabora apatite is characteristically lower than other igneous phosphate

minerals in the world. The Palabora carbonatite contains two types of apatite ores: foskorite and pyroxenite.

The foskorite embodies some 20 Mt of ore for each 30m of depth, and has a mean phosphorous pentoxide (P_2O_5) grade of 8.6 percent, at a cut-off grade of 6 percent. Borehole results indicate that mineralisation persists to a depth of at least 1000 m below surface. The pyroxenite contains 486 Mt of ore grading 6.9 percent P_2O_5 for each 30m of depth. A cut-off grade of 5 percent P_2O_5, to a depth for 600m, was used in calculating the reserve base of some 2 500Mt, which represents the third largest in the world.

The Glenover phosphate deposit, located north of Thabazimbi, in Limpopo, occurs in a smaller carbonatite pipe. High-grade phosphate ore from Glenover was mined out in the past and its dumps are currently being re-worked to recover phosphate.

Sedimentary phosphates are “soft” compared to the igneous phosphate of the Palabora Igneous Complex. As a result, sedimentary phosphates are suitable for direct application onto soil. Some sedimentary phosphate deposits occur along the western seaboard e.g. (Langebaan, Langfos) but are currently not being exploited. This is a potential opportunity for small scale miners and warrants further investigation. South Africa’s reserves of phosphate rock are estimated at 1 500 Mt and ranked 5th in the world.

4.2. PHOSPHATE MINING

Phosphate rock is mined by two companies in South Africa, Foskor in Palaborwa and Geckofert in Langebaan. Foskor is the major producer of phosphate in South Africa with a design capacity of approximately 2.8 Mt per year. The company started mining the foskorite ore zone in 1954. Palabora Mining Company (PMC) was formed in 1957 to exploit the non-phosphate minerals i.e. copper and vermiculite in the carbonatite complex, while Foskor retained the right to the phosphate minerals in the entire Phalaborwa Complex Foskor also has an opencast mine in the north-western part of the pyroxenite region, from which it mines pyroxenite for the production of high-grade phosphates (20 percent). In 1999, Foskor undertook the Extension 8 project that increased the plant capacity by 750 kt per annum.

The most recent extension to the mine is the Pyroxenite Expansion Project (PEP) which was divided into two phases PEP1 and PEP2. PEP 1 involved the construction of a new pyroxenite ore opencast mine together with the installation of a new primary gyratory crusher and an overland conveyor system, which was completed in June 2010. PEP 2 focused on de-bottlenecking the existing Extention 8 plant to improve its throughput rate in order to meet its original design capacity. This was completed in February 2011. The company now has a

design capacity of approximately 2.8 Mt per year. Proven reserves in the existing mine will last for at least another 60 years, with total ore resources extending for a further 8 years. The company has no further expansion plans in the short term.

Geckofert on the other hand mines phosphate rock of much lower grades and quality compared to that mined at Foskor. The small operation started in 2009 and has a life span of about 20 years. The mine has a capacity of ± 60 kt per annum.

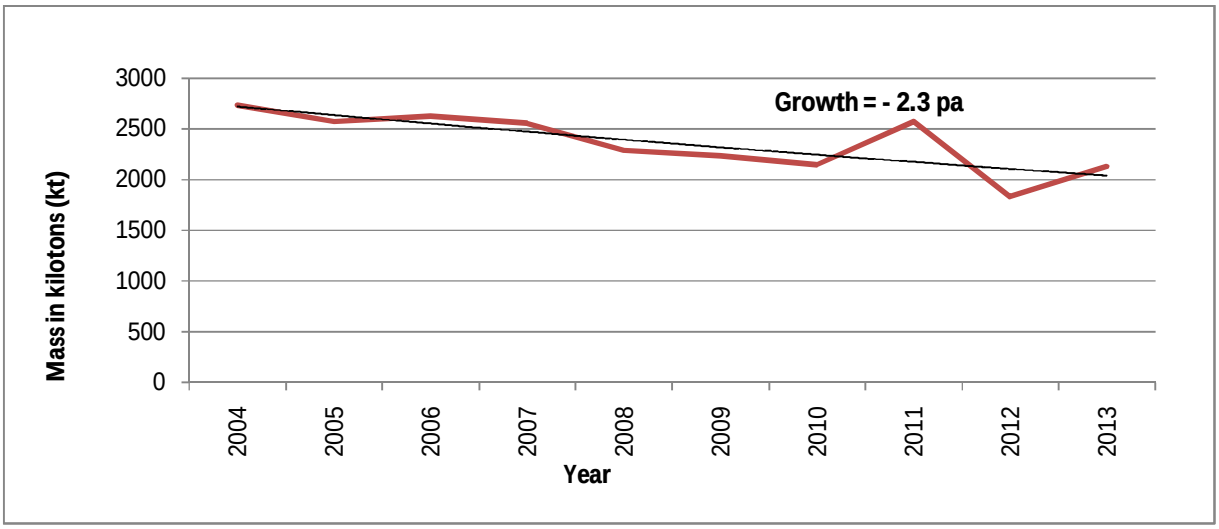
4.3. PROCESSING

Foskor's phosphate mine was re-sized to cater for internal demands from Foskor Richards Bay and domestic customers, which collectively consume less than one million tons per annum (i.e. Sasol Nitro and Omnia, which operate phosphoric acid and fertiliser plants). An expansion project at Foskor Richards Bay, with a R1.5 billion price tag was completed in June 2003. The plant produces sulphuric acid (H_2SO_4), phosphoric acid (P_2O_5) and granular fertiliser (MAP/DAP). H_2SO_4 is primarily an input in the production of P_2O_5. The granular fertiliser plant operates independently from the acid plants and may be shut down at times when demand is low. At full capacity, Foskor Richards Bay can produce 2.2 million tons of H_2SO_4 per annum, 720 kt of P_2O_5 and 300 kt of MAP/DAP. About 88 percent of granular fertiliser is sold locally.

4.4. SUPPLY OF PHOSPHATE ROCK

South Africa's production of phosphate rock varied between 2000 kt and 3000 kt since 2000 (Fig. 1). Phosphate rock production has been trending downwards since 2002, reaching a low of 2 148 kt in 2010, before increasing again to 2 575 kt in 2011 as a result of increased demand for fertilisers and depleting stock levels. The production decrease was mainly brought about by fluctuation in feed grades due to diminishing surface ground ore reserves. Technical problems that were experienced at Foskor since commissioning of Extension 8 project after 2003 also contributed further, to the decrease preventing the mine from reaching full capacity of 750 kt as planned. Production decreased drastically again in 2012 as a result of of wet weather conditions and structural failure of the South Pit Crusher stockpile gantry at Foskor mine. In 2013 production picked again to 2 131 kt in the absence of some of the challenges experienced in 2012.

FIGURE 1 : SOUTH AFRICA'S PRODUCTION OF PHOSPHATE ROCK, 2004-2013



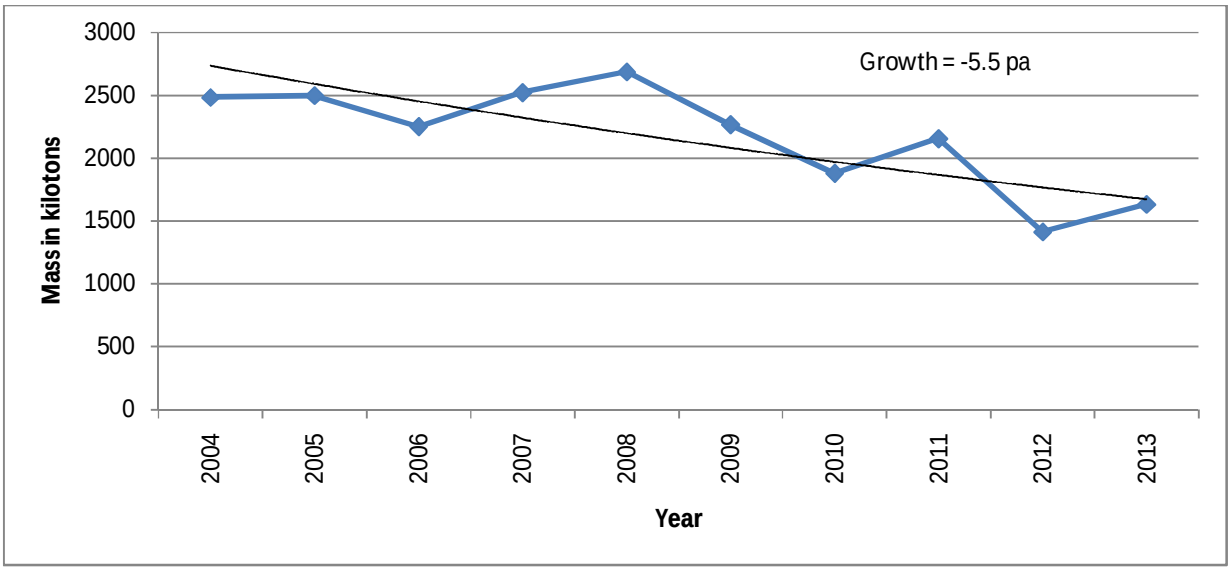
Source: Directorate Mineral Economics

4.5. DEMAND FOR PHOSPHATE ROCK

Demand dynamics differ in phosphate rock end-markets. In the Middle East and North Africa, vertical integration is boosting demand for phosphate rock rather than finished products, while Brazil and India are major markets for finished products. However, the outlook for Brazil and India differs. Brazil is aiming to reach self-sufficiency in the next decade, while India's rock resources are insufficient to satisfy the country's needs, even in the long term. Phosphate rock in SA is used to produce a wide range of products including food and industrial grade phosphates. The bulk of future expansions will be driven by increasing demand in the fertilizer and feed markets.

Local sales volumes of phosphate rock declined at an average rate of 5.5 percent annually, from 2 484 kt in 2004 to 1 634 kt in 2011 due to decreased demand for phosphoric acid (Fig. 2). Growth was experienced in 2008 and in 2011. The increase was attributed to the steady production of phosphoric acid at Foskor Richard Bay Plant, as well as improved railing capacity of phosphate rock from Phalaborwa to Richards Bay. Local sales volumes started decreasing again in 2012 and 2013 due to lower demand from phosphoric acid and granular fertilisers producers.

FIGURE 2: SOUTH AFRICA'S LOCAL SALES VOLUMES OF PHOSPHATE ROCK, 2004-2013



Source: Directorate Mineral Economics

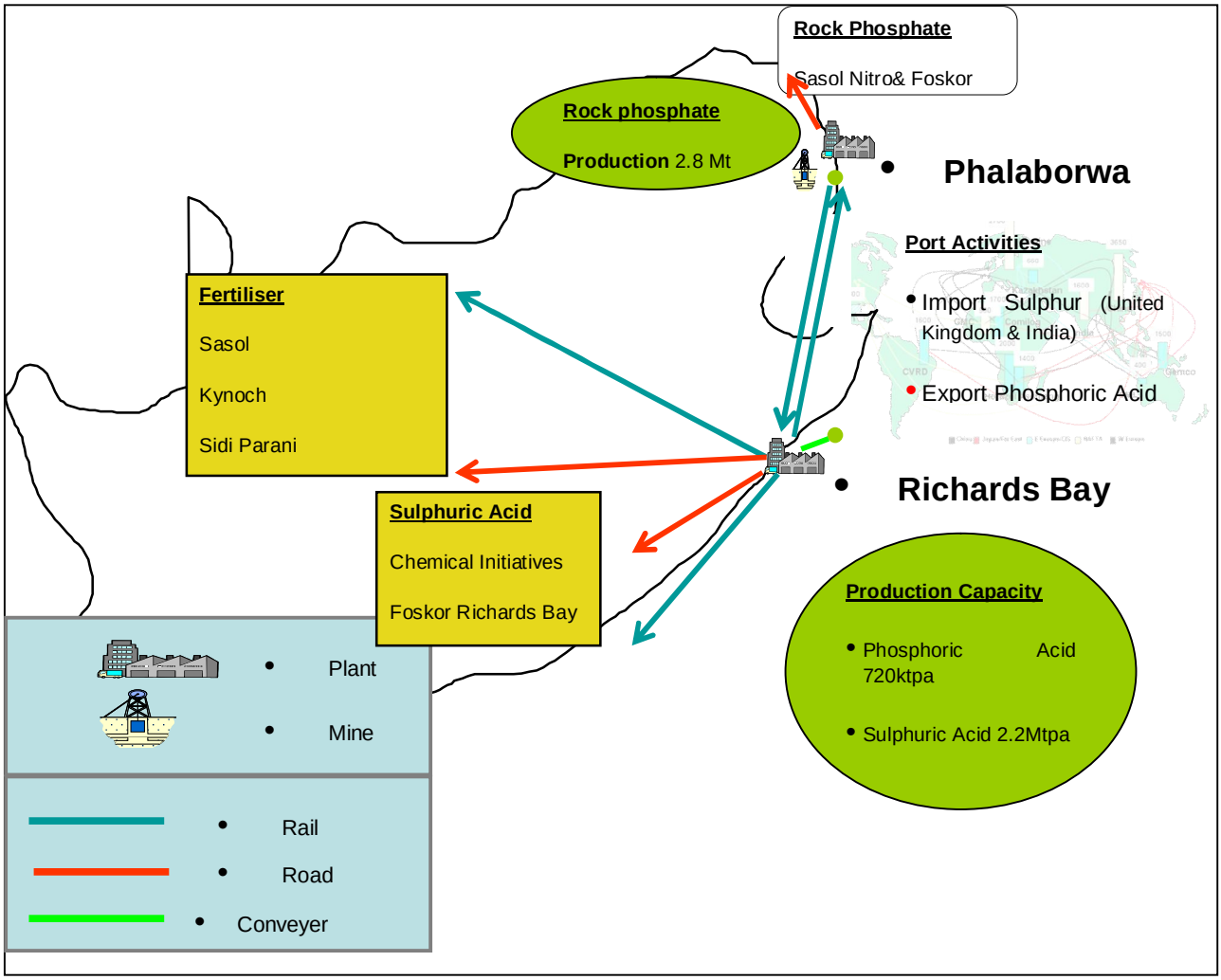
4.6. PHOSPHATE SUPPLY CHAIN

Foskor's Mining Division in Phalaborwa, mines phosphate rock (foskorite and pyroxenite), from which Foskor's Acid Division in Richards Bay produces phosphoric acid and phosphate-based granular fertilizers for local and international markets (Fig.3). The opencast mine in Phalaborwa, South Africa, has the capacity to yield 2.6 million tons per annum of phosphate rock concentrate from processing 35 Mt of ore per annum. Once crushed, milled, concentrated and dried, most of the phosphate rock concentrate is railed to Foskor's processing plant in Richards Bay, and the rest is sold to Sasol Nitro in Rustenburg.

The Richards Bay plant produces sulphuric acid (H_2SO_4), phosphoric acid (P_2O_5) and granular fertilizer (MAP/DAP). H_2SO_4 is primarily an input in the production of P_2O_5. The granular fertilizer plant operates independently from the acid plants and is shut down when demand is low. Foskor Richards Bay is 3 km from the deep-sea port which, by virtue of its sheer proximity, provides easy access to market. Raw material inputs such as sulphur and ammonia from Canada and the Middle East are imported. Phosphoric acid is then exported via the port of Richards Bay.

At full capacity, Foskor Richards Bay can produce 2.2 Mt of H_2SO_4 per annum, 720 kt of P_2O_5 and 300 kt of MAP/DAP. About 88 percent of granular fertilizer is sold locally. Foskor's fertilizer price is based on the global prices set in US Dollars and is published weekly in the Fertilizer Market Bulletin (FMB)

FIGURE 3: PHOSPHATE SUPPLY CHAIN.



Source: Grain SA Fertiliser Report 2011

5. SOUTH AFRICA'S FERTILISER INDUSTRY

5.1. HISTORICAL OVERVIEW

The South African Fertiliser Industry dates back to 1903, when the South African Fertiliser Company (SAFCO) began production of phosphate by means of animal bones. As the industry developed during the 20th century, the production of explosives became crucial, resulting in the production of larger quantities of by-product sulphuric acid. The by-product sulphuric acid and imported phosphate rock, formed the basis of a viable fertiliser industry. Explosive producers such as Kynoch (Umbogintwini) and Cape Explosives (Somerset West) began fertiliser production in 1919 and 1920, respectively. The original Kynoch and Cape Explosives joined forces in 1924 as AE&E, which later became AE&CI (i.e. African

Explosives and Chemical Industries, at present AECI Limited). AECI continues to produce both explosives and fertilisers among other product ranges.

The fertiliser industry flourished in the early 1950's, leading to the development of Foskor, Sasol and Iscor. As a result, the Fisons and Windmill (Sasolburg) and Bosveld (Phalaborwa) fertiliser factories were established. By 1969, these factories, together with Fisons factory at Milnerton, became part of Fedmis. Other companies such as Omnia and Triomf were also established. Sasol Limited, which previously was a supplier to other fertiliser manufacturers only, established its own fertiliser company (Sasol Fertilisers) and started marketing directly to farmers in 1984. In 1986, Kynoch took over the local interests of Triomf. At about the same time an overseas consortium, Indian Ocean Fertiliser (IOF) took over the Richards Bay plant. IOF produced phosphoric acid and soluble phosphates mainly for the export market.

In 1988, the operational interests of Fedmis, a division of Sentrachem, were taken over by Sasol Fertilisers, Kynoch Fertilisers and Omnia Fertilisers. During 1990, Foskor became a shareholder in IOF. In 1992, Sasol fertilisers decided to cease its direct marketing to farmers. In 1993, Kynoch Fertilisers took over the nitrogen interests of AECI. Chemfos (a subsidiary of Samancor), which mined phosphates at Langebaan and was also a fertiliser blender, ceased its activities towards the end of 1993. In the period 1999-2004, Foskor obtained the entire shareholding of IOF.

In 2008, 86 percent of the market share in terms of revenue in the fertiliser industry was shared between only three companies, Sasol, Omina and Kynoch. With Profert included, four companies shared 94 percent of the market. In 1992, Sasol decided to focus on wholesale production and stopped selling fertiliser as retailers.

In 2009, South African petrochemichal group Sasol mothballed its Phalaborwa phosphoric acid plant in Limpopo Province, owing to high feedstock prices and declining fertiliser demand. However, Farmers World Limpopo, a subsidiary of Meridian International Group in Africa took ownership of the mothballed Sasol Nitro plant in 2010, and is now fully operational under new management. Omina Fertiliser, a division of the Omnia Group also decided to cease operations at its phosphoric acid plant located outside Rustenburg. The plant produced phosphate based products, mainly phosphoric acid. The Industrial Development Corporation (IDC) remains the majority shareholder (59 percent) of Foskor, with Coramandel Fertilisers from India and Manyoro Consortium owning 14 percent and 15 percent respectively.

5.2. FERTILISER INDUSTRY STATUS QUO

The South African fertilizer industry comprises of four companies that share about 94 percent of the market. The four companies are Sasol, Omnia, Yara and Profert. Fertilizer products include nitrogenous, potash, and phosphate fertilizers (including ground rock phosphate). Consumption of fertilizers has remained around 2 Mt since the early 1980s. The main market for fertilizer is the agricultural industry. Although the nutritional concentration of fertilizer has increased over the years, there has not been much growth in the fertilizer industry in the past few decades due to the economic market conditions in the grain and oilseeds industry (47% of total fertilizer consumption).

The local fertiliser industry is fully exposed to world market forces and operates in a totally deregulated environment with no import tariffs or government sponsored support measures. Annually, the industry supplies about (760 kt of N + P_2O_5 + K_2O) of fertiliser products to the local market at a value of R3 billion ($480 million). This represents 20 percent of the local chemical industry (excluding oil).

Fertiliser consumption reached a peak of more than 3 Mt in 1982, when price control was in place and the industry operated in a protected trade environment. In 1982, the country suffered the most severe drought in two centuries. This coincided with the worst recession since 1930, which had a serious financial effect on both farmers and the fertiliser industry. Shortly after these, in 1984, the liberalisation of the South African trade policies started with the abolishment of price control and the opening-up of the economy. Once everything settled down, total fertiliser consumption levelled off in 1988 at around the 2 Mt per annum mark where it stayed until 2007 when the fertiliser consumption started decreasing slightly till 2009 to 1.8 -1.9 Mt

5.3. SUPPLIERS OF RAW MATERIAL FOR FERTILISERS

Sasol Limited supplies most of the country's ammonia, with some coming from Arcelo Mittal South Africa Steel (Iscor) and imports. South Africa now imports all its Urea following the closing down of Kynoch. Since the closure of Sasol's 160 kt/a ammonium sulphate (NH_2SO_4) plant in 2005, it now produces 100 kt/a of NH_2SO_4. The company still does not produce enough to meet the local demand but is working on expansions. Omnia and Sasol produce Nitric acid for the local market with significant surplus capacity available. Sasol, Omnia and Yara SA have granulation plants for the production of Limestone Ammonium Nitrate (LAN) and nitrate based Nitrogen Phosphorus Potassium (NPK) blends.

Foskor supplies phosphate concentrates to local and foreign fertiliser producers. Through

treatment with sulphuric acid, phosphoric acid or nitric acid, the concentrate is converted into a whole range of intermediate (phosphoric acid and DAP) and other downstream products such as superphosphate. Sulphuric acid is a by-product of most mining processing in SA but is also produced from imported and local sulphur. Sasol Nitro, Omnia and Yara SA supply intermediate and final products to the market. South Africa's current domestic fertiliser demand is around 760 kt plant nutrients ($N + P_2O_5 + K_2O$). This demand, as mentioned in this report, is met through local production and imports (TABLE 1).

TABLE 1: FERTILISER DEMAND, DOMESTIC PRODUCTION AND IMPORTS 2012

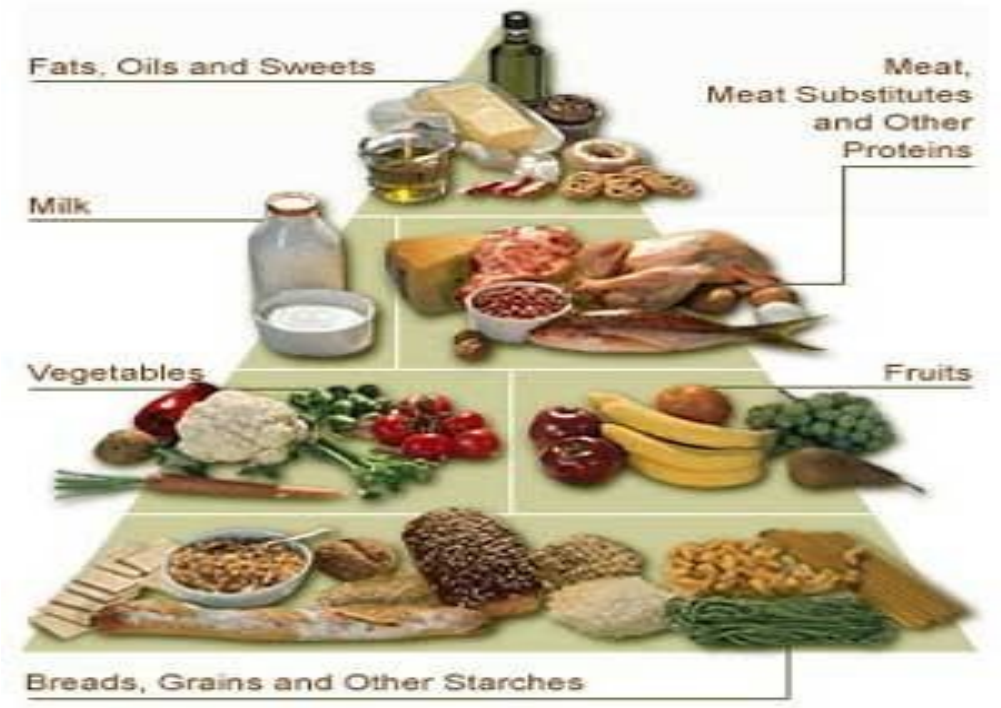
Nutrient	Demand (kt)	Domestic Production (kt)	Imports (kt)	Products
Nitrogen (N)	400	250	150	Mostly urea & LAN
Phosphate (P_2O_5)	200	Over 90% of demand	<10% of demand	Mostly DAP & MAP
Potassium (K_2O)	160	None	All	Mostly MOP

Source: Fertilizer Society of South Africa

6. STATUS OF FOOD SECURITY IN SOUTH AFRICA

According to the Human Sciences Research Council (HSRC), the food trends status in South Africa is classified under three sections; food secure, at risk of hunger, and experiencing hunger. Food security can be defined as ability to access adequate nutrition-food that is affordable, hygienic and naturally accepted, while hunger (food insecurity) exists when food is not easily accessible and households have difficulty securing adequate food (Fig 4). In 2013 about 45.6 percent of citizens in RSA were food secure, 26 percent experience hunger while 28.6 percent were living at the risk of experiencing hunger. This statistic indicates that, ways to secure food for all need to be put in place swiftly.

FIGURE 4: NUTRITIOUS FOOD THAT CAN BE ACCESSED BY A FOOD SECURE INDIVIDUAL



Source: Healthxwellness.com

According to the 2004 report "The state of food insecurity in the world" of the Food and Agriculture Organization (FAO) and a report of 2011 by the Directorate: Food Security within the Department of Agriculture, Forestry and Fisheries, food security also has three dimensions namely food availability, food access and food use. Food availability implies that a country must have sufficient quantities of food available on a consistent basis at both national and household level. Food access implies the ability of a nation and its households to acquire sufficient food on a sustainable basis. Food use refers to the appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation.

Food security is currently an issue to address, both nationally and internationally by politicians, academics, and civil society. Global summits have resulted in signing of declarations and construction of institutional bodies to see to it that food security is made a human right for all. The South African government has also made efforts to address the problems of malnutrition and hunger amongst other economic and social plights. The government established programs such as the Integrated Food Security Strategy (IFSS) and Integrated Nutrition Programme (INP), while also doing everything to ensure the realization

of desired outcomes and ensuring that the number of food insecure people in the country does not continue to rise.

7. CONTRIBUTION OF MINING TO AGRICULTURE INDUSTRY

South Africa needs both agriculture and mining to realize exponential economic growth to meet its 2020 job and food security targets. However, ways needs to be sought to see that the two sectors co-exist. Agriculture and mining have been identified as key job drivers that need to be used to secure strong and sustainable growth in the long term. However, mining activities have been found to pose a serious threat to arable land, water resources and food security. Mining activities are often associated with pollution and loss of soil fertility, which could be a threat to food security if not properly managed. The other major challenge posed by mining activities is water contamination. Water is a scares resource; which needs to be used sparingly.

The two sectors can still coexist to provide solutions to some of the country's emerging problems. After the 2008 food price and threatening food insecurity crisis, ways to link the two sectors have been revised. The South African government has already redirected funds to focus on the role of agriculture to secure food in the country. Mpumalanga, for example, is the country's major coal producer accounting for 80 percent of the coal that generates power and gets exported. Coal is mined in the province's Highveld region, which is also the leading producer of soya beans (51 percent), maize (24 percent) and dry beans (23 percent). According to the Mpumalanga Economic Growth and Development Path report, sixty mines are currently operating on 13 percent of river catchments and productive farms in the region, thus if pending mining permits and prospecting licenses were to be granted, 80 percent of the region's surface would be taken up by mines, with a potential impact on farming land and food production, such cases present good opportunity for sector to collaborate and establish ways of coexistence. The bottom line is that, South Africa needs both mining and agriculture for economic development, job creation and food security.

8. IMPACT OF MINING AND AGRICULTURE ON THE ENVIRONMENT

The mining sector is responsible for some of the largest releases of heavy metals into the environment than any industry. It also releases air pollutants including sulfur dioxide and nitrogen oxides in addition to leaving behind, tons of waste tailings, slag, and acid drainage. However, these gases could be captured and used in processes to produce fertilizers. Occupational and environmental exposure to heavy metals, silica, and asbestos can occur

during mining operations. There is a lot of hazards to human health caused by exposure to heavy metals. These metals are associated with a range of neurological defects in both children and adults in addition to a range of other systemic effects. Exposure to airborne silica and asbestos can cause lung cancer, pneumoconiosis and numerous other health effects.

Impacts always have mitigation measures that minimize the severity. It is upon both government and mining companies to make extra efforts to ensure that all agreements in the Environmental Impact Assessments (EIA) are adhered to. Below are some of the mitigation measures for mining projects:

- Adopting methods that are less wasteful,
- Use of technologies that are user and environmentally friendly,
- Rehabilitation of quarries after use,
- Minimizing surface disturbance by maximizing stone reserves through deep quarrying,
- Avoidance of establishing small and haphazardly located quarries that contribute to environmental degradation,
- The action of local authorities to promote environmental awareness campaigns and technical training programmes to add value to how the locals respond to mining processes and negative environmental impacts.

The above mentioned measures will create a sense of responsibility to the locals around the mine.

The impact of agriculture on the environment that is focused on is mainly that of pollution due to leaching of agrochemicals or erosion of contaminated soil particles. However, more important environmental problems are due to the imbalance or the lack of closure of nutrient cycles and the wrong choices made for this purpose. The natural role of agriculture is the re-utilization of wastes and effluents, no more congenial today for the farmers themselves. It is necessary therefore, to encourage farmers to play their role in conserving the environment. The definition of sustainable agriculture does not come from this role, and it is possible to stress the concept that by playing this role, agriculture becomes the ground for a sustainable society. Sustainable agriculture however, is the act of farming using principles of ecology, the study of relationships between organisms and their environment.

An area that is being mined can be used secondarily for agricultural purposes, the same way that an area that has been used for agricultural purposes could still allow for mining. The biggest challenge at hand is that land is the one common tool to feed the communities, create job and boost the economy. This emphasizes the need for all stakeholders to adopt the three dimensional approach to sustainability which demands that all three dimensions (economic environmental and social) be treated as equally important.

9. INDUSTRY REGULATION

South Africa has sufficient regulatory instruments in place to manage the symbiotic relationship between mining and agriculture. These regulatory instruments are predicated on the Constitution, the supreme law of the land, which guarantees the right to an environment that is not harmful to human health and well-being. It prescribes that the environment should be protected for the benefit of present and future generations. It enshrines the right to basic necessities such as food and water. The Constitution also affords the right to exploitation of the Nation's natural resources for the benefit of all South Africans. It enjoins the State to take reasonable legislative and other measures to ensure the realization of these rights.

The State has, since the advent of democracy, developed a plethora of legislations and policies to regulate mining and agriculture to achieve the model objectives enshrined in the constitution. The sustainability of agriculture and mining is based on sustainable and integrated management of natural resources as well as prudent environmental management evidenced by the fact that, three departments look into mining applications including Department of Environmental Affairs, Department of Water Affairs and Sanitation and Department of Mineral Resources. The MPRDA is part of the pursuit of legislative reform and embodies the spirit and support of the constitution. The Act provides for ecologically sustainable development of the Nations' natural resources and promotes economic and social development.

The regulatory framework governing mining and agriculture evolved over time, to resolve challenges that used to impede coexistence of these two sectors. The regulatory framework continues to evolve, illustrated by amendments to the MPRDA, which seek to improve on the consultation process by the applicants with surface right or land owners, in particular, and interested and affected parties. The detailed and involved consultation process will entail giving adequate notices, clear and accurate information to surface rights or land owners regarding the planned prospecting or mining operations, to enable the parties to make

meaningful decisions regarding the impacts of mining on land and the necessary measures to safeguard the environment. Structures such as the Regional Mining Development and Environmental Committee (RMDEC) and a Ministerial Advisory Council (MAC) dully constituted by representatives of relevant State departments within the national, provincial and local sphere of government or relevant organs of state within each sphere. They have been established to consider issues including co-existence between relevant sectors and advise accordingly in the spirit of co-operative governance and to advance the national developmental imperatives.

The proposed amendments to the MPRDA bill will make provision for certain minerals to be declared strategic, once enacted. These are minerals the Minister will, after consultation with the Minister of a relevant State department, declare as strategic from time to time in the Gazette, having regard to the national interest and the need to promote sustainable development of the nation's mineral and petroleum resources. Minerals necessary for agricultural products and equipment may for example be subject to this provision, highlighting their significance in ensuring a food secure country. Laws put in place, need to ensure that key minerals are preserved for long term purposes to avoid shortages in the future, for example regulating the export of minerals needed for meeting the country's developmental objectives.

The proposed amendments to the MPRDA further provide for an integrated approach to licensing. This entails synchronized processing and approval of applications for water use licenses, environmental authorizations and mining rights. The mine environmental management function have effectively been removed from the MPRDA and transferred to the National Environmental Management Act, (NEMA). The transfer of the mine environmental management function and synchronization of processes is consistent with the principles of co-operative governance as enshrined in the constitution and aimed at improved environmental protection and sustainable exploitation of the Nation's mineral and petroleum resources.

10. CHALLENGES OF SECURING FOOD

According to Food Bank South Africa more than 20 percent of the population, was food insecure in 2013. That means that approximately 11 million South Africans did not know where their next meal would come from. The government is faced with a challenge to ensure

food security for its citizens. However, the solution to the challenge of coexistence lies in the solution to the challenge of distribution of high value agricultural land. Furthermore, studies have shown that high value agricultural land could be the same land that has been approved for prospecting and mining rights. High value agricultural land available for crop production continues to decline. Possibilities for co-existence of the two activities in one area need to be properly planned alongside allowing for successive operation.

South Africa's local fertiliser industry is exposed to international markets and uncertainty of the exchange rate with agricultural value chain. The country is importing increasing amounts of fertiliser on an annual basis to satisfy local demand. These pose a challenge in that the country is becoming increasingly reliant on imports, which has a negative effect on prices as well as on the grain producers ability to produce affordable food in case of an international shortage.

Phosphate rock is an essential mineral used in the production of fertilisers. Unfortunately, phosphate rock is a non-renewable resource with current global reserves expected to be depleted in 50 -100 years. South Africa's reserves are estimated at 1.5 Mt and the country is ranked 5^{th} in the world. It is important that the government ensures more effective ways to preserve minerals and continual future supply of the mineral. The country cannot afford to allow for accelerated depletion of the mineral, only to import the mineral in the future. This will only put an upward pressure on production costs of fertilisers, which will in turn make the product expensive. This scenario could lead to difficulties in food production, which results in an exacerbated food insecure country. Farmers also need to adopt new methods, such as planting high-yielding crop varieties and applying nutrients, notably nitrogen, phosphorus and potassium (NPK) and other inputs such as biological control of pests. The use of fertilizer, some derived from phosphate rock has been successful in alleviating a great deal of hunger in the face of significant population growth. In order to sustain agricultural productivity at current and predicted future levels, it is crucial to determine the full extent of the supply of this finite resource.

Infrastructure that is used to produce primary fertiliser materials is very old and very expensive to replace. However, as part of social responsibility, mining operations in agricultural regions could consider investing in agricultural infrastructure e.g. technology. This situation also presents an opportunity for investors for expansion and development of new plants to meet the domestic demand. The fertiliser industry of South Africa is dominated by a few large raw material suppliers that supply raw materials to other fertiliser

manufactures, opening up an opportunity for more players to come on board to ensure sufficient supply to the industry.

Transport and distribution costs of fertilisers are a significant contributor to the price of South African fertiliser to the farmers. Transportation is mainly done by road, but was done dominantly by rail in the last ten years. However, it is much more cost efficient for phosphate producers to move enough phosphate rock to produce phosphoric acid and MAP between Phalaborwa and Richards Bay through rail transport.

11. DEVELOPMENTS

In July 2010, Sasol Nitro took a decision as part of an agreement with the Competition Commission, to divest from five of its regional fertiliser blending plants. The company intends to increase its focus on upstream activities of its fertiliser value chain, which was supported by investments in several new fertiliser production facilities at its Secunda operations. Sasol Nitro agreed with the Competition Commission that the company, market fertiliser from Secunda and three distribution centres within a 100km radius of Secunda and Sasolburg which resulted in Sasol becoming the only wholesaler.

Yara, the world's largest supplier of crop nutrients, has shut down most of its local fertiliser manufacturing plants to focus mainly on importing. The company agreed in 2010 with Farmsecure Technologies (Pty) Ltd, to acquire Yara's South Africa's fertiliser retail marketing businesses. The agreement was approved on the 31st of August 2010 leaving the company as an exclusive distributor of a selected range of premium Yara fertilisers in South Africa. Yara will soon be renamed to Kynoch Fertiliser. In 2013 the company again began talks to re-establish its business of fertiliser production in South Africa. It is yet to be seen if the company will be able to bring to life this plans.

12. CONCLUSION

Phosphate rock is clearly needed to complete the country's food security needs. It is therefore imperative for government to ensure that the mining of such minerals is preserved for the benefit of the future generations, through stringent laws and policies. Equally important, is the access to land for agricultural purposes, as well as access and availability of fertilizers at affordable prices. The lack of access to land for the South African majority needs to be addressed through sustainable, non-income-dependent measures. Stronger

working relationships with regard to land that has both mineral and agricultural wealth; need to be established to promote co-existence to achieve much bigger and life impacting goals.

The foundation has been laid as policies are drafted to allow for efficient relationship between the two industries. The realisation of the importance of this relationship is a step in the right direction. The two industries now need to strive towards co-existence instead of competing for the same resources (land, water). The two industries can only coexist in the same area through mutual agreement which will only come about through the understanding that the ultimate goals are similar. It only makes logical sense to work towards the goals together. The ultimate goals are to ensure continual job creation; economic growth and a food secure South Africa.

13. OUTLOOK

Fertilizers' demand is expected to increase locally and internationally in 2014, going into 2015 as demand for fertilizers is expected to increase since most countries focus on securing food for the growing population. World phosphate production is forecast to increase as a result of mine expansion projects and development of new mines in several countries. Future expansions will be driven by increasing demand in fertilizer and feed markets despite the fact that phosphate rock is used to produce a wide range of products, including food and industrial grade phosphates. The world phosphate consumption is forecast to increase by 6 Mt of phosphoric acid between 2014 and 2017. Consumption is expected to grow at an annual rate of 2.5 percent during this period.

Locally phosphate production is expected to increase further in 2014, as a result of increasing demand on the back of population growth, food shortages and climate change patterns.

The National Development Plan outlines food security as an important component of South Africa's vision for growth. While food shortage is on the rise within the country, the government is looking at ways to ensure food security. The strong linkages between the mining industry and the agricultural industry can make a significant contribution towards ensuring a food secure nation. As new systems are introduced, jobs are created to accomplish the ultimate goal of alleviating poverty and unemployment.

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