The pricing of barley in the Northern Cape production regions

by

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in the

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DECLERATION

I, Ayanda Demana, hereby declare that the dissertation submitted in partial fulfilment of the degree MSc (Agric) Agricultural Economics at the University of Pretoria is my own work and has not been submitted for a degree at any other tertiary institution.

Signature ……

Date: July 2015

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ABSTRACT

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Degree:	MSc (Agric) Agricultural Economics
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Supervisor:	Dr. André van der Vyver
Key Concepts:	Barley, Northern Cape, Wheat, SAFEX

The producer always has a need to diversify. Barley offers such a potential, specifically with the South African wheat industry on a decline. Innovative pricing mechanisms were designed by the barley industry during the course of 2009 and phased in thereafter. The price of malting barley was linked to the SAFEX wheat futures price. After much deliberation, the price of barley to producers in the Cape (mostly Southern Cape) is now determined by, *inter alia*, converting the SAFEX wheat price by a factor of 1.02. The formula for the Northern Cape producers was different and it was decided that a factor of 0.92, thus an 8% discount, should apply. However, production in the Northern Cape is still limited and although the factor looked reasonable to producers, it now appears that after three years, and much deliberation between existing and potential barley producers, there is a view that the production of barley is unfairly penalised. According to some producers, with this ratio there is limited incentive to produce and expand the production of barley.

This research determines whether the 8% price discount relative to wheat is adequate for the Northern Cape irrigation producers. Is it enough to encourage the producer to plant barley?

Comparing the production costs between barley and wheat only forms one part of the study, all other factors that involve the risk of producing malting barley vs. wheat were analysed. If possible these risks are quantified; alternatively it is systematically weighed in

the production process between barley and wheat. Alternative production options for producers as well as alternative sourcing possibilities, both inland and internationally are probed.

The research includes an overview of the international malting barley industry including the origin of barley, its uses, the technical composition of barley, leading producers and importers, cultivar and quality differentiation, feed barley against malting barley and price determination. A more in-depth analysis is done of South Africa and the irrigation areas vis-à-vis the global industry.

The primary focus of the research involves a compatible analysis between the production of malting barley in opposition to that of wheat. Apart from production costs various other factors are also analysed through a quality assessment process. This includes, but is not limited to, aspects such as, grading standards, cultivars, premiums, lodging and feed barley.

Production cost data obtained from GWK and Senwes indicate that producers earn substantially more from the production of barley than from wheat. Also, when the two sets of numbers are compared, barley is a better proposition against wheat in the GWK area as the gross profitability is 148% higher per hectare than in the Vaalharts area which stands at 57%. These, however, are not the only benefits, the benefits of an early maturing crop and fusarium resistance, rank as two of the main additional advantages in a high intensity production environment. Contrariwise, there is no doubt that the production of barley requires a higher degree of management skills and commitment. Lodging and the possibility of a downgrade to feed barley were listed as two of the key problem areas.

In the medium and long term, producers will benefit from alternative buyers and uses that are entering the industry. Even only a slightly more diversified industry on the demand side will be healthy in the long run. Prices currently paid by SAB based on the SAFEX wheat price are competitive when compared to the import cost of malting barley.

In conclusion, producers will greatly benefit by pro-actively launching a structured programme in the collection, processing and interpretation of data, whether limited to the irrigation areas or industry wide.

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LIST OF ACRONYMS

ASX (Sydney)	The Australia Stock Exchange also trading in futures products
CBOT	Chicago Board of Trade, now part of the CMEGroup
CMBTC	Canadian Malting Barley Technical Centre
CME (Chicago)	CMEGroup the Chicago based international exchange
COMBO	Common Crop Insurance Policy
DAFF	Department of Agriculture, Forestry and Fisheries
FAO	Food and Agriculture Organisation
HFM	High Fermentation Malt (referring to the cultivars)
ICE	Intercontinental Exchange
MATIF (Paris)	The futures exchange of France, now part of Euronext
MFM	Medium Fermentation Malt (referring to the cultivars)
MGEX	Kansas Board of Trade and Minneapolis Grain Exchange
NAMC	National Agricultural Marketing Council
NC	Northern Cape
SAB	South African Breweries Ltd, a subsidiary of SABMiller plc.
SA Maltsters	Southern Associated Maltsters (Pty) Ltd, a subsidiary of South African Breweries Ltd
SABMiller	SABMiller plc.
SAFEX	South African Futures Exchange
SFM	Slow Fermentation Malt (referring to the cultivars)
SC	Southern Cape
WC	Western Cape
USDA	United States Department of Agriculture

CHAPTER 1

INTRODUCTION TO THE STUDY

1.1 BACKGROUND

In South Africa, barley is primarily planted for malting purposes this is due to the higher risk of producing barley with malting quality, in comparison to producing wheat, coupled with the non-existence of a viable feed market for barley due to the oversupply of maize produced in the country (DAFF, 2012). Additionally, unlike most agricultural commodities there is only one major barley buyer in South Africa, SA Breweries Ltd (DAFF, 2012). From a producer's point of view, barley provides an alternative to growing wheat. The total area currently under barley amounts to only about 13.3% of the total area under wheat production and although barley cannot necessarily be produced everywhere that wheat is grown, the opposite is not true. In the Northern Cape (NC), the total area under barley stands at 39% of total area under wheat production. Barley can be grown in all areas where wheat is produced in the Northern Cape. This implies that when a producer decides what to grow, he will base his decision on the following two main criteria: Technical production factors and profitability.

Technical factors will include aspects such as rotational patterns, diseases, improved cultivars and soil quality, etc. Profitability implies a comparison of the net income from the production of barley compared to the production of wheat, for example 'yield times price' minus variable production cost. From a production perspective, barley is generally regarded as a more technically challenging crop compared to wheat. Thus, profitability also entails whether the price of the product can be fixed at planting time, and if so: whether it should be fixed, and if not, what will affect the price forward?

Over many years, determining prices, given their importance, resulted in high levels of stress for both producers and the single largest buyer, namely Southern Associated Maltsters (Pty) Ltd, a subsidiary of SABMiller plc. In 2009 it was decided to develop a price linkage formula whereby producers would have the option to fix barley prices during the season, of which prices are linked to the SAFEX wheat prices. Today the price of barley to producers in the Cape (mostly Southern Cape) (SC) is determined by, *inter alia*, converting the Safex wheat

price by a factor of 1.02. The formula for the NC producers is different and a factor of 0.92, hence an 8% discount applies. Why the difference in formulae? SABMiller, which for all practical purposes is the only buyer, contracts malting barley on demand per region. Their Caledon facilities are much bigger and require significantly more barley. Current Southern Cape agricultural practises mean barely is in direct competition with wheat. A premium therefore needs to be paid to attract producers. Compare this to the inland areas where (to date) the demand for malting barley is much smaller out of Alrode and based on farming practise in the Northern Cape, such as higher yields and double cropping, SABMiller can afford to offer a different price (structure) to producers. In future, the factor may change given the construction of a new malting plant in Alrode.

1.2 PROBLEM STATEMENT

Despite an agreement between SAB and barley producers whereby the price of barley is linked to the SAFEX December wheat futures contract, the production of barley in the Northern Cape is still limited. Risk, in addition to technical production factors, contractual obligations from buyers and profitability, is another factor that influences which crop the producer may produce, in this case either barley or wheat. Thus a comparison of potential complications occurring during the growth period which may affect the yield of barley relative to wheat is taken into account by the producer. Barley is known to be a more technically challenging crop to produce compared to wheat; yet the purchase price of barley by SAB in the Northern Cape irrigation areas is discounted by 8% relative to the wheat price. Is this fair, or is the production of barley being unfairly penalised?

1.3 PURPOSE STATEMENT

The purpose of the study is to determine if barley is competitively priced in the Northern Cape irrigation areas thus, whether the 8% discount relative to wheat is reasonable and adequate. The NC has a double crop system where maize is planted in the summer months and wheat in the winter months. Wheat could potentially be rotated with barley but incentives need to be put in place to encourage the producer to adjust his farming practices. Hence the relative price structure between barley and wheat should be fair and equitable to encourage barley production otherwise the potential for the NC irrigation producer to diversify into barley will be lost.

1.4 RESEARCH OBJECTIVES

The research objectives are:

- To determine if there is sufficient demand for locally produced barley from the NC by means of a brief overview of the industry.
- To analyse the risks associated with the production of barley vs. wheat and ascertain whether the financial incentive (price structure) is acceptable and justifies the current risk, but also future expansion.
- To examine the potential benefits of rotating barley in conjunction with alternative crops through an overview of existing literature.
- To objectively compare the production cost of barley and wheat in the NC irrigation areas to establish whether the relative production costs have been taken into consideration when determining the discount factor.

1.5 HYPOTHESIS STATEMENT

Barley in the Northern Cape irrigation areas is under-priced in comparison to wheat after taking into account all production factors, risks and profitability of barley and wheat.

1.6 CONTRIBUTION

The South African wheat industry has been in a decline for more than a decade. The NC is one of the few areas that could still produce wheat profitably. The production of barley could provide an alternative to producers who would like to diversify; however, it should be a profitable enterprise. Therefore clarity on whether barley is competitively priced in the NC irrigation areas could persuade inland barley producers and the industry to continue with the production and expansion of barley production. In addition to offering and alternative produce for producers, clarity on the competitiveness of the barley price will be beneficial for the malting industry and ultimately the economy as a reliable supplier of barley will be established.

1.7 DELIMITATIONS

Firstly, the study is based on a selective survey and personal interviews with stakeholders. Secondly, the study focuses on risk and other factors at a production level. Thirdly, the study does not attempt to quantify a new discount factor, irrespective of whether a higher or lower adjustment may be warranted.

1.8 METHODOLOGY

A literature review is conducted. The literature review covers the origin of barley, the distinction between barley and malting barley, the process of covering barley to malt and the beer making process. This will provide a solid background and understanding as to why SAB or malting barley buyers in general, require specific quality and standards. World markets, major exporters, producers, quality and price differences are also analysed. This provides insight and understanding on why both SAB and barley producers are interdependent on international factors. Additionally, South Africa is a net importer of malting barley and the cost of importing different types of malting barley is crucial for the local industry.

This is followed by an overview of the South African barley industry with specific focus on the NC. Furthermore, a production analysis to determine the risk associated with the production of barley compared to wheat will be conducted. All technical production factors, profitability and non-quantifiable risks will be considered during the production analysis.

The study included interviews with all stakeholders including organised agriculture (GrainSA), the processing industry (SABMiller and SA Maltsters), producers and agri-business (Senwes) representatives in Vaalharts, producers and agri-business (GWK) representatives in the Douglas area. Secondary data was sourced from sources such as DAFF, SAGIS, Senwes and GWK. Lastly, based on the outcomes of the research a conclusion will be drawn on whether barley is under-priced relative to wheat and recommendations are made.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter two serves to provide a better understanding of barley as a grain, its different uses and types. To this account a brief but informative general background of barley is given and a clear distinction between malt barley and feed barley is made.

A review on international production, exports and imports of barley is included. In addition, the production of barley in South Africa within the world setting and imports are looked at. International price formation is examined in this chapter. This provides useful insight into the industry and as to why barley producers and buyers (SAB) are dependent on international factors.

Lastly a review on malt: what is it, quality requirements for malting barley and the complex process of converting malting barley into malt is conducted, this is accompanied by a look at beer processing.

2.2 GENERAL BACKGROUND

Barley is defined as a cereal plant of the genus *Hordeum*, in the family Poaceae (or Gramineae), and its edible grain. The three cultivated species are *H. vulgare*, *H. distichum*, and *H. irregulare*. Barley is adaptable to a greater range of climate than any other cereal. Barley is a short-seasoned early maturing crop that is one of the most adaptive grains worldwide, it is able to grow in climates ranging from subarctic to subtropical areas. It also adapts to a high variety of soil and is less sensitive than wheat to dryness or poor soil quality (FAO, 2007).

About half of the world's barley crop is used as livestock feed, the rest for human consumption and for malting. Most beer is made from malted barley, which is also used in distilled beverages. Barley has a nutlike flavour and is high in carbohydrates, with moderate

quantities of protein, calcium, and phosphorus. Barley flour is used to make unleavened bread and porridge. Pearl barley, the most popular form in many parts of the world, is often added to soups. **(**Pearl barley is barley processed to remove its hull and bran. Barley must have its fibrous outer hull removed before it can be eaten; pearl barley is taken a step further and polished to remove the nutritious bran layer.)

Malt barley is one of the main ingredients in the manufacture of beer.

2.2.1 Feed and Malt Barley

Malt barley: is the combination of aromas, flavours and starch enzymes used for beer brewing, baking and cereals. Malting barley has numerous variations, ranging from light to dark and all are based on two key features: germination and kilning (Barley World, 2013). The principle traits used to define barley of a malting quality are high malt extract, low beta glycan, protein (ranging from low to high) and enzyme activity (ranging from moderate to high). These are important as the different end uses of malt barley require different quality specifications (Barley World, 2013).

Feed Barley: is used as animal feed (food for animals) and as with malting barley, the varieties differ in their feeding properties. The general rule is that superior quality malt barley is also superior feed barley however the same cannot be said in reversal. Typically, malt barley commands a price premium over feed barley, although it tends to yield less (Barley World, 2013).

2.3 INTERNATIONAL OVERVIEW OF BARLEY

2.3.1 World barley production

World barley production reached 145.1 million tons (USDA, 2014) during the 2013/2014 season, which is higher than the previous season. The production trend line over the past 12 years is almost stable on a level of 140 000 million tons, but in the previous three seasons production fell below this trend. As indicated in Figure 2.1, there are three regions that produce more than half of the world's barley: the European Union (mainly Spain, Germany and France), the Russian Federation and Canada (FAO, 2007).

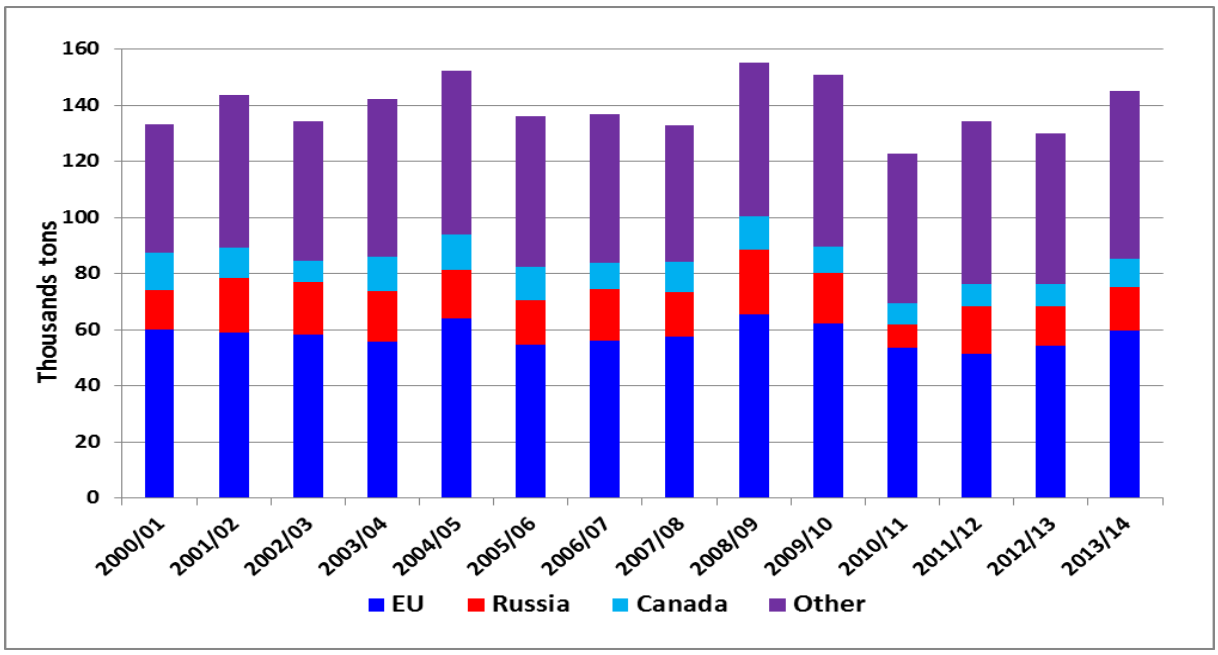

Figure 2.1: World barley production focusing on EU, Canada and Russia
Source: USDA, 2014

On a per country basis, Table 2.1 below lists the top producing countries worldwide.

Table 2.1: World top barley producing countries

(million metric tons)

Country	2009	2010	2011	2012	2013
Germany	12.3	10.4	8.7	10.4	10.3
France	12.9	10.1	8.8	11.3	10.3
Ukraine	11.8	8.5	9.1	6.9	7.6
Russia	17.9	8.4	16.9	14.0	15.4
Spain	7.4	8.2	8.3	6.0	10.1
Canada	9.5	7.6	7.8	8.0	10.2
Australia	7.9	7.3	8.0	8.2	7.5
Turkey	7.3	7.2	7.6	7.1	7.9
United Kingdom	6.7	5.3	5.5	5.5	7.1
United States	5.0	3.9	3.4	4.8	4.7
World total	151.8	123.7	134.3	133.5	144.8

Source: FAO, 2014

Barley was grown in about 100 countries worldwide during 2007. The world production in 1974 was 148 818 870 tons; since then, there has been a slight decline in the amount of barley produced worldwide annually. Looking at countries individually, production is either stable or on the decline, with Argentina being the exception until last season. Production increased from 1.36 million tons in 2009/10, to 5.50 million tons in 2012/13. It decreased to 4.75

million tons in 2013 and production is expected to remain around 4.00 million tons in 2014/15 (USDA, 2014).

Internationally, barley is known to be susceptible to *mild mosaic bymovirus* as well as *bacterial blight*. It can be susceptible to many diseases, but plant breeders have been working hard to incorporate resistance. The devastation caused by any one disease will depend upon the susceptibility of the variety being grown and the environmental conditions during disease development. Serious diseases of barley include *powdery mildew* caused by *Blumeria graminis* f.sp. *hordei*, *leaf scald* caused by *Rhynchosporium secalis*, *barley rust* caused by *Puccinia hordei*, and various diseases caused by *Cochliobolus sativus*. Barley is also susceptible to *head blight.* (Note: circumstances are slightly different in South Africa and are dealt with in 4.4.1.)

2.3.1.1 World malting barley production

The use of subsidies to encourage production in the EU, has resulted in the EU competing with Canada as the top malt barley producer. As seen in Figure 2.2, the EU is the world's leading barley exporting nation on 28%, with the Australia in second place at 23%.

2.3.2 World barley exporters

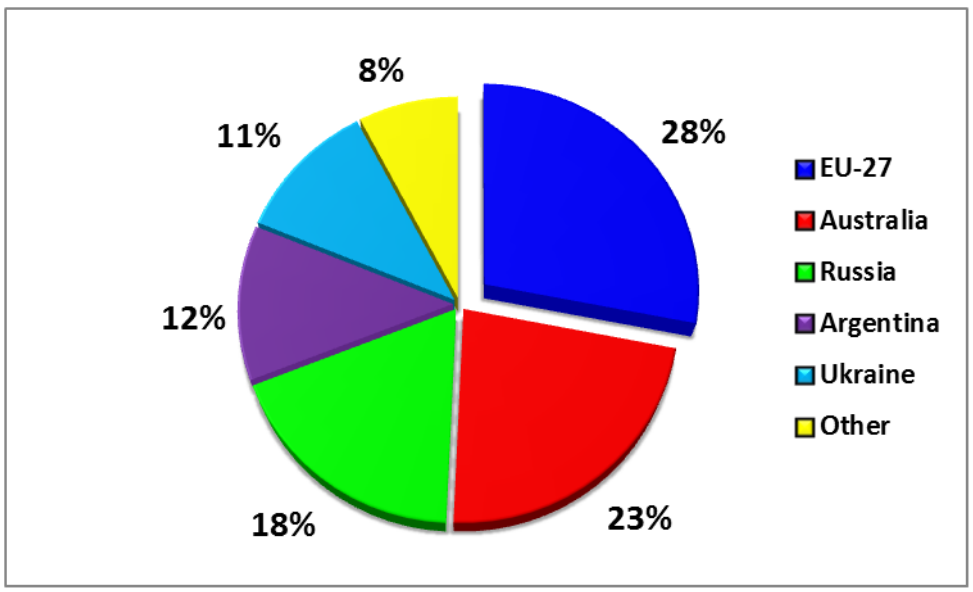

Figure 2.2: The world's top barley exporters and their world share
Source: USDA, 2014

According to the FAO results for 2011, the Ukraine was the world leader in barley export.

2.3.3 World barley importers

The world's top five barley importing countries are depicted in Figure 2.3. Saudi Arabia is the top importing country, with 36% of the total world imports; it is followed by China with 18%, the three remaining countries each import less than 10%. In totality the top five barley importing countries, account for 68% of total world imports.

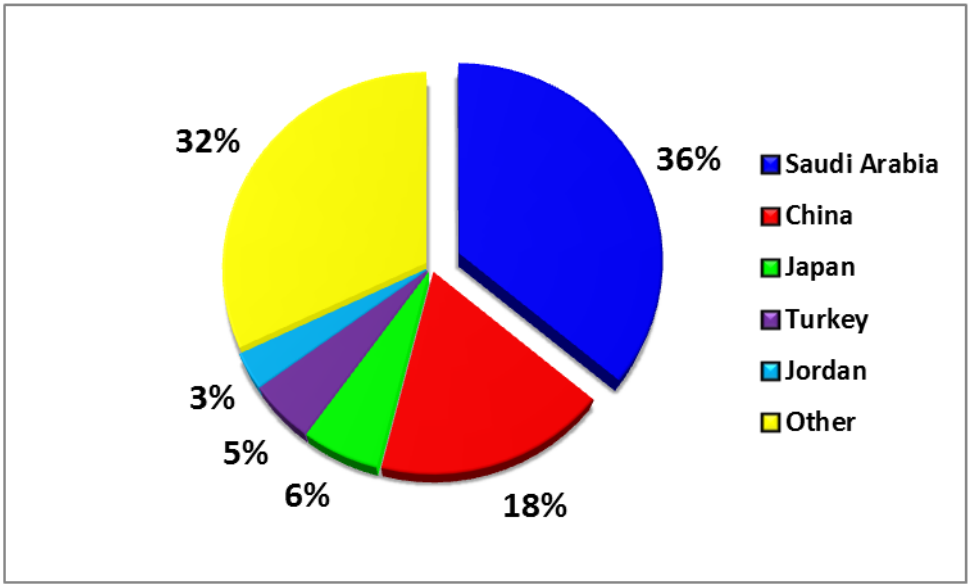

Figure 2.3: The world's top barley importers and their world share
Source: USDA, 2014

2.3.3.1 World malting barley importers

The 2007 FAO barley, malt and beer report, states that maltsters internationally are currently facing some challenges. Malt markets such as Brazil have been very competitive in recent years due to imports of lower quality and lower priced winter barley from the EU. That coupled with new malting capacity in the EU, Russia and Ukraine, is also increasing competition in offshore markets (FAO, 2007). The 2014 Canadian Malting Barley Technical Centre malting barley, malt and beer industry overview; indicates the malting barley import demand. The regions with the greatest malting barley import demand are China at 60% and Latin America at 18% as seen in Figure 2.4.

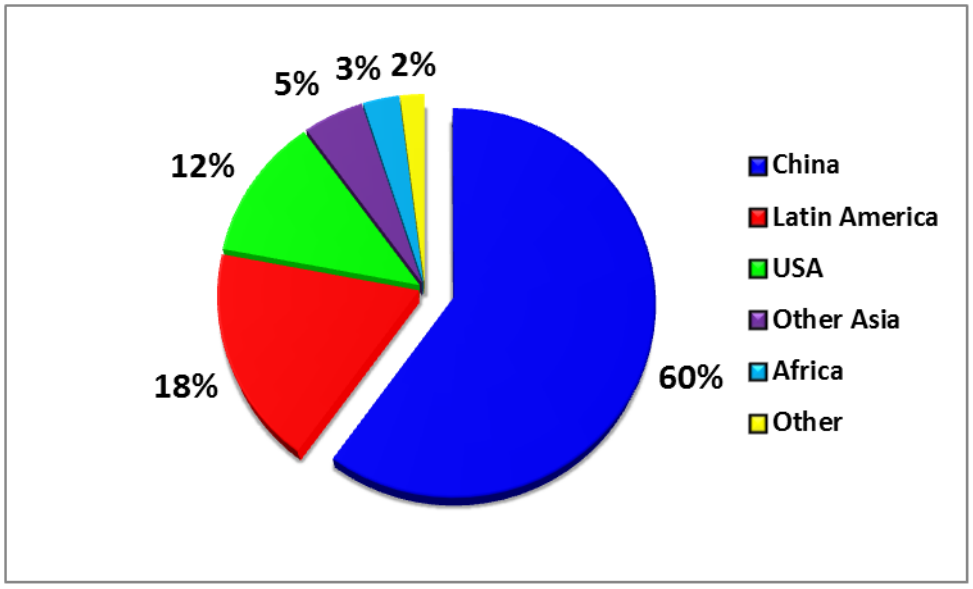

Figure 2.4: Global malting barley import demand
Source: CMBTC, 2014

2.3.4 South Africa

2.3.4.1 Production in a world context

South Africa's total annual production of barley is around 225 000 to 250 000 tons. Approximately 80% of all barley produced is classified as malting barley. This however, still results in a shortfall of about 75 000 tons of malting barley, which is imported either as malting barley or as malt. A comprehensive overview of the South African barley industry is provided in 3.5.

2.3.4.2 Imports

Traditionally, South Africa imported the High Fermentable Malt (HFM) cultivars from Canada (Recall, *fermentation* is the chemical reaction in which a ferment causes an organic molecule to split into simpler substances, especially the anaerobic conversion of sugar to ethyl alcohol by yeast. *Ferment*, again, is any agent or substance, such as a bacterium, mould, yeast, or enzyme that causes fermentation.) Europe has also been a leading exporter lately.

Until recently, South Africa could not successfully produce HFM type cultivars. HFM type cultivars are associated with lighter type beer, more common in the North American market. HFM type cultivars allow the brewer to add more adjuncts to create this effect. In comparison,

MFM are mostly associated with the heavier beers found in Europe, more malt and less adjuncts are added by the brewer. Should there be a shortfall of MFM and SFM cultivars, these are often are imported from Argentina or Australia. One should note that Australia offers a better selection, but Argentina is typically better priced. Both countries are often better priced than Europe or North America.

In Canada, for example, only 25 to 30% of its total crop of around 8 to 9 million tons of barley qualifies as malting barley (CMBTC, 2011). Of that, 11% goes to Canadian Brewing, 30% to Malt exports and 59% to Malt Barley exports (Figure 2.5). South Africa is the fourth largest importer of Canadian malting barley and the third largest importer of Canadian malt (CMBTC, 2011).

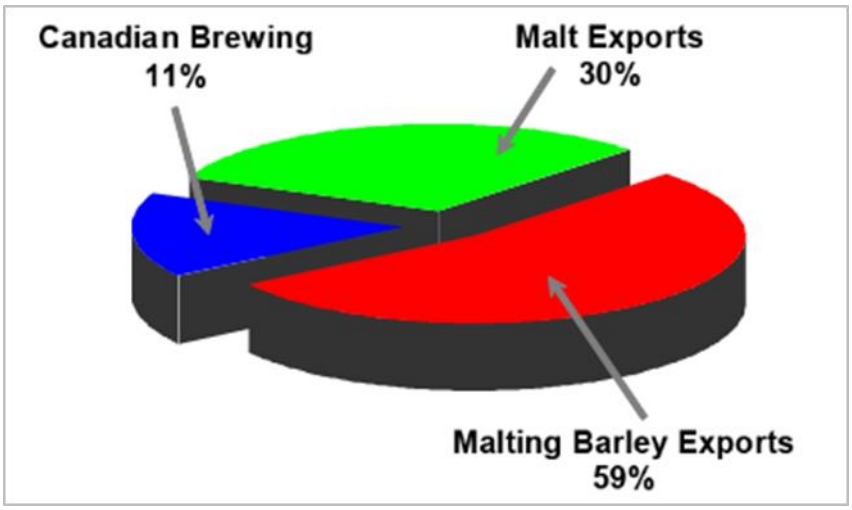

Figure 2.5: Markets for Canadian malting barley
Source: CMBTC, 2011

2.3.5 International prices

2.3.5.1 Price formation

Unlike maize, soybeans and wheat, there is no "single" market that dominates the discovery of the world price of malting barley. To begin with, the barley market as whole is dominated by feed barley and therefore interdependent on the price of particular maize, soybeans and wheat as a competitive alternative. (The grading specifications for malting barley means in most overseas countries only the best part of the crop qualifies for intake as malting barley.) World price discovery of maize and soybeans largely takes place on the CME (Chicago)

although the latter does not list a barley contract. Wheat price discovery also takes place on the Kansas Board of Trade and Minneapolis Grain Exchange (MGEX).

Currently the Intercontinental Exchange (ICE) lists a barley contract but volumes are still on the low side subject to the purpose. In 2011 the Actuarial and Product Design Division of the USDA concluded a study comparing the corresponding cash prices for corn and wheat from CME and hard red wheat from the Minneapolis Grain Exchange. The study found that maize (corn) has the highest correlation. Other exchanges in the world that list a barley contract include MATIF (Paris) and ASX (Sydney). MATIF lists a malting barley contract but liquidity is very low and ASX lists a feed barley contract.

As a result price discovery of malting barley mainly takes place over-the-counter. Although it trades at a premium to feed barley, this is subject to supply and demand in a specific location. On average, the premium of around US$50 or €35 could vary considerably also throughout the season, on new or old crop stock. For example, China normally imports malting barley from Europe unless supply is running low, in which case it would also look to Canada. Consequently, Canada then starts increasing its prices. It should be noted that quality is a key factor given the wide variety of malting barley available.

2.3.5.2 Market prices

During 2011 the prices of barley averaged $4.78/bushel in the United States and the total crop value was $745.1 million (AgMRC, 2013). Malting barley has a considerable price premium over feed barley (as discussed below) and the demand for malt and malt products, coupled with the supply of malt in both the local and world markets determine the price of malting barley. Gradually, prices are influenced by spring wheat and corn prices, since they are both viable production alternatives to barley as seen in Figure 2.6, particularly in irrigated regions (AgMRC, 2013).

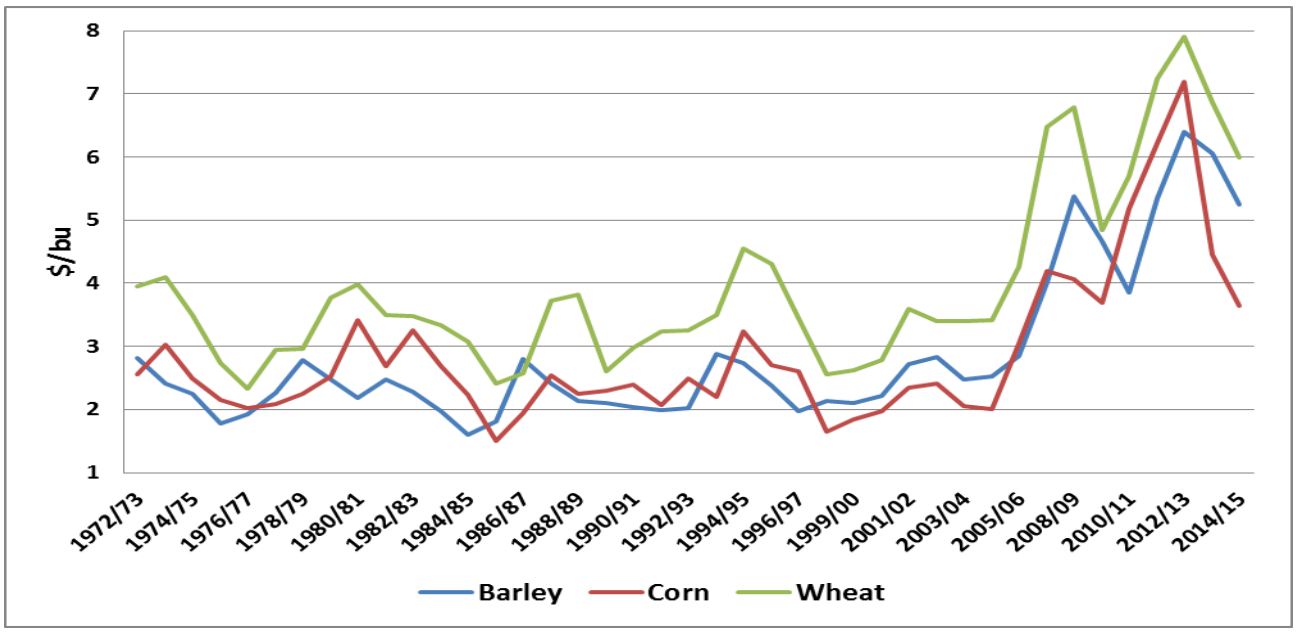

Figure 2.6: US prices of corn, wheat and barley
Source: NASS, 2014

During 2011 feed barley prices averaged $4.58/bushel, while open-market malting barley prices stood at $4.81/bushel (AgMRC, 2013). This in essences results in a premium of 5%, or $0.23/bushel. Nonetheless most malting barley contracts hold a $1.00/bushel or higher premium. Interestingly, between 1995 and 2005, the premium for open-market malting barley over feed barley averaged $0.70/bushel. This represents a 35% premium above feed barley, as feed barley prices averaged $2.01/bushel (AgMRC, 2013). Although, one should note that premiums for malting barley over feed barley are significantly smaller than a decade ago; see Figure 2.7(AgMRC, 2013).

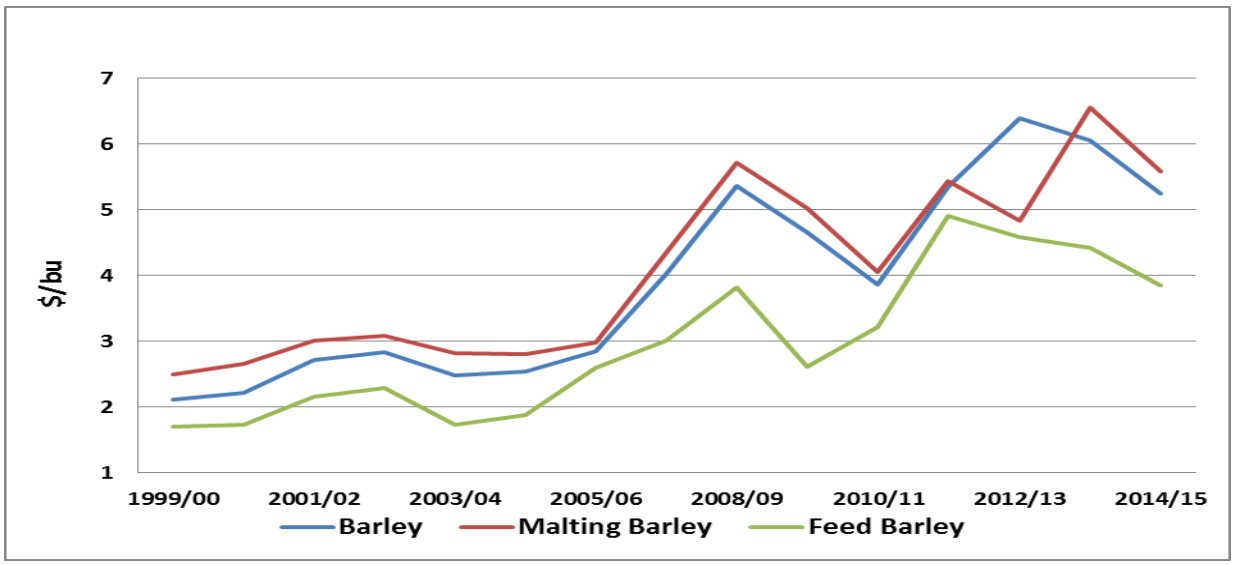

Figure 2.7: Comparing US barley prices to malting and feed barley prices
Source: NASS, 2014

In Figure 2.8 it is noticeable that US and Canadian barley prices traded in the same ranges between 1990 to 2003, but from 2003 till the current period, US barley prices have traded at a premium against the Canadian barley prices.

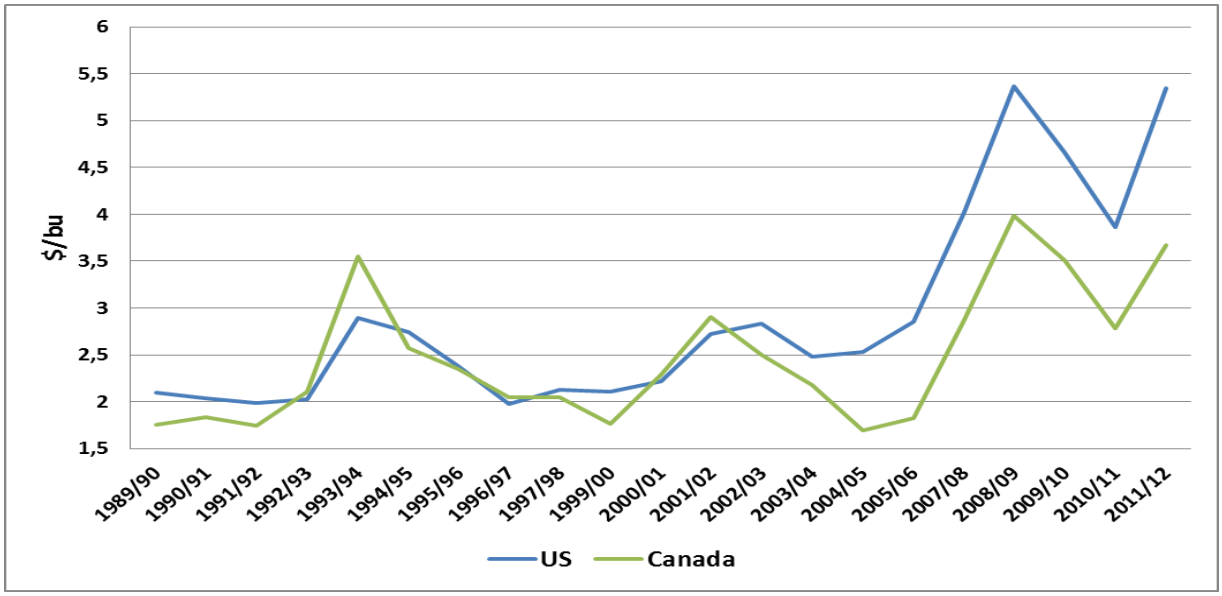

Figure 2.8: Comparing US barley prices to Canadian barley prices
Source: NASS, 2014 and Stats Canada, 2013

Section 4.9.9 deals with the import cost of malt barley into South Africa.

2.3.5.3 New price calculation method of the US

As already mentioned, in the US, barley is traded on the Intercontinental Exchange (ICE). However, recent trade volumes have been insufficient and under the Common Crop Insurance Policy (COMBO), it is essential to calculate a price in real time based on such exchanges (USDA, 2011). Barley prices were compared to the corresponding cash prices for corn and wheat from the Chicago Board of Trade (CBOT) as well as the cash prices of hard red wheat from the Minneapolis Grain Exchange (MGEX). The correlations of these three futures series in relation to barley were calculated over several timeframes (USDA, 2011). It is interesting to note that it was indicated that corn has the highest correlation over all timeframes analysed and is the futures basis for barley (USDA, 2011). Various methods for calculating the factor were considered, and a 10 year simple average of yearly data was established as the factor methodology for barley.

2.4 MALT

2.4.1 Processing malting barley into malt

What is malt? It is a grain product used in beverages and foods. Malt provides a basis for fermentation and adds flavour and nutrients. It is made by steeping grain, usually barley, in water and allowing partial germination to occur. The flavour of beer primarily results from the malt from which it is made. The enzymes produced within the barley seed during germination break down starch into malt sugar, or maltose, which is then fermented by yeast to yield alcohol and carbon dioxide. Whiskey likewise, is made with malt.

Brewers have numerous options in obtaining malt, they can purchase malt barley to manufacture malt themselves or purchase malt from malting companies (FAO, 2007). In both cases the malting barley quality must meet the quality specifications listed in Table 2.2. Specified malting barley varieties should also meet the requirements of the specific brewer. The growing, harvesting and storage conditions also affect the mating characteristics of barley (FAO, 2007).

Barley must meet the following criteria to be used in the brewing industry (FAO, 2007):

- High germination capacity
- Purity (in the variety)
- Graded grain
- Low protein content

Table 2.2: Detailed specifications for malting barley

Germination %: min 97% after 3 days	Micro-organisms below a set level
Germination index: min 6.0	Pesticides residues according to national law
Water content: 12.0%, max 13.0%	Ochratatoxin according to national law
Protein content: >9.0% and <11.5%	Aflatoxin according to national law
Grading: min 90% >2.5mm.	Variety purity: min 99%
B-glucan content max 4%	

Source: FAO, 2007

Wilson and Crabtree (1983) point out that within the malting barley market, price differentials signify the ability of barley to germinate in the malt house. In addition the authors state that prices vary amongst grades and varieties due to differences in kernel plumpness and protein levels (Wilson & Crabtree, 1983). Minimal protein levels are essential in malting barley because of two key traits: Firstly, protein acts a source of nitrogen for yeast metabolism and growth during fermentation. Secondly, the enzymes needed to convert starch into fermentable sugars are provided by the protein found in malting barley. However, barley with high protein levels is undesirable as it produces beer with unstable clarity (Wilson & Crabtree, 1983). Thus maltsters avoid barley with high protein levels and pay a premium if protein levels fall with a certain range (Heid & Leath cited in Wilson & Crabtree, 1983).

Kernel plumpness affects the consistency of germination and the amount of extract which could be produced from a ton of barley and since a higher rate of germination is associated with kernel plumpness, premiums are paid for high levels of plumpness (Wilson & Crabtree. 1983).

The quality specifications for the physical characteristics of malting barley have increased. This is driven by the necessity of maltsters to address the specific quality restrictions of brewers (FAO, 2007). There is presently an increased emphasis towards higher malt extract at low modifications levels, high enzymatic power levels, low malt colour levels and uniformity of grain size (FAO, 2007).

Malting is a natural process, of which, the basic principles have slightly evolved over time. Although barley has been malted for over 3000 years, the accurate knowledge and understanding of biochemistry; in addition with suitable varieties and modern equipment, has resulted in maltsters taking full control of the malting process during the past 50 years (HGCA, 2012). Maltsters use natural ingredients to produce a range of malts, which vary with regards to flavour, colour and other additional properties (HGCA, 2012).

The procedure of processing malting barley into malt as stated by the HGCA, depicted in Figure 2.9, is as follows:

Step 1 - Steeping: Barley is soaked or ‘seeped’ in large vessels filled with water for about two days. Seeping raises the moisture content to 45%, enabling the embryo in the barley grain to grow and thus beginning the malting process. Rootlets have begun to develop by the end of the seeping stage (HGCA, 2012).

Step 2 - Germination: Traditionally, germination took place on long malting floors, with grains turned frequently by shovels, modern-day malting plants use mechanised systems which allow strict control and low labour input (HGCA, 2012). During germination, the enzymes produced within the grain degrade some starch into sugars. The germination period is critical for the malting process; therefore; maltsters aim to halt germination when sufficient enzymes have been produced, normally after 5 days (HGCA, 2012).

Step 3 - Kilning: Heat, which stops germination, develops flavour and colour, and produces a stable product; is applied in a malt kin at temperatures between 60 to100 ºC for 1 to 1.5 days (HGCA, 2012). Characteristics flavours for certain whiskies are imparted during kilning through the use of peat smoke. Lastly, the rootlets produced through germination are sieved, resulting in the final product ready for the consumer, malt. Additionally, the rootlets are also used as animal feed co-product (HGCA, 2012).

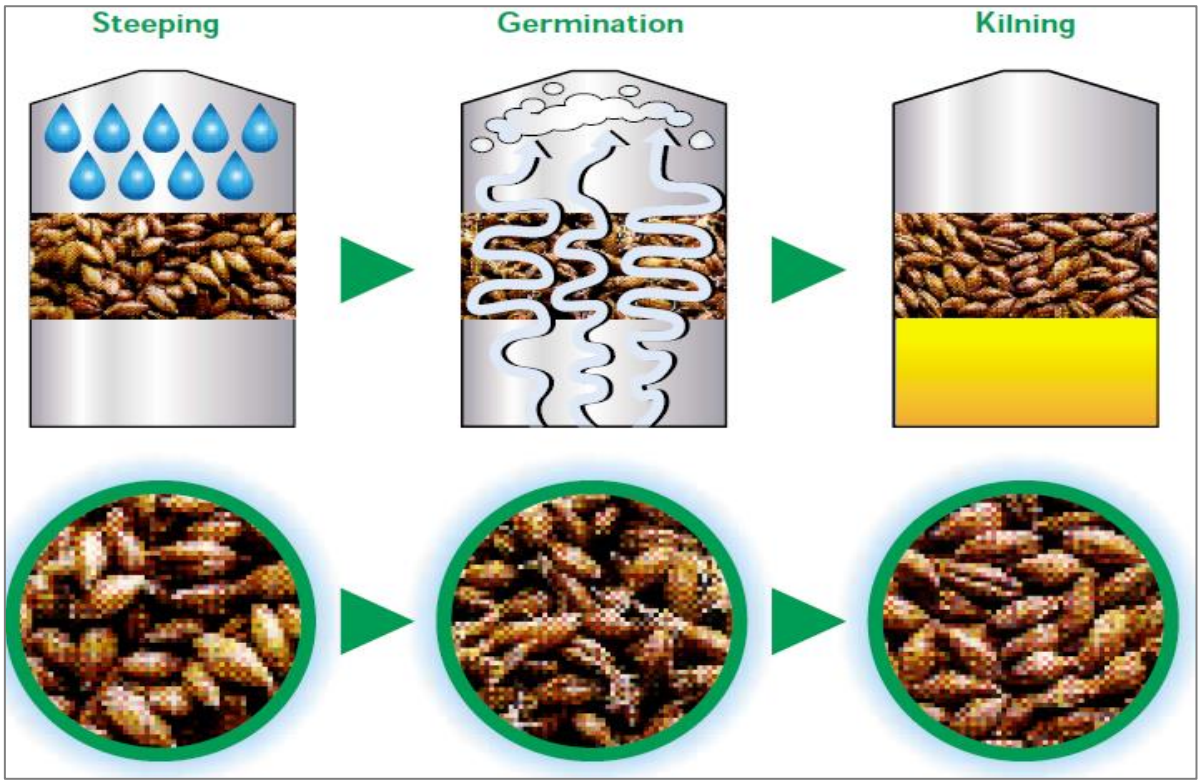

Figure 2.9: Steps of processing malting barley into malt
Source: HGCA, 2012

2.5 BEER

2.5.1 Brewing process

Industrial beer brewing consists of seven key steps, see Figure 2.10. The process begins with malted barley being milled (1), to crack the dried kernels and grind them into a course powder. The course powder is then seeped with hot water in a mash tun (2), which is a huge stainless steel vat, to produce wort. Wort is a thick, sweet liquid. The wort is then subsequently brewed in a large kettle (3) for a maximum of two hours (FAO, 2007). The wort is transferred into a fermentation tank (4) after cooling where the grain sugar is slowly converted into alcohol. The alcohol is then passed through a filter (5) to remove any yeast residue. Before the final stage, the wort is aged in large conditioning tanks (6), where it undergoes a second fermentation process. Beer becomes naturally carbonated during the aging process and brewers may opt to filter the beer again after aging (FAO, 2007). Finally, the complete product, beer, is mechanically bottled and may be pasteurised (7) subject to the brewer's preference. Pasteurisation kills any remaining yeast and other micro-organisms (FAO, 2007).

Beer is a fermented beverage. The sugar required for fermentation is obtained from the transformation of starch contained in the grain as a result of specific enzymes found in malt. Longer processes result from the aging process ('natural fermentation') which minimizes the use of additives (FAO, 2007). The longer processes are normally one to two weeks long, subject to the temperature at which the bottles are kept. As stated above brewers may opt to pasteurize their beer. Although this increases production costs, it also contributes to a higher quality product (FAO, 2007).

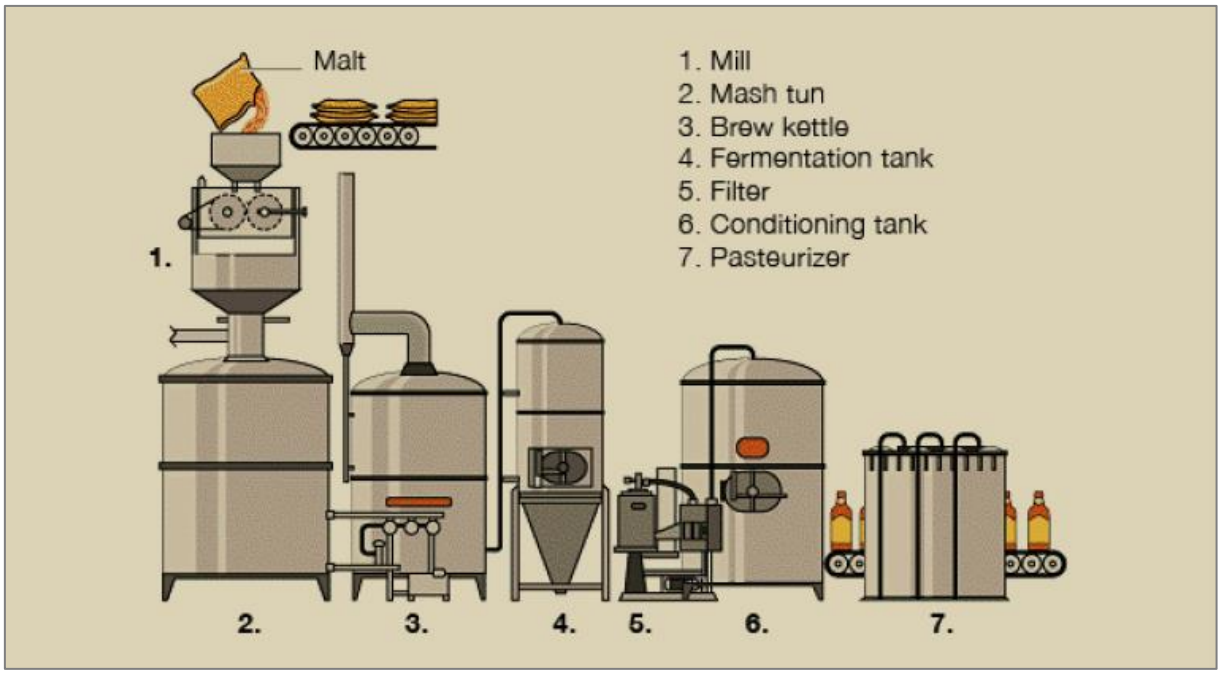

Figure 2.10: Brewing process
Source: FAO, 2007

To produce 10 hectolitre of light beer one would need:

Table 2.3: Ingredients required to produce 10 hectolitre of light beer

Ingredient	Measure
Malt	110 kg
Additional raw material	34 kg
Hops	1.4 kg
Rice	7.5 m^3
Electricity	105 kWh
Fuel	38 x 104 kcal

Source: FAO, 2007

2.5.2 World production of beer

Global players' ability to influence the world beer production, through brewery purchases, equity investments and takeovers continues to increase. The top 10 breweries account for 63% of global beer production (CMBTC, 2014). Table 2.4 below, lists the world's 10 largest breweries.

Table 2.4: The ten largest brewery groups worldwide

	Brewery	Country (Headquarters)	Production Volume 2012 (million hL)	% of world beer production
1	Anheuser-Busch + InBev	Belgium	399.37	18.10%
2	SAB Miller	United Kingdom	187.4	9.70%
3	Heineken	Netherlands	178.3	8.80%
4	Carlsberg including BBH	Russia Federation	119.7	6.20%
5	Grupo Modelo	Mexico	117.1	5.40%
6	Tsingtao Brewery Group	China	78.3	4.00%
7	Molson-Coors	United States	59.7	2.90%
8	Yanjing	China	57.1	2.80%
9	Kirin	Japan	49.3	2.80%
10	BGI/Groupe Castel	France	28.4	2.50%

Source: The data was extracted from the brewers' own annual reports, 2013

As seen in Table 2.4 SABMiller is the second largest brewery globally with a total beverage volume growth rate of 6%, totalling 187.4 million hectolitres, with lager volumes at 5% and soft drink volumes at 8%.

2.6 SUMMARY

Barley is an extremely adaptive grain with three cultivated species, H. vulgare, H. distichum, and H. irregular. Malt barley is predominantly used for beer brewing and has strict quality specifications, whereas feed barley is used as animal feed. Malt barley commands a price premium over feed barley.

World barley production has been stable at about 140 000 million tons, however production fell below the trend in the previous three seasons. The majority of the world's barley is produced in the EU, Canada and Russia. Equally, the EU is also the world's leading barley exporting nation at 28%. With regards to imports Saudi Arabia is the leading importing country at 36%.

South Africa produces between 225 000 to 250 000 tons of barley per year, with 80% of production being malting barley. South Africa imports most of its HFM Cultivars from Canada. MFM and SFM Cultivars are often imported from Argentina and Australia. It should be noted that although Argentina is better priced, Australia offers a better selection.

It can be concluded that there is no single, dominate market for malting barley. Price discovery usually takes place over - the - counter and is subject to supply and demand. As stated earlier, malting barley commands a large premium over feed barley, with the ultimate price being influenced by the supply and demand of malt in both the local and world markets. Gradually, prices are being influenced by spring wheat and corn prices (AgMRC, 2013).

Malt, which is one of the main ingredients used in beer and whiskey, is made by steeping barley and allowing partial germination to occur. The process of converting malting barley into malt includes (1) steeping, which is when barley is soaked in water for two days, (2) germination and (3) kilning.

Beer brewing is an intricate process whereby, malted barley is milled, seeped in hot water in a mash tun, to produce wort. Thereafter, the wort is boiled in a kettle and fermented where the yeast coverts to sugar to alcohol. Lastly, the alcohol is filtered, undergoes a second fermentation process. The beer may then be pasteurised.

CHAPTER 3

AN OVERVIEW OF THE SOUTH AFRICAN BARLEY INDUSTRY WITH SPECIAL FOCUS ON THE NORTHERN CAPE

3.1. INTRODUCTION

Chapter three looks at the risk within the South African the barley industry. The chapter also includes a general overview of the industry and a look at the production of malting barley, with slightly more focus on the irrigated NC areas.

3.2 OVERVIEW OF THE SOUTH AFRICAN AGRICULTURAL SECTOR

Agriculture contributes around 2.9% to South Africa's gross domestic production (GDP) and about 7% to formal employment. In addition, the agro-industrial sector comprises about 12% of the country's GDP (DAFF, 2013); hence it is an integral part of the economy. However, as depicted in Figure 3.1, from 1960 the contribution of the Agricultural, Forestry and Fisheries sector to the economy has been on the decline (DAFF, 2009). Although, the general trend is downwards, it displays a cyclical pattern (DAFF, 2009). The contribution of the Agricultural, Forestry and Fisheries sector to the country's real value addition in the short and medium term, is portrayed by the upward and downward fluctuations (DAFF, 2013).

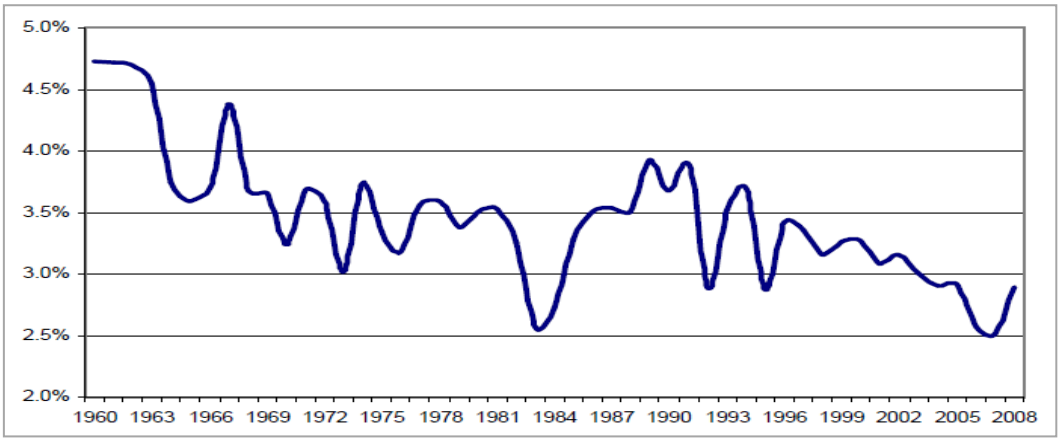

Figure 3.1: Share of real value added by the agriculture, forestry and fisheries sector to total real value added by all sectors in South Africa's economy (at 2000 constant prices)

Source: SARB Online Database, 2013

Weather plays a major role in the agricultural sector and also increases the risk that the sector is exposed to. All producers and processors within the South African grain market are affected by the risks involved in agriculture (van der Vyver, 2013).

The report by the National Agricultural Marketing Council (2009) on the functioning of the agricultural futures market for grains and oilseeds in the light of concerns expressed by GrainSA, explored the determinants of maize, wheat and sunflower seeds prices. The determinants of a price were identified as (1) the world price of grain, (2) the exchange rate, (3) stock levels and (4) the size of the domestic crop (NAMC, 2009). The determinants have risk factors associated with them and in order to be profitable, market participants need to have knowledge of the risk factors and how they affect the price of the commodity (NAMC, 2009).

3.3 RISKS INVOLVED WITHIN THE SOUTH AFRICAN BARLEY INDUSTRY

In South Africa, barley is planted primarily for malting purposes, seeing as there is the non-existence of a viable feed market for barley due to the oversupply of maize produced in the country (DAFF, 2012). In contrast with other commodities, there is only one major buyer for barley in South Africa, the SA Maltsters. SA Maltsters is responsible for supplying its major stakeholder, South African Breweries Ltd, (a subsidiary of SABMiller plc.), with malted barley. Barley producers mostly had a guaranteed market but lately are exposed to price risk. (The price of barley is now linked to the wheat price, see below.) If this is the case and some risks are eliminated, why is South Africa still not supplying enough barley to meet the local demand? According to DAFF (2012), the answer lies in the fact that a whole new risk is seen in the barley industry, since barley is only planted for malting purposes and there is only one major buyer (SA Maltsters), producers find it too risky to participate in such a market. They realise that failure to meet SA Maltsters quality requirements would ultimately results in no or a narrow market for their products (DAFF, 2012).

3.4 BARLEY VALUE CHAIN

Malting barley is a particular type of barley used in beer brewing. South Africa only produces malting barley, although all barley does not necessarily meet the final quality criteria (DAFF, 2012). Alternatively, barley grain may be milled to produce flakes, flour and bran (DAFF, 2012).

Milling is a process whereby the seed kernel is crushed and the outside bran is separated from the inside part of the kernel. Food to nourish a new plant is stored within the inside of the seed kernel. Thereafter, the endosperm is ground to make flour (DAFF, 2012). As a means of improving the digestibility of barley, the barley grain is cracked for cattle feed or ground to make chicken feed and feed for hogs (DAFF, 2012).

The dried stems of the barley plant after the head that holds the grain kernels has been removed are known as barley straw. Barley straw is used as soft, dry bed for livestock and can be produced into paper, building materials and fibre board (DAFF, 2012). Silage is created when the whole plant is cut down, piled, compacted and allowed to ferment, since fermentation preserves the nutritious value of beef and dairy cattle feed (DAFF, 2012).

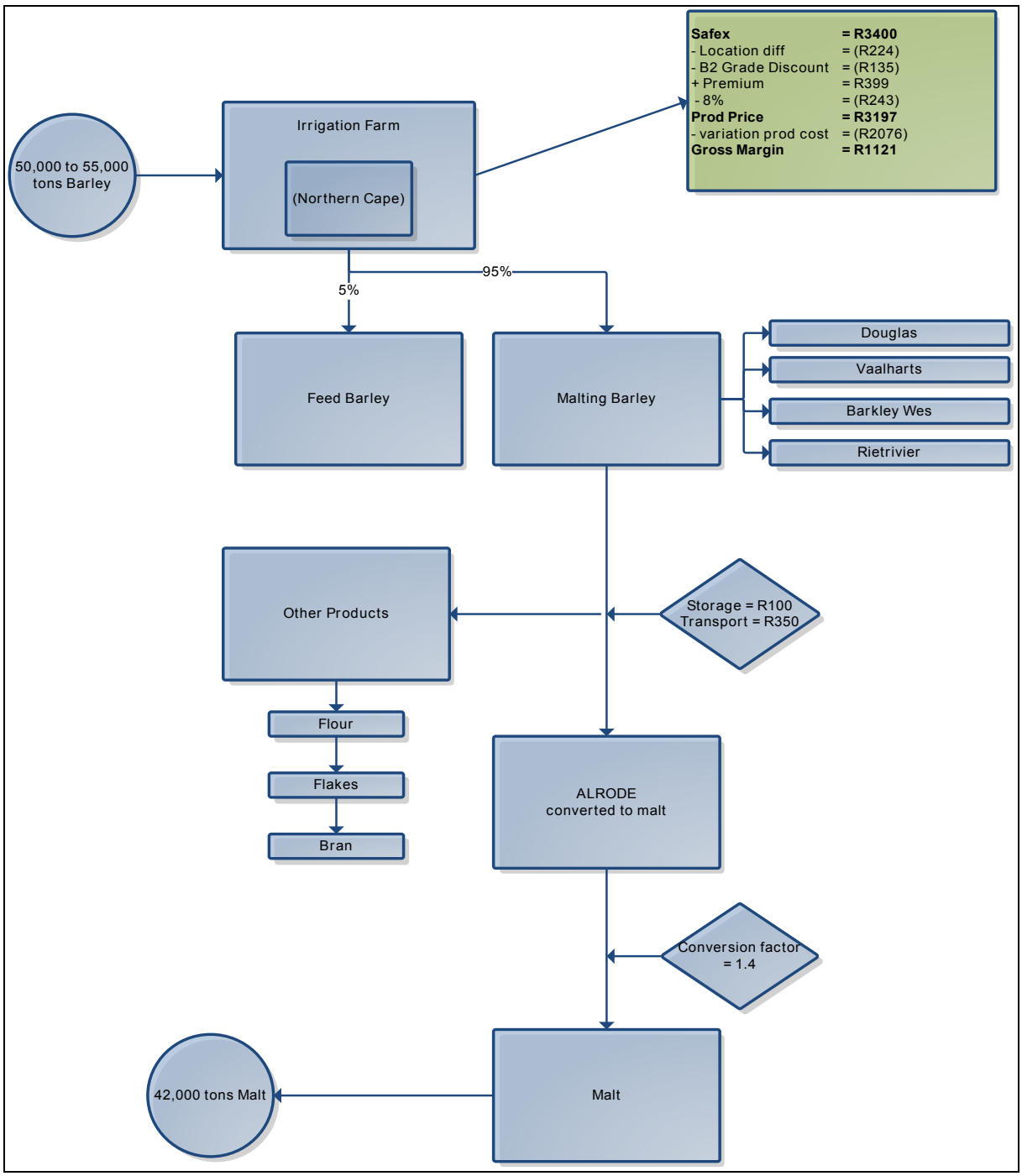

Figure 3.2: Barley value chain
Source: Own calculations

3.5 SOUTH AFRICAN BARLEY INDUSTRY

3.5.1 General

SABMiller plans to invest up to $2.5 billion in Africa over the next five years to build and refurbish breweries (Motsoeneng & Mahlaela, 2012). This is to meet the rising demand for beer in the continent. SABMiller plans to build two to three breweries each year across Africa, where breweries are already running at or close to full capacity (Motsoeneng & Mahlaela, 2012).

After a decade of relative political stability, Africa has developed many fast-growing economies, and is home to a billion people. It is perceived as the next big growth or emerging market for consumer goods, despite the fact that it still poor (Motsoeneng, T and Mahlaela, 2012). Compared with North America or Europe where average beer consumption is at 70 litres per person per year, beer consumption in Africa, which stands at 8 litres per person annually, is insignificant. This implies that beer is seen as a status symbol and few Africans can afford it (Motsoeneng, T and Mahlaela, 2012).

Another big investment by SAB, according to Business Day (2013), is the new state of the art, R700 million malting plant in Alrode, Gauteng. The new plant will make it possible for SAB to reduce the amount of malting barley it imports as well as assist it in supporting emerging black farmers. Currently SAB sources around 65% of its malting barley locally and the amount is expected to increase to around 90% to 95% once the new maltings plant is completed (Business Day, 2013). The new plant will allow SAB to reduce its exposure to volatile international markets and price swings, while replacing a substantial amount of its imported malt and barley with locally sourced barley. Business Day (2013) states the new plant will be built next to one of its two current malting plants, the existing Alrode brewery. About 216 000 tons of barley per year is malted in the Caledon plant situated in the Western Cape, while the Alrode plant malts around 42 000 tons per year (Business Day, 2013). The Alrode plant is about 40 years old and nearing the end of its economic life. It will be decommissioned once the new plant is fully operational (Business Day, 2013). The new plant will have a capacity of 180 000 tons of malted barley by its completion in 2015.

3.5.2 Production of barley in South Africa

Until 1997, the production of barley was almost exclusively limited to the WC and specifically to the SC. Production on an experimental basis was only brought to the inland irrigation areas of Vaalharts during 1997. Once established, hectares grew rapidly and in 2001 9 200 ha were planted. The following year there was a setback, but in 2003 it reached a peak of 14 200 ha. Since then it has stayed more or less constant as depicted in Figure 3.3.

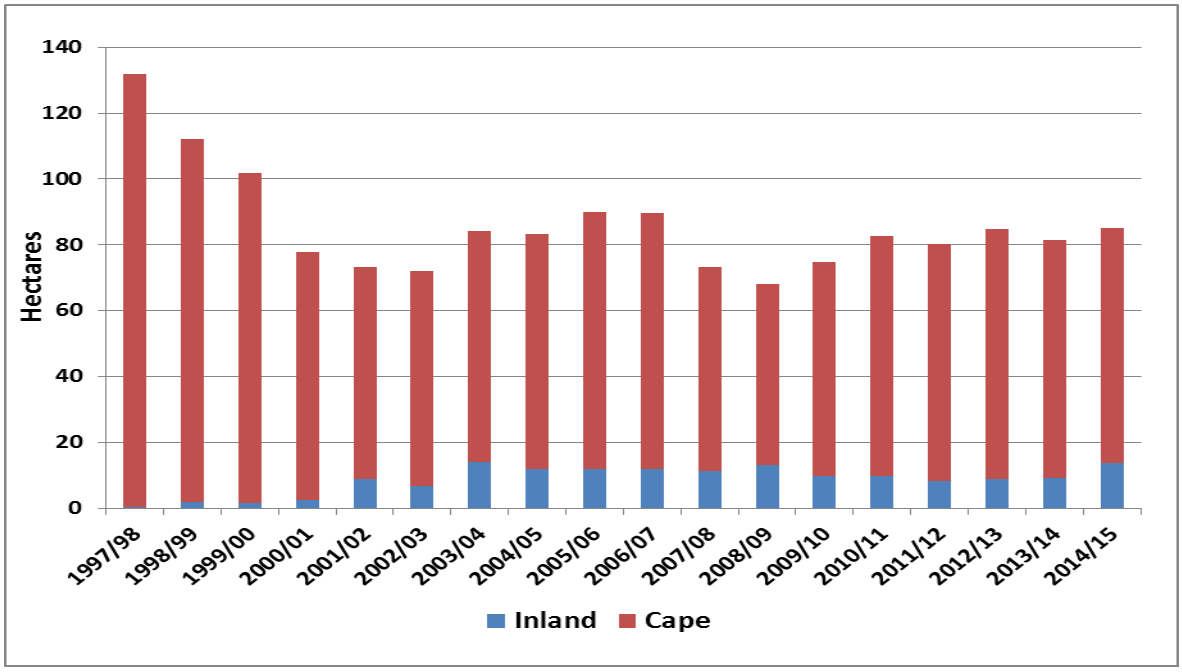

Figure 3.3: SA barley hectares planted, 1997/98 to 2014/15
Source: DAFF, 2014

Total South African production varies considerably, and this could directly be attributed to the volatile dry land production conditions in the SC. The inland irrigation areas produce on average around 75 000 tons with a variance of 5 000 tons. However, in the SC, which typically produces around 150 000 to 175 000 tons, production may deviate by as much as 100 000 tons from one year to the next. For example in 2010, 119 900 tons were produced, only to increase to 234 900 tons in the following year.

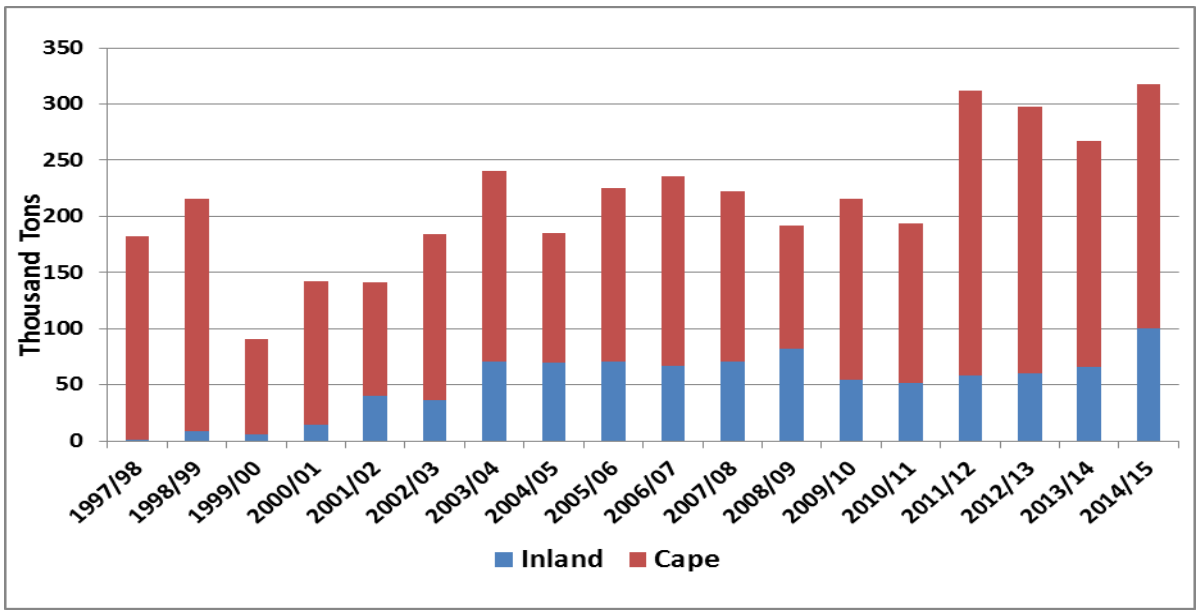

Figure 3.4: SA barley production, 1997/98 to 2014/15
Source: DAFF, 2014

Since 2002/03, the SC has averaged 2.36 tons per hectare while the irrigation areas that have averaged 6.02 tons per hectare. However, it is worth noting that in 2011 yields in the SC made a significant leap to 3.53 tons per hectare while those in the NC jumped to 7.13 tons per hectare. Yields last year were significantly less in the SC (DAFF, 2014).

One should note that level of production is not entirely bound to the decision by the farmers but also by the amount that is contracted by SAB. With the expansion in malting capacity in the NC, there will be a push by SAB to make barley production more attractive compared to wheat, but once the required expansion has taken place, the volumes produced will be carefully monitored. If South Africa produces a significant surplus of malting barley, which is unlikely, it will have to be exported. This could lead to SAB contracting less amounts of barley.

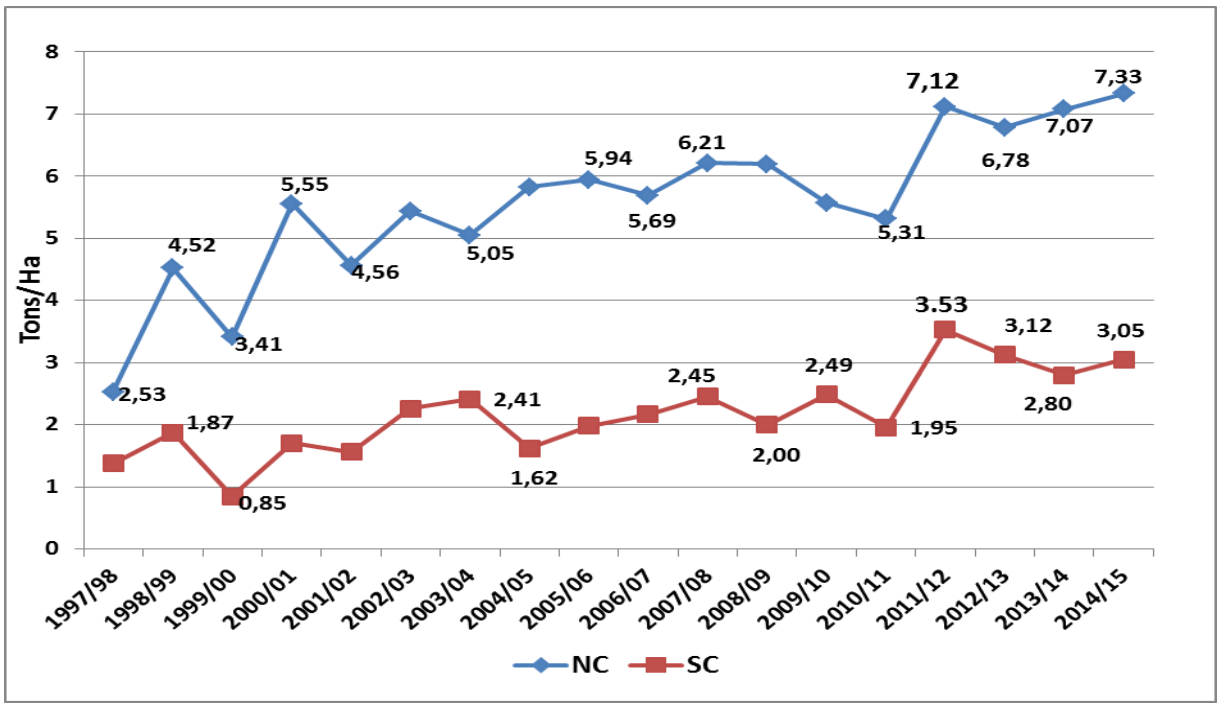

Figure 3.5: SA barley yields
Source: DAFF, 2014

3.5.3 Consumption and imports of barley in South Africa

As previously mentioned, almost all the barley produced in the irrigation areas are grown for malting purposes. In normal years, only about 5% of the barley produced is found to be unsuitable for malting purposes and this is often consumed on-farm, given the large price differences. In the SC, the situation is slightly different. Production conditions are unstable, leading to larger percentages of feed barley from time to time. Given the variance, it is not realistic to attach an average percentage but the feed barley component probably falls within a range of 10 to 20%. Since pricing in the Cape feed market is considerably different (being a net importer of feed grain), higher quantities of feed barley find its way into the market.

Over the last 10 years, South Africa's demand for malting barley has been around 260 000 tons per year. Imports vary, affected not only by the shortfall in quantity but also quality requirements. Since 2003 the demand has been at an average of 75 000 tons per year. Quality plays an important role since maltsters often import specific cultivars based on brewing requirements.

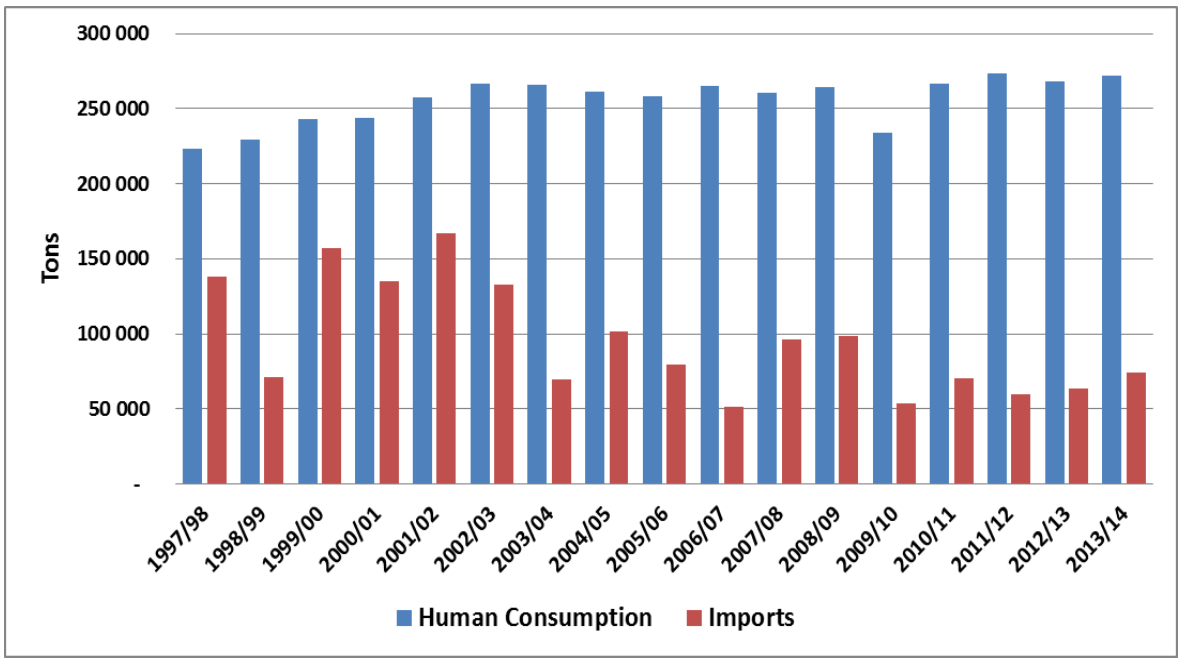

Figure 3.6: SA barley: human consumption vs. imports
Source: SAGIS, 2014

3.5.4 The production of malting barley under irrigation

The production of barley is mainly concentrated in three irrigation production areas, namely Vaalharts (about 33 000 tons), GWK (about 17 000 tons) and Taung (approximately 7 000 tons). GWK consists of Douglas (the majority), Rietrivier and Barkley West. Smaller quantities are also grown in the Modderrivier and Hopetown areas, which are typically included in the GWK numbers. Lately, some experimentation has also been conducted in the Brits/Koedoeskop irrigation areas, providing approximately 2 000 tons. For all practical purposes, SAB is the only buyer and barley is produced under a production allocation awarded to specific areas and farmers.

3.5.4.1 Vaalharts-irrigation scheme

- Vaalharts has approximately 80 barley farmers. Their allocation for production is about 31 000 to 32 000 tons on 5 000 ha with average yields of about 6.2 tons/ha. The average production per farmer is 400 tons, but this varies greatly. The smallest production per farmer starts at around 30 tons while the four largest farmers produce between 800 and 1600 tons each.

- Vaalharts has the potential to produce around 75 000 tons of small grains (winter grains). Wheat could make up between 24 000 to 36 000 tons leaving the balance to barley, approximately 40 000 to 50 000 tons.
- Producers are keen to plant more. After the completion of the new Alrode plant, demand might increase and based on the production allocation system currently in place, the Vaalharts producers are of the opinion that new contracts should be issued in the same ratio.
- The main depots for delivery are: Magogong, Vaalharts and Jan Kempdorp which belong to Senwes Ltd. Barley yields increased over the last 10 years from 5 tons/ha to 6.2 tons/ha.
- Producers generally have a strong preference to maintain their allocation, because if they do not plant in a particular year they may lose out in future years.
- The Vaalharts-irrigation scheme typically plants about 2 weeks earlier than Douglas.
- SAB has appointed a field officer to service the area.

3.5.4.2 Taung

- SAB initiated action several years ago to offer local small scale farmers the opportunity to produce barley. They supply them with inputs and finance and purchase production on the same basis as in the other allocation areas.
- SAB has also appointed a field officer to assist the producers.
- In 2012/13, 1 190 hectares were planted and 7 090 tons were produced.
- In 2011, SAB said that there were 104 small scale farmers involved.
- Typically a small farmer is allocated a 10 hectare plot.

3.5.4.3 GWK

- Similar to Vaalharts, a system of production allocations is offered to the producers in cooperation with GWK.
- Approximately 16 000 to 17 000 tons are produced on 2 400 ha for SAB. Production is mainly focussed around Douglas, Barkley West and Rietrivier (Jacobsdal) with smaller quantities at Modderrivier and Hopetown. Currently no production takes place in Prieska. (Note, not all areas are exclusively administered by GWK.) Approximate hectares and quantities are as follows:

	Area	Tons	Hectares
•	Douglas	9 000 to12 000	1 300 to1 700
•	Barkley West	up to 4 700	up to 700
•	Rietrivier	up to 3 700	up to 470

- There are approximately 40 barley producers in the broader GWK area and SAB has appointed a field officer to assist them and to contact field trials.

3.5.5 Grading

Barley like all grains and oilseeds is graded under the Agricultural Product Standards Act, 119 of 1990. An extract of the regulations for both barley and wheat are included under Annexure 2. The full set of regulations can be downloaded at the following links:

Barley:

http://www.nda.agric.za/doaDev/sideMenu/foodSafety/doc/localImportRegulations/gg36587%20nn443%20APS%20Malted%20barley.pdf

Wheat:

http://www.nda.agric.za/doaDev/sideMenu/foodSafety/doc/localImportRegulations/WheatRegulations.pdf

The barley grading regulations were recently revised and published in the Government Gazette on 21 June 2013 while the wheat grading regulations latest revision dates back to 17 December 2010.

3.5.6 Pricing

Since barley is primarily produced in South Africa for malting purposes and SAB is the only major buyer purchasing virtually the entire crop, price has always been an issue. This brought considerable strain to the relationship as, often the crop was already planted and the growing season far progressed while there was not yet clarity on the price. The price was also not the only issue since quality and quantity was very important vis-à-vis the production shortfall and import alternatives.

With the SC historically being the only production area and with wheat virtually the only alternative for producers, the profitability of barley production has always been compared to that of wheat. Figure 3.7 below illustrates the relationship between the average barley and wheat producer prices deflated with the producer price indices for field crops.

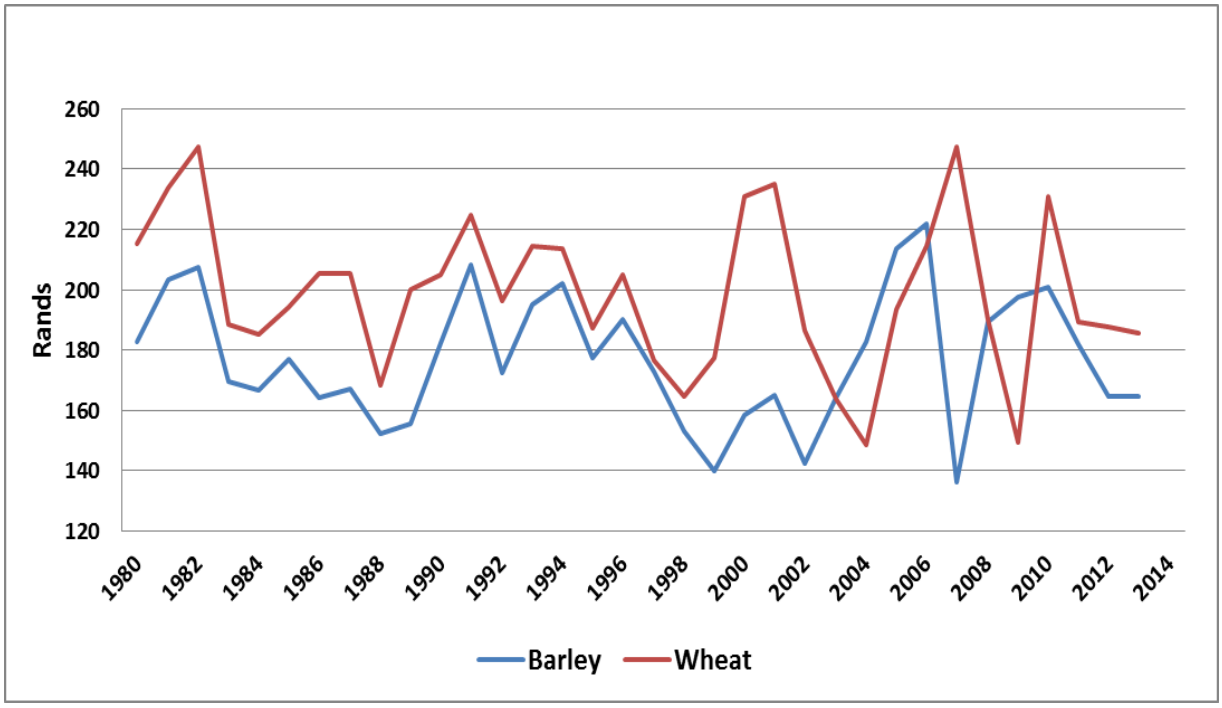

Figure 3.7: Barley and wheat producer prices
Source: DAFF, 2013

It has only been since the 2011/12 season that the price has been linked to the SAFEX wheat December futures contract. (In 2011/12 it was fully implemented but it was done on an experimental basis in the two years prior to that.) This now enables both the producers and the buyer to price individually and according to their respective price views. Pricing could also take place post-harvesting. The detail price formula is dealt with in 4.9.

3.6 SUMMARY

As barley is planted entirely for malting purpose in South Africa and there is in all essence a single buyer, the barley industry can be viewed as a risky market to participate in. If the producers fail to meet the required malting barley standards, they are left with no viable alternative market (DAFF, 2012). Conversely, barley that does not meet the malting quality criteria can be milled to produce flour, flakes and bran.

Huge investments have been made by SAB and a new malting plant in Alrode, Gauteng; which should be completed in 2015 is being built. The Alrode malting plant will operate at a capacity of 180 00 tons of malting barley (Business Day, 2013). This investment will enable SAB to source barley locally, thus reducing its costs and assisting with the emergence and growth of new barley producers.

On a production level, the variation, on a year to year basis in the NC irrigated areas is around 5 000 tons. This is contrary to the dry land SC area where production may deviate significantly, by as much as 100 000 tons, from one year to the next. The production of malting barley is concentrated in three areas: Vaalharts, GWK and Taung.

Vaalharts and GWK (Douglas, Rietrivier and Barkley West) are situated in the NC. Vaalharts produces about 32 000 tons on 5 000 ha, whereas GWK produces approximately 17 000 tons on 2 400 ha. In all the irrigation production areas SAB has appointed field officers to assist barley producers.

CHAPTER 4

A COMPARISON BETWEEN BARLEY AND WHEAT

4.1 INTRODUCTION

In chapter four, a production cost and profit comparison between barley and wheat in both the GWK and Vaalharts area is conducted. The budgeted costs are compared to the actual costs given by GWK and Vaalharts (Senwes). This will give information as to whether producers earn more from barley than wheat, and whether barley is profitable.

In this chapter factors such as pests, water management and yields are analysed. The different types of irrigation barley cultivars under production in South Africa and production allocations are examined.

Lastly, the general price determination of barley is explored. This will give insight into whether the prices currently paid by SAB are competitive.

4.2 PRODUCTION COST

4.2.1 GWK area

As could be expected, production costs vary between different areas and different farm sizes. A distinction should be made between areas like Vaalharts, with smaller sized farms, and Douglas, where the irrigation farms and pivots typically are bigger. However, it seems that the different types of soil occurring on different farms, is an even more important factor. Nitrogen application on sandy soils (more) and heavy soils (less) differ considerably.

Below are the production cost data and actuals supplied by GWK (2013). This is the aggregated data collected by them through different study groups that submit data annually.

Table 4.1: Yield and turnover

	Unit	BARLEY	WHEAT
Safex prices		3 310	3 310
Transport differential		-256	-325
B2 deduction		-135	-135
8% factor		-234	
Premium/upgrades		+250	
Net price/ton		**2 935**	**2 850**
Yield		6.5	6.5
Turnover/ha		**19 080**	**18 525**

Source: GWK, 2013

The variable input cost data of GWK was once again used:

Table 4.2: Variable production input cost

		BARLEY	WHEAT
Fuel		563	563
Fertiliser	Barl. 150kg/ha N Wht 250kg/ha N	5 665	7 353
Micro-elements		910	839
Seed	Barl. 80kg/ha Wht 100kg/ha N	768	1 180
Weed & pest control		364	1 143
Insurance		1 049	1 018
Harvesting cost		1 002	1 002
Irrigation cost		2 420	2 420
Mechanisation		402	402
Pivot cost		350	350
Total cost/ha		**13 496**	**16 279**
Yield		6.5	6.5
Total cost/ton		**2 076**	**2 504**

Source: GWK, 2013

On this basis net profit compares as follows:

Table 4.3: Profit comparisons

		BARLEY	WHEAT
Turnover/ton		2 935	2 850
Input cost/ton		2 076	2 504
Net profit/ton		859	346
Gross profit/ha		5 584	2 246

Source: GWK, 2013

Based on these numbers gross profit per hectare for barley is 148% higher than that of wheat.

When we look at the actual numbers it looks slightly different:

Table 4.4: Actual vs. budget, 2012(barley)

Douglas Barley	**Douglas Gem**	**Cost guide**
Returns (t/ha)	7.83	6.5
Gross Income (GI)	**22 893**	
Costs		
Seed	595	720
Fertilizer	5 894	5 506
Consulting services	89	20
Chemicals	629	234
Electricity	1 548	1 560
Crop insurance	1 305	736
Marketing costs	92	975
Contract labour	716	1 117
Casual labour	12	
Sundry expenses	9	
Total (A)	**10 889**	**10 868**
Other Costs		
Fuel, oil and grease	1 171	
Repairs	1 454	
Labour costs	752	
Other fixed costs	686	
Total (B)	**4 063**	
Total Costs (A+B)=C	**14 952**	
Net Margin (GI-C)	**7 941**	

Source: GKW, 2013

- Most notable is that where the budget provided for a yield of 6.5 tons per hectare for both barley and wheat, barley in the Douglas area achieved a yield of 7.83 tons/ha. Although barley producers experienced favourable production conditions thereby out-performing

the budget, wheat did even better achieving 8.07 tons/ha. (Note, GWK adjusted the budget yield for 2013 to 7.5 tons/ha for both barley and wheat.) Actual numbers were only collected from a small participating group. However, what is important is how the two sets of data compare. Although both products did better, wheat outperformed barley by 0.24 tons per hectare or 3.1%. Is this significant? It equates to approximately 10% of net margin on a per hectare basis. Assuming the data is reliable, it substantiates the claims of some producers that wheat outperforms barley in good years, but not nearly by as much as the 1.0 ton that was claimed. Unfortunately, no other comparisons exist.

- On a line item basis some items were higher and others were lower, but total variable and overhead costs ended up about 12% higher than budgeted. Actual total cost increased to R14 952 against the budget of R13 496. Since prices achieved were very similar, the additional yield of 1.33 tons/ha (7.83 against 6.5) resulted in the net profit increasing from R5 584 to R7 941 per hectare, or by 42%.

- Exactly the same can be said for wheat (see Table 4.5) although not to the same extent. Total costs increased to R17 898 against the budget of R16 279, therefore, an increase of 10%. The profit of wheat nearly doubled from R2 246 (budget) to R4 328 (actual), an increase of 93%.

Table 4.5: Actual vs. budget, 2012(wheat)

Douglas Wheat	**Douglas Gem**	**Cost guide**
Returns (t/ha)	8.07	6.5
Gross Income (GI)	**22 226**	
Costs		
Seed	1 000	1 040
Fertilizer	6 953	7 088
Consulting services	139	20
Chemicals	731	789
Electricity	1 875	1 560
Crop insurance	1 173	815
Marketing costs	104	975
Contract labour	1 201	1 347
Casual labour	6	
Sundry expenses	77	
Total (A)	**13 259**	**13 634**
Other Costs		
Fuel, oil and grease	1 085	
Repairs	1 740	
Labour costs	918	
Other fixed costs	896	
Total (B)	**4 639**	
Total Costs (A+B)=C	**17 898**	
Net Margin (GI-C)	**4 328**	

Source: GWK, 2013

Also of note was the final nitrogen applied:

Table 4.6: Actual quantities used, fertiliser & seed

ACTUAL USAGE					
Fertiliser					Seed
	N	P	K		Kg seed/ha
Douglas Barley	174	48	68		67
Douglas Wheat	250	47	68		97

Source: GWK, 2013

According to the actual data collected, the kilograms of nitrogen applied per hectare of wheat remained the same at 250kg/ha. However, for barley it increased from a budgeted 150kg, to 174kg/ha in actuality. It is difficult to ascertain whether the increased use of nitrogen resulted in the higher yields of barley. The rest of the input quantities were in line with the budget.

4.2.2 Vaalharts area

Senwes provided the budgeted 2012 production cost for malting barley and wheat in the Vaalharts area (2013). In an attempt to make the figures reasonably compatible to that of

GWK, the producer price and tons were adjusted to the same levels. Take into account this is not about actual numbers but about a comparison between barley and wheat. The outcome in Table 4.7 is very similar to that of GWK. Gross margin (budgeted) per hectare for malting barley is R7 647 and R4 857 for wheat. Importantly, the gross margin of barley exceeds that of wheat by 57%.

Table 4.7: Production cost - Vaalharts area

Irrigation hub	**Barley**	**Wheat**
Product price (R/ton)	2 935	2 850
Returns (t/ha)	6.5	6.5
Gross Product Revenue (GPR)	**19 078**	**18 525**
Specified Costs (R/ha)		
Seed	592	1 323
Fertilizer	4 354	5 336
Herbicides	167	216
Pesticides	205	328
Fuel	870	870
Repairs	334	334
Lubricants	44	44
Irrigation	2 189	2 189
Total Specified Costs (A)	**8 756**	**10 640**
Other Specified Costs (R/ha)		
Aerial spray	180	360
Crop insurance	813	780
Contract harvest	650	802
Grain hedging	714	650
Product credit interest	317	436
Total Other Specified Costs (B)	**2 674**	**3 028**
Total Costs (A+B)	**11 430**	**13 668**
Margins		
Rand per hectare	**7 647**	**4 857**
Rand per ton	1 177	747

Source: Senwes, 2013

Senwes does not have a system in Vaalharts whereby actuals are collected post the 2012 season, they prefer rather to prudently adjust the budget for the new season.

When compared to the GWK numbers, on the face of it, it does appear as though profitability of barley in the Vaalharts area is higher than that in the GWK area. Moreover, when the two sets of data are compared, barley is a much better proposition against wheat in the GWK area. The gross profitability is 148% higher per hectare than in the Vaalharts area (57%).

Therefore, producers in the GWK area have an additional incentive to increase production of barley vis-à-vis other products whereby producers in the Vaalharts area might conclude that the additional profit margin does not justify the risk.

4.3 QUALITY ASSESSMENT

Fairly unique to the South African environment, grading is done on a sliding scale with multiple intervals and the producers are rewarded for better quality (see Annexure 1). In addition, the sliding scale for nitrogen has been compiled on a basis whereby the producer is penalised if the nitrogen is either too low or too high. The current grading criteria is as follows:

4.3.1 Plumb kernels

Barley:

Plumpness 6.25

Kernel plumpness is important for homogeneity during the malting process. Thin kernels take up water faster than plump kernels. Thin kernels also have a relatively higher percentage husk, which can give beer an astringent taste. Therefore, more uniformity plumpness will result in better malt quality. The sliding scale for plump kernels is such that more is paid *pro rata* for barley with a kernel plumpness that increases from 70% to 100%, measured above a 2.5 mm sieve. As in the case of nitrogen content, the cut-off point must be confirmed with the grain handlers.

Wheat:

When compared to wheat, plumb kernels lead to high hectolitre mass and a higher grade. Hectolitre mass and protein are the two main criteria in grade determination. For wheat to be graded as B1 the hectolitre mass should be a minimum of 77kg (other criteria also applies). Grade B2 requires a minimum of 76kg but by far the majority of all wheat produced under irrigation nowadays has a hectolitre mass of 77kg and higher.

4.3.2 Nitrogen

Barley:

Protein range 1.5% to 2.0%.

The criterion is extremely strict in that barley outside of the range is not accepted as malting barley.

Wheat:

Nitrogen application is directly aligned to protein levels which again determine the grade. Grade B1 requires a protein content of a minimum of 12% (on a 12% moisture basis) and grade B2 a minimum of 11%. The quality of wheat produced under irrigation has improved in the last three years. Approximately 60 to 65% of produce now grade as B1, and the wheat is primarily not graded accordingly due to protein levels being between 11 and 12%.

4.3.3 Moisture

Barley:

Maximum moisture levels allowed at delivery is 13%. Moisture only compensates for weight, and provides no incentive (see wheat below). Producers say that SAB wants the barley as dry as possible, but that they on the other hand would prefer to harvest as soon as possible once the barley is ripe in order to get it off the land.

Wheat:

A moisture level of 13% or less is required at intake. When compared to barley it should be highlighted that producers receive no weight compensation when they deliver wheat with a moisture contents of, say 11%, whereas in the case of barley they do get compensated. However, wheat exceeding 13% could be dried which is not possible with barley, for fear that the germination capability may be affected.

4.3.4 Screenings

Barley:

Screenings is between 1.0 to 1.5%. According to the GWK farmers, this could sometimes be a problem causing them to lose out on the R91 premium.

Green kernels, caused by new stem growth after the initial development of the main plant are also a problem. Tolerance is only 2%.

There is also a view that barley is more susceptible to sprouting, caused by rain in harvesting time when ripe, than wheat. This could not be confirmed.

Wheat:
Grading regulations require a maximum of 3% screenings. If more, some agri-businesses may either make a weight adjustment or require that the producer clean the wheat at his own cost. The agribusiness also has the right to downgrade the wheat.

4.3.5 Foreign matter

Barley:
The cut off point for foreign matter is 2%, while a price incentive applies to foreign matter under 1%. A base price is applicable for barley with foreign matter content between 1% and 2%, but a feed grade price is applicable for barley with foreign matter content above 2%.

Wheat:
The requirement is a maximum of 1%. There is also a collective requirement of a maximum of 3% together with screenings, etc. Once again, if these criteria are exceeded most silos have the capability of cleaning the wheat but at the cost of the producer.

4.3.6 Cultivars

Barley:
Cultivars cannot be mixed since water intake by kernel differs.

Wheat:
Cultivars are mixed.

4.3.7 Premiums

Barley:

According to SAB (2013) on average they paid producers in the GWK area R329.28 per ton and in the Vaalharts area R312.33 per ton. This could not yet be cross-reference with data from the respective agri-business. Ideally data per each of the five categories should be available which will enable more accurate analysis statements concerning, for example, nitrogen levels.

Wheat:

Wheat producers are subjected to a preferred or recommended cultivars list which originates from an agreement between producers and millers and other industry stakeholders. This has hardly ever offered any decision making by commercial producers since seed companies normally supply only the cultivars on the list. With regards to research and strategic industry decision making it becomes more complex.

Producers almost never earn quality premiums e.g. protein content above 13%. This should not be confused with locations premium that are paid in some areas. Pro-producer lobby groups have as yet not successfully made a case for superior South African wheat baking characteristics, although discussions are ongoing.

4.4 PRODUCTION AND LOGISTICS

Interviews with stakeholders dealt with a vast range of different statements regarding the production process. They are categorised below and although each one is addressed, little scientific data is available to substantiate the extent of the claims. Unlike in 4.3 above, barley and wheat are dealt with collectively in this section.

4.4.1 Pests

It was often said by producers that as production became more popular in the irrigation areas, the number of pests also increased.

Fusarium needs special attention. More than once it was stated that the fact that barley is not susceptible to fusarium is a huge benefit. (Note: barley infected fusarium has been reported elsewhere in the world.) This is particular true for those farmers that have fusarium problems in respect of their wheat. Barley is also not affected by take-all ('vrotpootjie').

Pests on barley that do occur include armyworm ('vals bolwurm'). This is seemingly limited to barley. Producers state that losses of up to 4ton/ha could occur. Some of them now use a preventive spray resulting in additional costs. Another pest that occurs is leaf miner ('blad myner').

Fungus diseases under irrigation conditions are not a problem, unlike in the SC. However, there is a fungus called 'santamonas' that occurs in the Prieska area.

Another benefit is that maize stalks or straw with fusarium or take-all ('vrot pootjie') may be used on barley lands.

4.4.2 Nitrogen application

In the past it was considered cheaper to produce barley since the nitrogen application was less, around 30 to 40kg/ha. Today new cultivars require 130 to 140kg/ha and in some cases 170 to180kg/ha. However, this is somewhat of a paradox – barley has higher yield potential, therefore producers also strive to achieve higher yields by applying more nitrogen. There is a limit though, since protein levels may not exceed 2.0%.

Estimates by stakeholders on usage vary considerably and none correspond with the data collected by GWK. The field officer of SAB estimates the average nitrogen application for barley in the Douglas area to be around 180 to 200kg/ha, going up to 220kg/h in some instances, compared to 250kg/ha for wheat. Most barley is produced on sandy/loamy soil which requires on average between 180 to 200kg/ha. GWK producers themselves estimate 160kg/ha for barley and 220kg/ha for wheat, but acknowledge that in sandy soils the application is up to 220kg/ha. On heavy soils they estimate nitrogen application to be between 80 to 90kg/ha. Bear in mind, GWK actual numbers for 2012 showed 174kg/ha for barley and 250kg/ha for wheat. Although data varies, it does seem that in most cases barley uses less nitrogen, resulting in considerable cost savings.

GWK producers indicated that because of the sensitivity to final protein levels, nitrogen is tested before the time which increases costs. Further enquiries indicated that this possibly refers to the 'end tester' that tests leaf chlorophyll that is closely related to the nitrogen level. The test indicates whether the plant requires more nitrogen, or not. Testing for nitrogen is also closely related to 'precision farming practices'.

4.4.3 Water management

Producers in the Vaalharts have specifically mentioned that barley requires better management of water. Directly after being irrigated the kernels are heavy and if the wind starts to blow there is real danger of lodging since the stem is top-heavy. This means that, day or night, the pivot has to be switched off and the producers are obliged to physically drive out to the pivot in order to do so. However, it was pointed out by some producers, that modern technology now enables a producer to manage the pivot from a cell phone. He can switch it on or off by sending a sms. Meters measuring wind strength may also be electronically linked to the pivot, automatically switching the pivot off if wind strength exceeds a certain danger level.

Feedback on water usage has indicated that wheat uses 500 to 600 mm in most areas, while barley in the Douglas area uses around 530 mm and in Vaalharts 460 mm. Again, this could not be verified scientifically. Nonetheless, it does appear that barley uses somewhat less water. The benefit in this lies with the usage of electricity, less water means less electricity which in turn results in cost savings.

4.4.4 Plant genetics

The barley stem is weaker than wheat and is hollow. If lodging occurs the barley stem may recover (stand-up), but it depends on the stage of the growth phase – it should still be somewhere between the milk and soft dough stage.

4.4.5 Lodging

Lodging appears to be a very contentious issue, particularly from a producer perspective. Various statements were made:

- Lodging occurs fairly easily, all that is required is 5 to 10mm and a strong wind.
- Some degree of lodging always seems to occur. Anything between 3 to 5% is acceptable, and viewed as though barley has reached its full potential.
- Claims were made that sometimes lodging of 40 to 70% occurs, even at times 100%.
- Barley could yield 7 to 8 tons but if lodging occurs it reduces the yield to 5 tons. The moment the plant lies down, birds have a far better chance to eat it since they can then sit on the ground. In some areas next to the river where large bird populations exist, yields could drop to as low as 2 tons/ha.
- If lodging occurs it not only affects the quantity but also the quality of barley.

Despite all the allegations made with regard to lodging, no data has been collected. This makes it impossible to quantify the extent of the problem on an industry basis. For example, if lodging does occur it is limited to a certain percentage of the land and also only to a certain land or lands and not the whole farm, also not to all farms in the area. In the specific area were lodging occurs, all barley is not lost but it depends heavily on the growth phase. Measured in terms of the specific square meters of the land where lodging occurred, losses may be significant but when weighed against the total farm or even the area, this could be negligible. Some plan of action has to be put in place to quantify the problem.

4.4.6 Yields

Vaalharts producers said that barley yields 4 to 9 tons. Oppositely, wheat has the potential to yield up to 11 tons. It is said that under ideal conditions wheat would typically yield 1 ton/ha more than barley. However, it has also been said, traditionally and on a long term basis, barley production is more stable than wheat. It has been a while since producers encountered production problems with wheat. The last three years in particular were above average. GWK-producers made a statement that you could get 9 tons/ha with barley but not with wheat.

Once again comparable data is difficult to come by. Figure 4.1 below, compares the yield per hectare of barley vs. wheat produced in the NC. The data used is the official CEC data collected by DAFF. On an area basis (e.g. Douglas or Vaalharts) or on an individual production unit (farm), statements about yield may be correct but no reliable data exists to substantiate this. On provincial basis barley yields per hectare appear to be more volatile. This makes sense given the smaller production area. Another observation is that traditionally

barley would not outperform wheat but in the 2011/12 year this happened for the first time. There is no reason why this could not be repeated in future. Test trials of the new cultivar Cristalia showed yields of 9 tons per ha (SAB, 2013). Note: it is too early to make general presumptions but technology changes all the time.

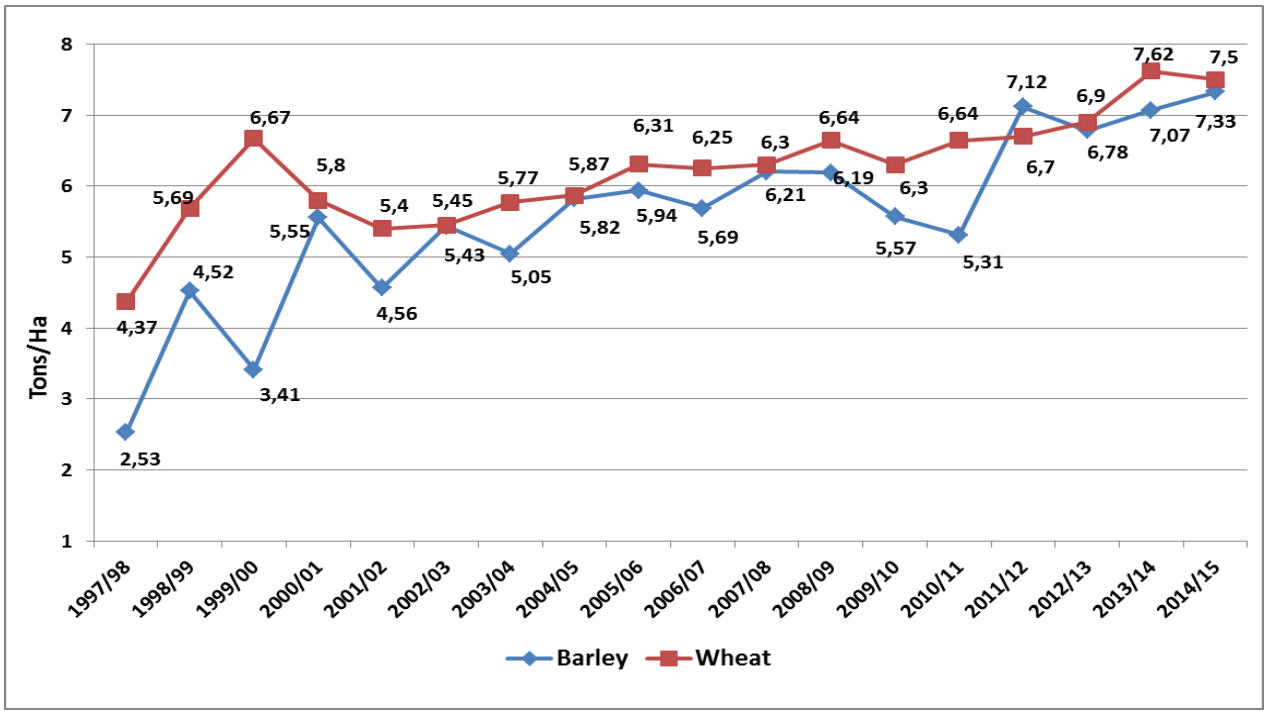

Figure 4.1: SA barley vs. wheat yields (irrigation) per hectare
Source: DAFF, 2014

4.4.7 Harvesting time

It seems that one of the major benefits for producers is that barley has a slightly shorter production cycle and could be harvested 1 to 2 weeks earlier than wheat. This is highly beneficial for producers since it results in better optimisation of their equipment i.e. using less combines and trucks in combination between a barley and wheat harvesting programme. This compares to when only wheat has been planted and it ripens at the same time.

Another significant benefit is that once the barley is harvested, maize may be planted immediately. Maize that is planted early, even only a week or two, typically produces better yields. Could this be quantified? Yes, but such research will first have to be undertaken on an individual farm basis before being aggregated.

4.4.8 Feed barley

Unlike in the rest of the world, South Africa only strives to produce malt barley. Feed barley in South Africa is the result of malt barley that is downgraded. The SC is a net importer of feed grain. This means that the price differential between feed grains and malt barley is relatively small compared to the NC irrigation production areas which are net exporters of feed grains. Malt barley and wheat command a price premium of around 50 to 60% higher than that of feed grains, mainly yellow maize. Any malting barley that is downgraded to feed barley results in huge losses to the producer.

Vaalharts producers estimate feed barley delivered to the silos to be around 3 to 4%. Additionally, feed barley that is downgraded at silo intake is often returned to the farm and stored which is estimated to be an additional 5 to 6%. This roughly corresponds with the estimate of the SAB representative in the Douglas-area who estimate feed barley to be at a maximum of 6 to 7%, plus the 2 to 3% that is taken back to the farm. GWK provided the actual tons delivered to their silo. They are as follows: in 2012, 1 148 tons; in 2011, 661 tons and in 2010, 1 000 tons (estimate). This equals roughly 6% of production. Alas, clear confirmation needs to be obtained as to whether the tons taken back to the farm have to be added to calculate the total feed barley component and the average sales price achieved for feed barley. Should this then be added or deducted to the tons of malting barley produced referred to in 4.1 thus 7.83 tons/ha in the case of GWK?

Another specification on the contract specifies that over deliveries on a producer contract will not be taken up, meaning that the price will be reduced to that of feed barley. Though, this rarely ever happens in practice.

When a load is downgraded, farmers help each other by blending their downgraded load with a following load, subject to its graded specifications, with the result that the average between the two loads will be within specifications. Strictly speaking, this is illegal according to their contracts. Another problem occurs when the following load is not readily available and the downgraded load has to wait at the silo, resulting in time wastage, which may also be detrimental for the truck owner.

Wheat on the other hand, has four grades and a producer does not have a similar problem with delivery, transport or storage.

4.4.9 Barely straw

It has been said that barley straw is worth more than that of wheat. No confirmation has been received. In fact GWK confirmed that the preferred practise in their area is for the producer to burn his lands after harvesting.

4.4.10 Weight

The mass per volume for barley is less than wheat. Thus less tons can be transported per truck and more storage bins are required for barley. 1 bushel of wheat weighs 27kg while 1 bushel of barley weighs 22kg or 18.51% less than wheat.

4.4.11 Storage

Since it is critical for barley cultivars to be stored separately, if there are not enough bins at a silo complex only one cultivar may be produced and stored. Modderrivier, for example, is such a location where only Puma is produced due to a lack of storage bins.

Storage costs should also be placed into perspective, as two issues are at stake:
Due to the volume-mass difference between barley and wheat, as barley weighs less than wheat, it is more expensive to store barley. Also, barley takes up more space for the same weight of wheat.

- Table 4.8 below, sets out the weight differences between barley, malted barley and wheat.

Table 4.8: Weight of barley, malted barley & wheat

WEIGHT OF BARLEY, MALTED BARLEY AND WHEAT
Barley : 1 US bushel = 48lb = 21.7724kg
Malted barley : 1 US bushel = 34lb = 15.4221kg
Wheat (13.5%) : 1 US bushel = 60lb = 27.2155kg
1 US bu = 35.2391 liter
1 cubic meter = 1000 liter
1 cubic meter = 28.3776 bu
Barley : 1 cubic meter = 617.85kg
Malted barley : 1 cubic meter = 437.64 kg
Wheat : 1 cubic meter = 772.31 kg
Barley to malted barley : x 70.83%, or / by 1.4118

Source: Wikipedia, 2014

- The practice is for the agribusiness to invoice the storage cost (handling and daily storage), interest and fee for the account of the buyer. The storage rate for barley is slightly higher due to weight differences. GWK rates are as follows (2012):
  Barley, handling cost is R55.00/ton, with the daily storage cost at 76c/t/day. With regards to wheat, handling cost is R49.75 and daily storage cost at 76c/t/day. (Data on Senwes rates could not be obtained in time.)

4.4.12 Volunteer barley ('Opslag')

Another downside to the production of barley opposed to wheat is the fact that seemingly more volunteer ('opslag') barley is found when lands are prepared for the next crop. This is then sprayed with roundup which addresses the problem.

4.5 CULTIVARS

Controversy exists regarding the irrigation cultivars. It seems that producers initially struggled to master the production techniques of the first cultivars. New cultivars brought new challenges and not all producers are keen on experimenting or switching over to the new cultivars. Their production techniques are all slightly different.

The current cultivars are known as medium fermentation types (MFM). This specifically refers to Puma and Cocktail that currently makes up the majority of hectares planted. HFM cultivars originate mostly from Canada and the US, while MFM cultivars originate from Europe.

The latest releases are Marthé and Cristalia, which are high fermentation types (HFM). Marthé has just been released for commercial production, in 2012, while Cristalia is still in the experimental phase. Despite the higher value attached to the HFM cultivars and the long term benefits for the industry, producers are not keen to adapt to Marthé, as it seemingly has an even bigger problem with lodging. Due to the lack of HFM types being produced, SAB has to import these types, thus incurring additional costs.

The allocation of cultivars for production to individual farmers is an SAB decision and a sensitive one at that. Cultivars may not be mixed at all; therefore; handling and storage facilities also play an important role.

The following irrigation cultivars are under production:

- **Puma:** It has been said that SAB plans to phase out this cultivar in another three years. Puma is a MFM type cultivar.
- **Cocktail:** The cultivar genetically has lower nitrogen content and less plumb kernels, thus it requires a higher nitrogen application. Less plumb kernels signify higher screenings. The sliding scale was adjusted and it is a MFM type cultivar.
- **Marthé:** It is vulnerable to lodging and requires higher a nitrogen application. It is potential HFM type cultivar.
- **Cristalia:** The latest release but it is still being tested. Similarly, it is a potential HFM type cultivar and has a higher plant density.

Senwes and GWK are paid by SAB to conduct experimental surveys. It is all done under commercial conditions.

4.6 PRODUCTION ALLOCATIONS

Irrigation producers in the NC are dependent on strict production allocations made available by SAB. For all practical purposes, SAB is the sole buyer of malting barley in South Africa. Malting barley produced in the Cape is sent to the malting plant in Caledon while malting barley from irrigation areas, mainly the NC, is utilised at their malting plant in Alrode. Although SAB is building a brand new plant adjacent to the existing Alrode plant, the present capacity of Alrode is only 55 000 tons of malting barley. Allowing for preferential quality imports and experimental trials, only around 50 000 tons can be utilised from the inland areas. When the new plant is operational, the old plant will be de-commissioned. The new plant will

have a full capacity of 190 000 tons of malting barley but it will not immediately run at full capacity. It has not been communicated to producers by SAB whether they intend to source all the required malting barley from the irrigation areas, or also from elsewhere.

Local barley produced under irrigation was first produced under experimental conditions in the Vaalharts-area in 1997. In later years, trials were also conducted in other areas like Douglas and Taung. With limited capacity at Alrode, SAB works on a strict annual allocation system based on area, followed by a specific non-transferable producer allocation. In addition, SAB also prescribes which cultivars should be produced. Practicalities, such as storage facilities and growing conditions, etc. are taken into account. In 2011 the allocation composition was as depicted in Table 4.9 below. At the time Marthé was still considered to be under experimental phase and did not form part of the allocation. Producers have a 10% tolerance for over and under deliveries.

Table 4.9: Cultivar allocation composition

KOOP	AREA	CULTIVAR				TOTAL
		PUMA	SSG 585	COCKTAIL	MARTHE	
SENWES	VAALHARTS	16000	3000	10000	280	29280
	TAUNG	-	-	6000	280	6280
GWK	GWK	7500	-	6500	280	14280
PRIVAAT	HOPETOWN	1000	-	-	-	1000
TOTAAL		24500	3000	22500	840	50840

Source: SAB, 2011

4.7 ROTATION OPTIONS

One important question that has been asked of the various stakeholders is: should barley not be produced as an alternative to wheat, and what other options are available? It appears that the answer, to a great extent, depends on the rotational practices followed by individual farmers. Although several options were mentioned, general consensus among all stakeholders could not be found. The options included:

- Double cropping of maize, meaning early maize in September. However, this was rejected in other circles, the reason being that the 'frost free' period runs from 20 October to 20

April. Anything planted earlier or later than these dates is highly susceptible to frost damage.

- Early maize was mentioned of which the benefits are higher yields and profitability.
- Seed onions were mentioned as a realistic possibility but apparently the scope (hectares) is extremely limited.
- Early groundnuts and or cotton are possibilities but this depends, to a large extent on the rotational pattern of the individual farm.
- Lucerne was also a possibility but requires a commitment of a minimum of three years.

Although there are other alternatives, none are prominent enough for producers to consider barley as not being a profitable alternative to wheat.

4.8 ALTERNATIVE BUYERS AND/OR USAGE

Although SAB as the major buyer of malting barley still reigns supreme, it does appear that some alternative buyers are appearing on the horizon. Not only have several micro-breweries established themselves in the last decade, but well-known names such as Heineken (Heineken and Amstel) and Namibian Breweries (Windhoek) are also targeting the South African market with new investments. A feasibility study was recently undertaken for the construction of a malting plant at Modderriver, though this has since been postponed.

Another use for barley has also emerged from companies such as Voerboer and Fodder Solutions that germinate seedlings, mostly in trays that fit into custom made containers, which are then sold into the specialised feed market. Although they were initially interested in feed barley as volumes are increasing, they are starting to compete in the broader barley market for product. They are also willing to pay a higher price for feed barley, particularly if it was downgraded due to high nitrogen content.

Lastly, the development of additional irrigation hectares in the NC has certain limitations. It appears that demand for products grown on these hectares may exceed the supply. For example, GWK is about to erect a new wheat flourmill with an approximate capacity of 120 000 tons of wheat per annum. Although they currently produce more than sufficient wheat in the area, the question is whether they will channel this wheat through their own mill or whether they intend to continue to service their existing customers while expanding production. SAB has already commenced with construction of a new malting plant at Alrode

with an initial capacity of approximately 130 000 tons of barley and a full capacity of 180 000 tons. This is roughly three times more than that of the existing plant. More than likely they will be looking towards the irrigation areas for supplies.

4.9 PRICING AND IMPORT PARITY ALRODE

4.9.1 General price determination

Until 2009, SAB as the sole purchaser in South Africa of large quantities of malting barley annually determined a fixed price with producers for the purchase of their barley. The formula was based on a cost-plus formula. This process did not work well for various reasons, not least being that it was cumbersome to finalised, and although variable costs were fairly easy to include in the production cost calculation, the inclusion of a component for overhead costs was difficult.

This eventually resulted to a change in the pricing formula from a cost-plus basis to a free market price in 2009, as South Africa at that time already had a fully functional wheat futures market. Worldwide there always had been a relationship between wheat and barley being from the same family (Poaceace) and tribe (Triticeae), and as a winter grain, was competing for hectares planted. It was thus decided to determine the price relationship between these two products.

Henk Geyer (2009), at the time employed by Senwes and closely associated with the Vaalharts-producers, researched price relationships. He identified several countries across the world that produced both barley and wheat over a period of approximately 10 years. He then analysed the price trends in each country and established that on aggregate barley trades at an 8% discount. However, SAB also conducted its own research. Their methodology involved using a price band with import parity representing the upper band and production cost the lower band. Using a simulation model they determined what the most likelihood scenario would be. This was then compared to the price of wheat. In the end SAB came to the same conclusion as Geyer and after further consideration it was decided on a new price formula whereby SAB would purchase barley at an 8% discount to wheat in the NC. (Note: the author had no direct insight into the studies, although attempts were made to obtain them.)

The detailed formula (which is still in use) is slightly more complex, though, and is calculated as follows:

Table 4.10: Barley producer price formula

PRICE FORMULA			
	Example (2012/13)		**Safex transport differentials in 2012/13**
Safex B1 price*	3 400		Modderrivier R256, Douglas not registered
minus Location differential (e.g. Hartswater)	224		Douglas: R256 - agreed on, not registered
minus Safex B2 grade discount	135		Prieska: R??? - theoretical, no producers yet
Sub-total (base price)	3 041		Magogong: R232
minus Factor adjustment (8%)	243		Hartswater: R224
Total (before premiums)	R 2 797.72		
Quality criteria: Allowable range	**Maximum Premium %**	**Rand gain: Per ton**	
Nitrogen content (1.5% - 2.0%)	3.50%	97.92	
Plumbness (70% - 100%)	1.99%	55.67	
Screenings (0% - 5.0%)	4.00%	111.91	
Moisture content (8% - 13%)	3.50%	97.92	
Foreign matter (0% - 2.0%)	1.27%	35.53	
	Maximum Rand gain:	R 398.95	
TOTAL PRICE (Rand per ton):	**R 3 196.67**		
Notes:			
* Both buyer and seller price individually on Safex at their own discretion			
** N and Plumbness are intrinsic qualities that should be paid for in addition			
*** Screening, moisture & FM are barley weight adjustments and should be compared with the pricing practises for wheat to put in perspective.			
Screenings:			
@ 0% screenings buyer pays 100/100 per ton barley: R3000 x (100/100) = R3000			
Seller: R3000 + R111 (premium) + R120 (value of screenings on farm) = R3171			
@ 4% screenings buyer pays 104/100 per ton barley: R3120 - (1500*4%) = R3020			
(estimated value of screeenings R1500/ton)			
It 'pays' seller to deliver 'clean' barley, buyer gains on high screenings, but			
it depends on in- and outloading practises of storage operator.			
Foreign Matter (FM):			
@ 0% FM buyer pays 100/100 per ton barley: R3000 x (100/100) = R3000 + R53 = R3053			
Seller: R3000 + R35 (premium) + R60 (value of FM on farm) = R3095			
@ 2% FM buyer pays 102/100 per ton barley: R3060 - (1500*2%) = R2980			
(estimated value of FM R1500/ton)			
It 'pays' seller to deliver 'clean' barley, buyer gain on high FM, but			
it depends on in- and outloading practises of storage operator.			
Moisture:			
@ 13% moisture buyer pays 113/100 per ton barley: R3000 x (113/100) = R3390			
@ 8% moisture buyer pays 108/100 per ton barley: R3000 x (108/100) = R3240 + R97			
Buyer has a gain of R53, it 'pays' seller to deliver with high moisture content.			

Source: Own calculations

4.9.2 Premiums paid

As discussed in 4.3.7, the average premium paid in 2012 in the GWK area is R329.28 and in the Vaalharts area R312.33.

4.9.3 Wheat grade differential

There is an argument that when the price formula was finalised in 2009, the typical composition of the average irrigation wheat producer was on average B2 grade wheat. Improved seed cultivars and production techniques today means that at least 50% of wheat delivered is of B1 quality and only around 10% is of B3 quality or worse. In fact, in all of the GWK production areas during 2012/13 64% of wheat was of B1 quality. The B2 grade differential deduction could therefore be reduced to at least half and probably even two-thirds.

Table 4.11 : GWK wheat grade distribution, percentage

	B1	B2	B3	B4	UT	KA	Total
2011/12	51.6	33.8	12.6	2.0	0.03	0	100%
2012/13	64.6	25.2	6.9	0.7	1.5	1.2	100%
Ave							100%

Source: GWK, 2013

Farmers tend to compare the 8% discount factor combined with the grade discount of a B2, with the premium they receive for above average specifications. They state that the premium compensates for the B1 discount but not the 8% factor, leaving them still worse off. Yet, when the data in Table 4.10 is analysed, the B2 discount (R135) and the 8% (R343) add up to R378 per ton. If compared to the maximum premium that could be achieved, namely R399, the discount is R21 per tons less. When compared to the actual premiums paid, R329 in the GWK area, the discounts are roughly R50 more than the premiums.

4.9.4 A ‘fair’ price for barley

In discussions some producer representatives indicated that they were looking for a 1:1 ratio to the price of wheat. Others talked about a partnership, sharing in the cost of imported barley versus “cheaper” locally produced product.

One can say that these statements are theoretical. With this is meant that it is almost impossible to quantify all the benefits or risks associated with the production of barley versus wheat. The two main reasons for this are: Firstly, production conditions on a per farm basis

differ significantly, even more so when the skills and management style of the owner is taken into account. Secondly, in a free market environment, which certainly applies to barley and wheat production in South Africa, circumstances change significantly during a season and also from year to year. Lodging and/or feed barley might be serious problem during one year but not at all during the following year. Unless long term reliable industry data is compiled, this may never be quantified.

A 'fair' price there remains a concept that may not be accurately determined in practice. (Also see Conclusion.)

4.9.5 Linking to malting barley price to the SAFEX wheat contract

Producers and agribusiness representatives were also asked whether they are satisfied with the current method of using wheat to hedge prices risk. Without exception everybody indicated that they were satisfied.

Senwes does all the marketing for Vaalharts producers. They all expressed their satisfaction with the wheat price model. GWK farmers indicated their satisfaction with the pricing model linked to wheat. Pricing is done internally by the trading division of GWK and likewise, are satisfied.

4.9.6 Price volatility and correlation

Volatility is known as the variability or movement of a trend. Historical volatility, which represents past price movements, is based on observed movements of price over a historical period, will be analysed in this section.

4.9.6.1 Method of calculation

The volatility of prices of barley and wheat is calculated using the standard deviations of the logarithm of prices in differences, thus:

$r = ln\frac{Pt}{Pt-1}$ which is the year- to- year logarithmic price change, therefore

$HV = \sqrt{\frac{1}{n-1}}\sum_{t=1}^{n}(ri - r)^2$ (Huchet-Bourdon, 2011)

A three year window is used to compute volatility; therefore volatility is computed over three years. This specific method is reasonable for two reasons. Firstly, it is more relevant for analysis that is conducted over a long history of price changes, in this case 30 years of price data is used. Secondly, it provides a homogenous analysis regardless of the observation frequency. The price data used in the analysis is sourced from the Abstract of Agricultural Statistics and Microsoft Excel was used to calculate the respective volatilities.

4.9.6.2 Price volatility of barley and wheat

Tables 4.12 and 4.13 and Figure 4.2 below depict the price volatility for barley and wheat , as calculated using the above mentioned formulae.

Table 4.12: Barley price volatility

Year	1986	1989	1992	1995	1998	2001	2004	2007	2010	2013
Barley	4.15	7.53	10.61	5.85	11.76	11.22	14.16	27.07	33.41	6.09

Source: Own calculations

Table 4.13: Wheat price volatility

Year	1986	1989	1992	1995	1998	2001	2004	2007	2010	2013
Wheat	3.72	19.72	5.38	7.10	14.92	1.37	18.49	29.19	36.36	10.47

Source: Own calculations

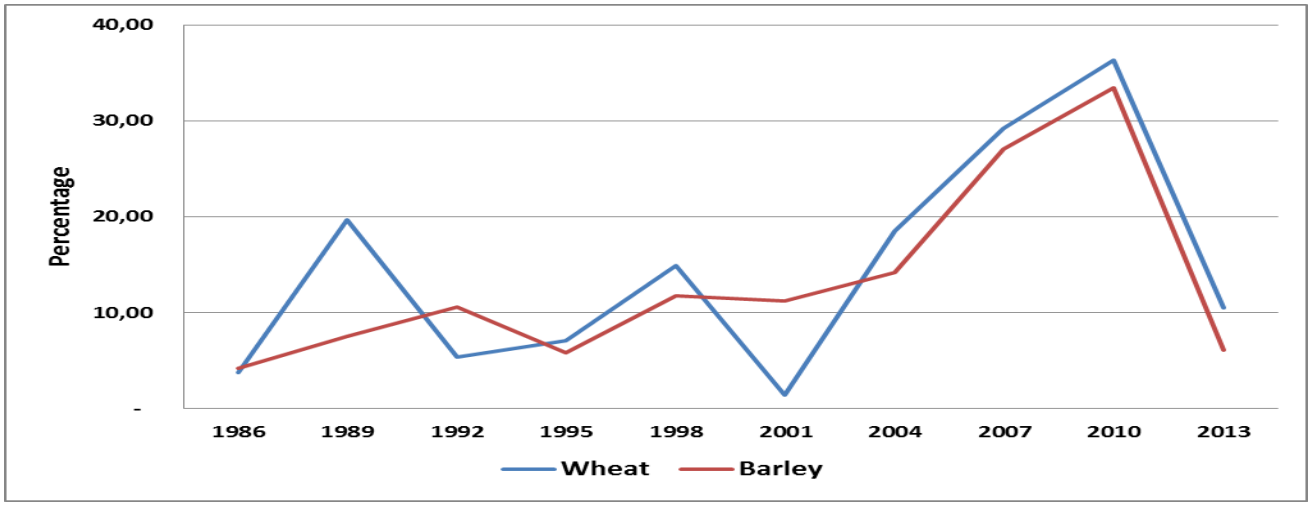

Figure 4.2: Price volatility of barley vs. wheat
Source: Own calculations

From Figure 4.2 it can be seen that wheat tends to be slightly more volatile that barley, and over the last 10 years volatility for both wheat and barley has been rather high, with exception to the 2013, where both commodities experienced a lower volatility score. In 2013 volatility was extremely low at 6 % for barley. This implies that the prices were rather constant and not much variation was experienced during that period, the 'constant' price trend could be attributed to the existing agreement between barley producers and SAB. Also it is worth noting that since about 2004, the volatility for both barley and wheat seem to exhibit the same pattern or trend, albeit with different calculated values.

4.9.6.3 Correlation

The correlation between wheat and barley annual prices is 0.942348. The correlation is extremely high, almost close to one, which should be expected as barley prices are based on or linked to the SAFEX December wheat futures contract. The correlation coefficient simply states that the two price series are positively related, thus if one should increase, the one should in all practical terms do the same.

4.9.6.4 Seasonal price volatility

Daily SAFEX December wheat prices for 2012, 2013 and 2014 were used to calculate the seasonal volatility of wheat. The prices seemed to be most volatile in 2012 as seen in the figure below.

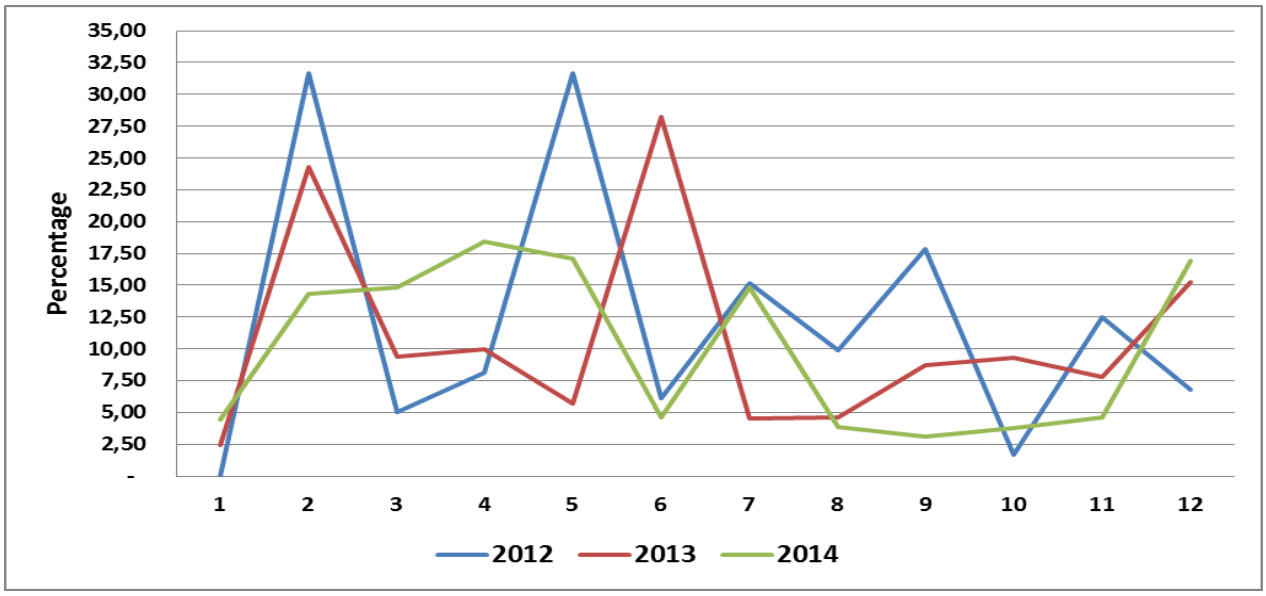

Figure 4.3: Seasonal price volatility wheat
Source: Own calculations

4.9.7 Yield volatility

Table 4.14 and Figure 4.4 below depict the yield volatility for barley and wheat. The barley yield in the irrigation areas is distinguished from the yield in the SC, since the SC uses dry land irrigation.

Table 4.14: Yield volatility

Year	2000	2003	2006	2009	2012	2014
Barley(Irrigated)	47.34	18.94	9.5	9.67	19.68	5.02
Barley(Dry land-SC)	77.07	22.95	31.7	22.12	44.97	11.62
Wheat	20.95	6.5	4.17	5.28	2.18	5.8

Source: Own calculations

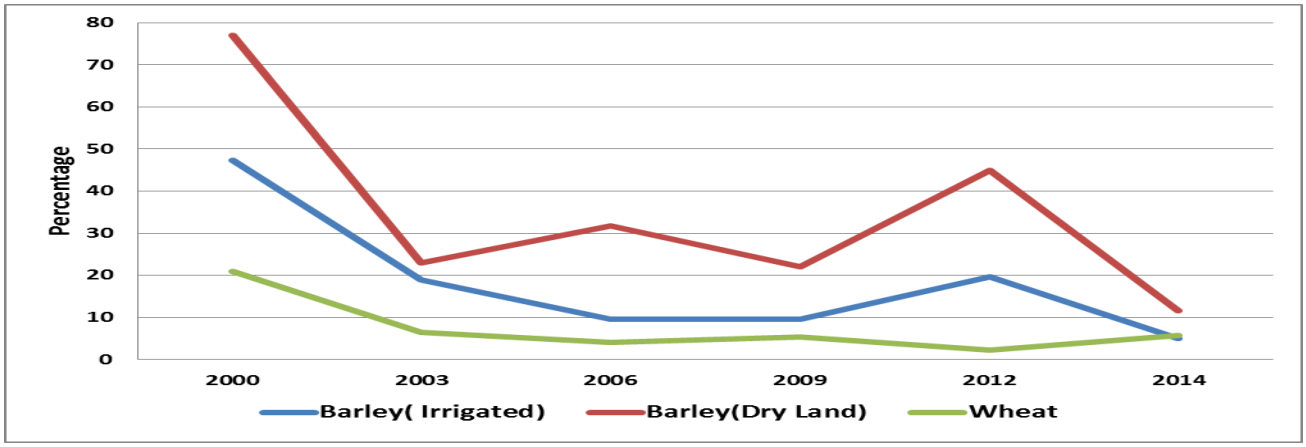

Figure 4.4: Yield volatility of barley vs. wheat
Source: Own calculations

Barley yields in the dry land are the most volatile when compared against wheat and irrigation areas barley yields. The barley yields in the irrigated areas have become less volatile over time and one can say that wheat yields are the least volatile of the three sets of data.

4.9.8 International price difference between wheat and barley

There were two studies done, one by Henk Geyer which indicated that barley trades at a 8% discount to wheat on the international markets, and another by Hennie Gouws (at that time with GWK) over a 20 year period. Geyer was interviewed but since he has left Senwes, the results could not be obtained. The study by Gouws could not be verified.

Re-analysing the price relationship fell outside of the scope of this study. Nonetheless, recent research undertaken by the USDA has been outlined and referenced (see 2.3.5.2).

4.9.9 Import parity price of malting barely

Like any other coarse grain, the price of barley and that of malting barley follows the general trend of the world markets. Figure 4.5 below, illustrates how significant the volatility of barley prices are in Europe and Russia.

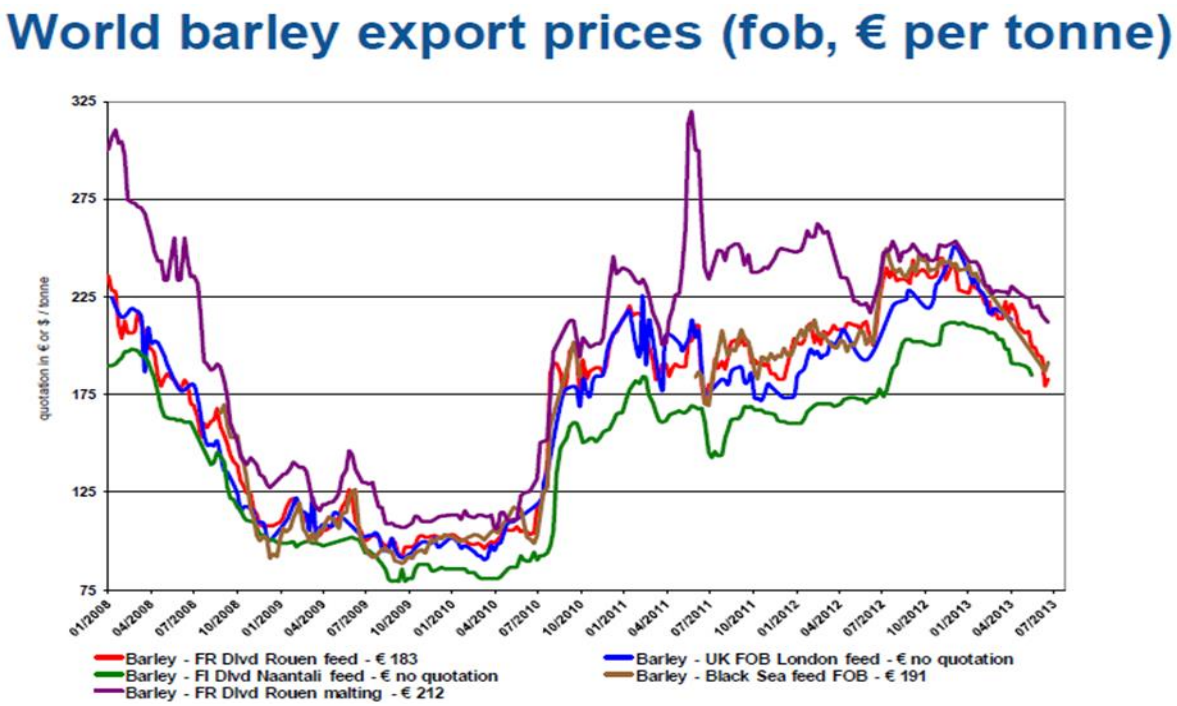

Figure 4.5: World barley export prices
Source: EU, 2013

As explained in 2.3.5, there are no formal markets for malting barley. Malting barley is typically traded at a premium to feed barley and varies from country to country depending on quantity available that season, quality demand from brewers and old or new season stock, etc.

The current fob price of French feed grain barley is trading at around $240 (GrainSA, 2013). This compares to the price of malting barley of around €218 (U$280) fob per ton Mosel and Scandinavia around €208. The UK is trading at a discount of €2 to Scandinavia and €5 to France (Tendency, 2013). (€218 = US$280 @ U$1.2850=€1.00).

When compared to Canada and the US, Canadian new crop malting barley fob Vancouver is quoted at US$263 per ton, a premium of around U$25 per ton. Note: all crop prices are much higher (U$320 to 335) (€231 to 240) (Tendency, 2013; Government of Saskatchewan, 2013; Agrimoney, 2013). Also keep in mind that within the Northern Hemisphere countries are potentially looking for record or near record crop, and prices are not only declining but are extremely volatile.

Table 4.15: Import parity: Canadian malting barley

IMPORT PARITY: CANADIAN MALTING BARLEY	**US$/ton**
SSCW 2 row:Vancouver fob	263
Freight	42
Cif Durban (U$)	305
Exchange rate	10.00
Cif Durban (Rand)	**R 3 047**
Discharge cost harbour	100
Transport Alrode	280
Landed price Alrode	**R 3 427**
Safex Dec13 (8 July 13)	3434
Difference: Imp - local	-7
Notes: 1. Caculation not exact due to volatile prices & exchange rates 2. Assume B2 disc. & 8% = premiums	

Source: Government of Saskatchewan and own calculations, 2013

Import values illustrate that South African prices are in line with international prices. Take into account that although an importer might pay a premium for HFM cultivars the bulk of local cultivars (Puma and Cocktail) are MFM or standard cultivars. Marthé and Cristalia are considered potential HFM cultivars but are still under experimental production.

Note: South Africa also imports malt (malting barley that has been converted into malt) which is lighter than malting barley, has value added and has a different pricing structure. This, however, falls outside of the scope of this study.

4.9.10 Supplying Alrode from alternative origins, mill-door cost

The following may be said about whether or not Alrode could be supplied by areas other than the NC irrigation areas:

- SAB for the second year of a three year programme is experimenting with cultivars in the MGK area (Loskop and Brits irrigation areas). Other than producers having to master the product techniques of a new product, the final product will be similar to malting barley from other origins. What makes the area different is its close proximity to the Gauteng market, meaning producers have much choice in what to grow, specifically including all the fresh produce options. This might mean that SAB will have to pay more to be financially competitive.
- Alrode presently has a capacity of 42 000 tons malt. Approximately 55 000 tons of malting barley is produced in the inland irrigation areas and this is more than adequate to supply Alrode. Little or no malting barley is sourced elsewhere, except for quality purposes, if needed.
- With an initial expansion to a capacity of 130 000 tons of malt, the demand for malting barley will be on average three times more. At full capacity the plant will require 190 000 tons of malting barley. From a quality point of view, there is no reason why this could not be in part be supplied from the Cape or elsewhere. Storage capacity, however, is crucial since cultivars need to be stored separately and currently Alrode has limited storage facilities.
- If quality is not an issue or even for a limited number of tons, calculating the mill door cost is a relatively simple exercise. Below in Table 4.16 a mill door comparison was done supplying malt barley from the Cape to Alrode as an alternative. Fortunately for irrigation producers, the 2% premium paid to Cape barley producers works against them in this case.

Table 4.16: Alrode mill door comparisons, Hartswater and Cape

PRICE FORMULA		
Example (2012/13)	**Hartswater**	**Cape**
Safex price	3 400	3 400
minus Location differential (e.g. Hartswater)	-224	-420
minus Safex B2 grade discount	-135	-135
Sub-total (base price)	3 041	2 845
minus Factor adjustment (-8% / +2%)	-243	57
Total (before premiums)	2 798	2 902
Transport (road) to Alrode	350	450
Landed price Alrode	3 148	3 352
* Storage cost should also be taken into account. Sometimes barley is stored at Regina.		
** Transport rates could vary depending on back-load and time of season.		

Source: Own calculations

4.10 SUMMARY

Production cost data obtained from GWK indicates that producers earn substantially more from the production of barley than from wheat. Budgeted figures in the Douglas areas show a gross income per hectare of R5 584 per hectare for barley against R2 246 per hectare for wheat, the actual numbers are higher. The compatible numbers for Vaalharts are R7 647 and R4 857, respectively. When the two sets of numbers are compared, barley is a better proposition against wheat in the GWK area. Gross profitability is 148% higher per hectare than in the Vaalharts area, which is only 57% higher.

This, however, is not the only benefit, and the benefits of an early maturing crop and fusarium resistance, rank as two of the main additional advantages in a high intensity production environment.

There is no doubt that the production of barley requires a higher degree of management skills and commitment. Lodging and the possibility of a downgrade to feed barley were listed as two of the key problem areas. Fortunately, the professional assistance of SAB field personnel is invaluable.

Adjusting to the production of new cultivars brings its own challenges; however, in the long run the introduction of potential HFM cultivars such as Marthé and Cristalia is also beneficial

for producers. This could result in fewer imports by SAB and more opportunity for producers. It does appear that an expansion in production allocations will easily and eagerly be taken up by producers. Rotational alternatives do exist but they are limited and often linked to the preference of a particular farming enterprise.

In the medium and long term, producers will benefit from alternative buyers and uses that are entering the industry. Even only a slightly more diversified industry on the demand side will be healthy in the long run.

In terms of price determination, SAB has changed their pricing formula from a cost- plus basis to a free market price in 2009, as South Africa already had a functional wheat futures market. The methodology used import parity to represent the upper price band and production costs as the lower price band, thereafter the most likely scenario was determined using a simulation model and compared to the price of wheat. As per the new price formula, SAB purchases barley at an 8% discount to wheat in the NC.

Prices currently paid by SAB based on the SAFEX wheat price are competitive when compared to the import cost of malting barley irrespective whether it is a HFM cultivar, a MFM or standard malting barley.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

The main objective of the study was to analyse the production of barley against that of wheat and whether the financial incentive is adequate to justify the current risk but also future expansion.

SAB is expected to increase its locally sourced barley from 65% to around 90 to 95% by 2015, which indicates that there is sufficient demand for locally produced barley. In addition, the introduction of potential HFM cultivars provides SAB the opportunity to reduce their imports and a growth opportunity for local barley producers.

Producers earn sustainably more form barley that wheat, which in relation with the benefits of barley as an early maturing crop and its fusaruim resistance proves that despite the 8% deduction by SAB. There is an adequate financial incentive for the production of malting barley. Additional management skills and commitment required in the production of barley seem to be offset by the additional benefits.

Although, early maize which may result in higher yields and profitability, early groundnuts and/ or cotton and double cropping of maize are possible alternative crops. These alternatives are not prominent enough and producers consider wheat to be the most profitable alternative to barley.

In the study reference was made to certain additional costs but based on available data, it appears that all additional costs have been incorporated in the production cost and were taken into account by SAB when the discount factor was determined

One area that needs further investigation is to determine a more accurate percentage of feed barley produced. This also relates to the percentage of lodging. Although figures were obtained from GWK as to the quantity of feed barley delivered to the silo, it is not clear whether this has been included in the overall production tons per hectare. Also, it is known

whether some producers end up with feed barley on-farm that was not delivered, but again no data exist to accurately quantify this.

Based on information obtained, there is no justification for a reduction in the 8% discount. Rather, if the incentive to produce barley vs. wheat has to be equalised, there may be merit in increasing the 8% discount. Importantly, there is also no reason why a producer should not benefit financially from producing barley, given the strategic importance for locally produced malting barley to SAB. Therefore, one can reject the hypothesis and conclude that barley in the Northern Cape irrigation areas is fairly or competitively priced in comparison to wheat after taking into account all production factors, risks and profitability of barley and wheat.

The original B2 discount included in the price-formula does warrant an adjustment. The quality of wheat delivered has improved to such a degree that at any time, 50 to 70% of wheat delivered, is of a B1 quality, putting barley at a disadvantage.

5.2 RECOMMENDATIONS

5.2.1 Data collection

The study was hampered by the collection of adequate and reliable data. It is recommended that the NC irrigation producers initiate a programme whereby adequate data is collected and made available annually to prospective interest groups. A set of predetermined data could be collected and made available on a website. This will also enable producers and other stakeholders to comment.

Some basic data already exists but it is not freely available or categorised for convenient usage and interpretation. Various sources had to be approached causing time delays, followed by interpretations that had to be aligned.

Other data is simply not available on some of the issues were raised in discussion. Probably the best example was the issue of ‘lodging’. Despite numerous references to this occurrence, there is no data available that may the assist the researcher to quantify the problem. Another example is feed barley; the implications of malting barley being downgraded to feed barley in

the irrigation areas are huge. Yet very limited data exists which made it impossible to quantify the problem.

Although outside of the scope of this study, if an attempt had to be made to quantify the relative difference in price between barley and wheat (the 8% factor), it will not be possible unless more basic information is collected as input to such a calculation.

5.2.2 Industry perspective

Although this study focussed exclusively on the irrigation areas, it still required an industry perspective. Hardly any recent studies are available. Not even the cost of importing malt barley or malt could be found. With a single buyer still dominating demand, it is recommended that producers commission a detailed industry overview. It should, however, not be a once-off affair, but be undertaken on the basis that it be repeated, say every three years, with selective updates every year. The malting barley industry in South Africa is large enough to justify such research but at the same time not as large or contentious (e.g. from a food security point of view) as the maize or wheat industry where interest is often self-initiated by industry stakeholders, including government.

5.2.3 Producer representation

Producers should also consider appointing a full time official to look after the interest of the irrigation malting barley producers or even better, all malting barley producers nationwide. Several similar producer organisations exist and it is relative easy to determine if such producer organisation adds benefit to producer interests. Note: this is in addition to current structures for organised agriculture.

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ANNEXURE 1

QUALITY ASPECT						
PLUMPNESS		PERCENTAGE	% OF PRICE COCKTAIL	% OF PRICE OTHER	PRICE FACTOR COCKTAIL Crop 12	PRICE FACTOR OTHER Crop 12
PLUMPNESS		70%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		71%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		72%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		73%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		74%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		75%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		76%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		77%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		78%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		79%	0.00%	0.00%	R 0.00	R 0.00
PLUMPNESS		80%	0.66%	0.00%	R 18.35	R 0.00
PLUMPNESS		81%	0.73%	0.00%	R 20.30	R 0.00
PLUMPNESS		82%	0.80%	0.00%	R 22.24	R 0.00
PLUMPNESS		83%	0.86%	0.00%	R 23.91	R 0.00
PLUMPNESS		84%	0.93%	0.00%	R 25.86	R 0.00
PLUMPNESS		85%	1.00%	0.66%	R 27.80	R 18.35
PLUMPNESS		86%	1.06%	0.73%	R 29.47	R 20.30
PLUMPNESS		87%	1.13%	0.80%	R 31.42	R 22.24
PLUMPNESS		88%	1.20%	0.86%	R 33.36	R 23.91
PLUMPNESS		89%	1.26%	0.93%	R 35.03	R 25.86
PLUMPNESS		90%	1.33%	1.00%	R 36.98	R 27.80
PLUMPNESS		91%	1.40%	1.06%	R 38.92	R 29.47
PLUMPNESS		92%	1.46%	1.13%	R 40.59	R 31.42
PLUMPNESS		93%	1.53%	1.20%	R 42.54	R 33.36
PLUMPNESS		94%	1.60%	1.26%	R 44.48	R 35.03
PLUMPNESS		95%	1.66%	1.33%	R 46.15	R 36.98
PLUMPNESS		96%	1.73%	1.40%	R 48.10	R 38.92
PLUMPNESS		97%	1.80%	1.46%	R 50.04	R 40.59
PLUMPNESS		98%	1.86%	1.53%	R 51.71	R 42.54
PLUMPNESS		99%	1.93%	1.60%	R 53.66	R 44.48
PLUMPNESS		100%	1.99%	1.66%	R 55.33	R 46.15

Source: NDA, 2013

QUALITY ASPECT									
SCREENINGS		PERCENTAGE	% OF PRICE ALL CULTIVARS	PRICE FACTOR Crop 12					
SCREENINGS		0.0%	4.00%	R 111.21	SCREENINGS	2.1%	1.50%	R 41.70
SCREENINGS		0.1%	4.00%	R 111.21	SCREENINGS	2.2%	1.50%	R 41.70
SCREENINGS		0.2%	4.00%	R 111.21	SCREENINGS	2.3%	1.50%	R 41.70
SCREENINGS		0.3%	4.00%	R 111.21	SCREENINGS	2.4%	1.50%	R 41.70
SCREENINGS		0.4%	4.00%	R 111.21	SCREENINGS	2.5%	1.50%	R 41.70
SCREENINGS		0.5%	4.00%	R 111.21	SCREENINGS	2.6%	1.50%	R 41.70
SCREENINGS		0.6%	4.00%	R 111.21	SCREENINGS	2.7%	1.50%	R 41.70
SCREENINGS		0.7%	4.00%	R 111.21	SCREENINGS	2.8%	1.50%	R 41.70
SCREENINGS		0.8%	4.00%	R 111.21	SCREENINGS	2.9%	1.50%	R 41.70
SCREENINGS		0.9%	4.00%	R 111.21	SCREENINGS	3.0%	1.50%	R 41.70
SCREENINGS		1.0%	4.00%	R 111.21	SCREENINGS	3.1%	0.43%	R 11.95
SCREENINGS		1.1%	4.00%	R 111.21	SCREENINGS	3.2%	0.43%	R 11.95
SCREENINGS		1.2%	4.00%	R 111.21	SCREENINGS	3.3%	0.43%	R 11.95
SCREENINGS		1.3%	4.00%	R 111.21	SCREENINGS	3.4%	0.43%	R 11.95
SCREENINGS		1.4%	4.00%	R 111.21	SCREENINGS	3.5%	0.43%	R 11.95
SCREENINGS		1.5%	4.00%	R 111.21	SCREENINGS	3.6%	0.43%	R 11.95
SCREENINGS		1.6%	4.00%	R 111.21	SCREENINGS	3.7%	0.43%	R 11.95
SCREENINGS		1.7%	4.00%	R 111.21	SCREENINGS	3.8%	0.43%	R 11.95
SCREENINGS		1.8%	4.00%	R 111.21	SCREENINGS	3.9%	0.43%	R 11.95
SCREENINGS		1.9%	4.00%	R 111.21	SCREENINGS	4.0%	0.43%	R 11.95
SCREENINGS		2.0%	4.00%	R 111.21	SCREENINGS	4.1%	0.00%	R 0.00
					SCREENINGS	4.2%	0.00%	R 0.00
					SCREENINGS	4.3%	0.00%	R 0.00
					SCREENINGS	4.4%	0.00%	R 0.00
					SCREENINGS	4.5%	0.00%	R 0.00
					SCREENINGS	4.6%	0.00%	R 0.00
					SCREENINGS	4.7%	0.00%	R 0.00
					SCREENINGS	4.8%	0.00%	R 0.00
					SCREENINGS	4.9%	0.00%	R 0.00
					SCREENINGS	5.0%	0.00%	R 0.00

Source: NDA, 2013

QUALITY ASPECT						
NITROGEN		PERCENTAGE	% OF PRICE COCKTAIL	% OF PRICE OTHER	PRICE FACTOR COCKTAIL Crop 12	PRICE FACTOR OTHER Crop 12
NITROGEN		1.50%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.51%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.52%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.53%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.54%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.55%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.56%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.57%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.58%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.59%	3.5%	0%	R 97.31	R 0.00
NITROGEN		1.60%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.61%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.62%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.63%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.64%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.65%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.66%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.67%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.68%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.69%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.70%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.71%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.72%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.73%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.74%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.75%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.76%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.77%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.78%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.79%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.80%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.81%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.82%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.83%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.84%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.85%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.86%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.87%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.88%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.89%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.90%	3.5%	3.5%	R 97.31	R 97.31
NITROGEN		1.91%	0%	0%	R 0.00	R 0.00
NITROGEN		1.92%	0%	0%	R 0.00	R 0.00
NITROGEN		1.93%	0%	0%	R 0.00	R 0.00
NITROGEN		1.94%	0%	0%	R 0.00	R 0.00
NITROGEN		1.95%	0%	0%	R 0.00	R 0.00
NITROGEN		1.96%	0%	0%	R 0.00	R 0.00
NITROGEN		1.97%	0%	0%	R 0.00	R 0.00
NITROGEN		1.98%	0%	0%	R 0.00	R 0.00
NITROGEN		1.99%	0%	0%	R 0.00	R 0.00
NITROGEN		2.00%	0%	0%	R 0.00	R 0.00

Source: NDA, 2013

QUALITY ASPECT				
MOISTURE		PERCENTAGE	% OF PRICE ALL CULTIVARS	PRICE FACTOR Crop 12
MOISTURE		8.0%	3.5%	R 97.31
MOISTURE		8.1%	3.5%	R 97.31
MOISTURE		8.2%	3.5%	R 97.31
MOISTURE		8.3%	3.5%	R 97.31
MOISTURE		8.4%	3.5%	R 97.31
MOISTURE		8.5%	3.5%	R 97.31
MOISTURE		8.6%	3.5%	R 97.31
MOISTURE		8.7%	3.5%	R 97.31
MOISTURE		8.8%	3.5%	R 97.31
MOISTURE		8.9%	3.5%	R 97.31
MOISTURE		9.0%	3.5%	R 97.31
MOISTURE		9.1%	3.5%	R 97.31
MOISTURE		9.2%	3.5%	R 97.31
MOISTURE		9.3%	3.5%	R 97.31
MOISTURE		9.4%	3.5%	R 97.31
MOISTURE		9.5%	3.5%	R 97.31
MOISTURE		9.6%	3.4%	R 94.53
MOISTURE		9.7%	3.3%	R 91.75
MOISTURE		9.8%	3.2%	R 88.97
MOISTURE		9.9%	3.1%	R 86.18
MOISTURE		10.0%	3.0%	R 83.40
MOISTURE		10.1%	2.9%	R 80.62
MOISTURE		10.2%	2.8%	R 77.84
MOISTURE		10.3%	2.7%	R 75.06
MOISTURE		10.4%	2.6%	R 72.28
MOISTURE		10.5%	2.5%	R 69.50
MOISTURE		10.6%	2.4%	R 66.72
MOISTURE		10.7%	2.3%	R 63.94
MOISTURE		10.8%	2.2%	R 61.16
MOISTURE		10.9%	2.1%	R 58.38
MOISTURE		11.0%	2.0%	R 55.60
MOISTURE		11.1%	1.9%	R 52.82
MOISTURE		11.2%	1.8%	R 50.04
MOISTURE		11.3%	1.7%	R 47.26
MOISTURE		11.4%	1.6%	R 44.48
MOISTURE		11.5%	1.5%	R 41.70
MOISTURE		11.6%	1.4%	R 38.92
MOISTURE		11.7%	1.3%	R 36.14
MOISTURE		11.8%	1.2%	R 33.36
MOISTURE		11.9%	1.1%	R 30.58
MOISTURE		12.0%	1.0%	R 27.80
MOISTURE		12.1%	0.9%	R 25.02
MOISTURE		12.2%	0.8%	R 22.24
MOISTURE		12.3%	0.7%	R 19.46
MOISTURE		12.4%	0.6%	R 16.68
MOISTURE		12.5%	0.5%	R 13.90
MOISTURE		12.6%	0.4%	R 11.12
MOISTURE		12.7%	0.3%	R 8.34
MOISTURE		12.8%	0.2%	R 5.56
MOISTURE		12.9%	0.1%	R 2.78
MOISTURE		13.0%	0.0%	R 0.00

QUALITY ASPECT				
FOREIGN MATTER		PERCENTAGE	% OF PRICE ALL CULTIVARS	PRICE FACTOR Crop 12
FOREIGN MATTER		0.0%	1.27%	R 35.31
FOREIGN MATTER		0.1%	1.27%	R 35.31
FOREIGN MATTER		0.2%	1.27%	R 35.31
FOREIGN MATTER		0.3%	1.27%	R 35.31
FOREIGN MATTER		0.4%	1.27%	R 35.31
FOREIGN MATTER		0.5%	1.27%	R 35.31
FOREIGN MATTER		0.6%	1.27%	R 35.31
FOREIGN MATTER		0.7%	1.27%	R 35.31
FOREIGN MATTER		0.8%	1.27%	R 35.31
FOREIGN MATTER		0.9%	1.27%	R 35.31
FOREIGN MATTER		1.0%	1.27%	R 35.31
FOREIGN MATTER		1.1%	0.00%	R 0.00
FOREIGN MATTER		1.2%	0.00%	R 0.00
FOREIGN MATTER		1.3%	0.00%	R 0.00
FOREIGN MATTER		1.4%	0.00%	R 0.00
FOREIGN MATTER		1.5%	0.00%	R 0.00
FOREIGN MATTER		1.6%	0.00%	R 0.00
FOREIGN MATTER		1.7%	0.00%	R 0.00
FOREIGN MATTER		1.8%	0.00%	R 0.00
FOREIGN MATTER		1.9%	0.00%	R 0.00
FOREIGN MATTER		2.0%	0.00%	R 0.00

Source: NDA, 2013

ANNEXURE 2

STAATSKOERANT, 17 DESEMBER 2010 No. 33860 5

GOVERNMENT NOTICES
GOEWERMENTSKENNISGEWINGS

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES
DEPARTEMENT VAN LANDBOU, BOSBOU EN VISSERYE

No. R. 1184 17 December 2010

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

AGRICULTURAL PRODUCT STANDARDS ACT, 1990
(ACT No. 119 OF 1990)

Source: NDA, 2010

No. R. 1186 **17 December 2010**

AGRICULTURAL PRODUCT STANDARDS ACT, 1990
(ACT No. 119 OF 1990)

REGULATIONS RELATING TO THE GRADING, PACKING AND MARKING OF BREAD WHEAT INTENDED FOR SALE IN THE REPUBLIC OF SOUTH AFRICA

The Minister of Agriculture, Forestry and Fisheries, acting under section 15 of the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990), has

(a) made the regulations in the Schedule;

(b) determined that the said regulations shall come into operations on the date of publication; and

(c) repealed the regulations published in Government Notice No's R. 905 of 10 July 1998 as amended by R.1421 of 6 November 1998, R.876 of 14 September 2001, R.979 of 19 July 2002, and R.1210 of 29 August 2003.

SCHEDULE

Definitions

1. Unless the context otherwise indicates, any word or expression in these regulations to which a meaning has been assigned in the Act shall have that meaning, and;

"**animal rests**" means dead rodents, dead birds and dung;

"bag" means a bag manufactured from - -

(a) jute or phormium or a mixture of jute and phormium; or

(b) polypropylene that complies with SABS specification CKS632;

"bulk container" means any vehicle or container in which bulk wheat is stored or transported;

"**consignment**" means --

(a) a quantity of wheat of the same class, which belongs to the same owner, delivered at any one time under cover of the same consignment note, delivery note or receipt note, or delivered by the same vehicle or bulk container, or loaded from the same bin of a grain elevator or from a ship's hold; or

(b) in the case where a quantity referred to in paragraph (a), is subdivided into different grades, each such quantity of each of the different grades;

"container" means a bag or bulk container;

"**cultivar list**" means the list of cultivars determined from time to time by the Executive Officer: Agricultural Product Standards and which is obtainable from the Executive Officer: Agricultural Product Standards, Private Bag X258, Pretoria, 0001;

"**damaged wheat**" means wheat --

(a) which have been damaged by insects;

(b) which have been distinctly discoloured (orange-brown, dark brown or black) by external heat or as a result of heating caused by internal fermentation in wheat with an excessive

Source: NDA, 2010

PART I

QUALITY STANDARDS

Classes of wheat

3. The classes of wheat are --

(a) Bread Wheat; and

(b) Other Wheat.

Standards for classes

4. (1) Notwithstanding the provisions of sub regulations (2) and (3), all consignments of wheat must --

(a) be free from any toxin, chemical or other substances that renders it unsuitable for human consumption or for processing into or utilisation thereof as food or feed and may not exceed the permissible deviations regarding aflatoxin in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);

(b) contain not more poisonous seeds or ergot sclerotia than permitted in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);

(c) be free from organisms of phytosanitary importance as determined in terms of the Agricultural Pest Act, 1983 (Act No. 36 of 1983);

(d) be free from mould infected, sour and rancid other grain, foreign matter and any other matter;

(e) be free from any undesired odour, taste or colour not typical of undamaged and sound wheat;

(f) be free from animal rests;

(g) with the exception of Other Wheat, be free from insects;

(h) with the exception of Other Wheat, be free from stinking smut infection; and

(i) with the exception of Other Wheat, have a moisture content not exceeding 13 per cent.

(2) A consignment shall be classified as Bread Wheat if --

(a) the wheat in the consignment consists of at least 95 per cent (m/m) of one or more of the bread wheat cultivars specified in the cultivar list; and

(b) it complies with the standards for Grade 1, Grade 2, Grade 3, Grade 4 or Utility Grade set out in regulation 6.

(3) A consignment of wheat shall be classified as Other Wheat if it does not comply with the standards for Bread Wheat.

Grades of wheat

5. (1) The grades for Bread Wheat shall be as follows:

(a) Grade 1;

(b) Grade 2;

Source: NDA, 2010

(c) Grade 3;

(d) Grade 4; and

(e) Utility grade.

(2) No grades are determined for Other Wheat.

Standards for grades of wheat

6. (1) Subject to the provisions of subregulations (2), (3) and (4), a consignment of wheat shall be graded as --

(a) Grade 1 if the nature of deviation, specified in column 1 of Table 1 of the Annexure, in that consignment does not exceed the percentage specified in column 2 of the said table opposite the deviation concerned;

(b) Grade 2 if the nature of deviation, specified in column 1 of Table 1 of the Annexure, in that consignment does not exceed the percentage specified in column 3 of the said table opposite the deviation concerned;

(c) Grade 3 if the nature of deviation, specified in column 1 of Table 1 of the Annexure, in that consignment does not exceed the percentage specified in column 4 of the said table opposite the deviation concerned;

(d) Grade 4 if the nature of deviation, specified in column 1 of Table 1 of the Annexure, in that consignment does not exceed the percentage specified in column 5 of the said table opposite the deviation concerned; and

(e) Utility Grade if the nature of deviation, specified in column 1 of Table 1 of the Annexure, in that consignment does not exceed the percentage specified in column 6 of the said table opposite the deviation concerned.

(2) The minimum hector litre masses for the different grades are as follows:

(a) Grade 1 - 77 kg;

(b) Grade 2 - 76 kg;

(c) Grade 3 - 74 kg;

(d) Grade 4 - 72 kg; and

(e) Utility Grade - 70 kg.

(3) (a) Grade 1, Grade 2 and Grade 3 shall have a minimum falling number value of not less than 250 seconds;

(b) Grade 4 shall have a minimum falling number value of not less than 200 seconds.

(c) Utility Grade shall have a minimum falling number value of not less than 150 seconds.

(d) Notwithstanding the provision of paragraph (a), wheat shall be deemed to comply with the requirements of the paragraph concerned if it deviates with not more than 30 seconds lower than the minimum prescribed for Grade 1, Grade 2 and Grade 3, as the case may be.

Source: NDA, 2010

(4) The minimum protein content (on a 12 per-cent moisture basis) for the different grades shall be as follows:

(a) Grade 1 - 12 per cent;

(b) Grade 2 - 11 per cent;

(c) Grade 3 - 10 per cent;

(d) Grade 4 - 9 per cent; and

(e) Utility Grade - 8 per cent.

PART II

PACKING AND MARKING REQUIREMENTS

Packing requirements

7. Wheat of different grades shall be packed in different containers, or stored separately.

Marking requirements

8. (1) Every container or the accompanying sale documents of a consignment of wheat shall be marked or endorsed by means of appropriate symbols specified in subregulation (2), with --

(a) the class of the wheat; and

(b) the grade.

(2) The symbols referred to in subregulation (1) shall appear in the order of class and grade.

(3) The symbols used to indicate the different --

(a) classes shall be --

(i) B in the case of Bread Wheat; and

(ii) O in the case of Other Wheat;

(b) grades shall be --

(i) 1 in the case of Grade 1;

(ii) 2 in the case of Grade 2;

(iii) 3 in the case of Grade 3;

(iv) 4 in the case of Grade 4; and

(v) UT in the case of Utility Grade.

PART III

SAMPLING

Taking of sample

9. (1) A sample of a consignment of wheat shall --

Source: NDA, 2010

ANNEXURE/AANHANGSEL

TABLE 1/TABEL 1

STANDARDS FOR GRADES OF BREAD WHEAT/
STANDAARDE VIR GRADE VAN BROODKORING

"

Nature of deviation/ Aard van afwyking	Maximum percentage permissible deviation (m/m)/ Maksimum persentasie toelaatbare afwyking (m/m)				
	Grade 1/ Graad 1	Grade 2/ Graad 2	Grade 3/ Graad 3	Grade 4/ Graad 4	Utility Grade/ Utiliteit-graad
1	3	4	5	6	7
(a) Heavily frost-damaged kernels/ Erg rypbeskadigde korrels	5	5	5	5	10
(b) Field fungi infected kernels/Land-swambesmette korrels	2	2	2	2	2
(c) Storage fungi infected kernels/ Opbergingswambesmette korrels	0,5	0,5	0,5	0,5	0,5
(d) Screenings/Sifsels	3	3	3	4	10
(e) Other grain and unthreshed ears/ Ander graan en ongedorste are	1	1	1	1	4
(f) Gravel, stones, turf and glass/ Gruis, klippies, turf en glas	0,5	0,5	0,5	0,5	0,5
(g) Foreign matter including gravel, stones, turf and glass: Provided that such deviations are individually within the limits specified in item (f)/ Vreemde voorwerpe met inbegrip van gruis, klippies, turf en glas: Met dien verstande dat sodanige afwykings individueel binne die perke is in item (f) aangegee	1	1	1	1	3
(h) Heat-damaged kernels/Hittebeskadigde korrels	0,5	0,5	0,5	0,5	0,5

Source: NDA, 2010

Nature of deviation/ Aard van afwyking	Maximum percentage permissible deviation (m/m)/ Maksimum persentasie toelaatbare afwyking (m/m)				
	Grade 1/ Graad 1	Grade 2/ Graad 2	Grade 3/ Graad 3	Grade 4/ Graad 4	Utility Grade/ Utiliteit-graad
1	3	4	5	6	7
(i) Damaged kernels, including heat-damaged kernels: Provided that such deviations are individually within the limit specified in item (h) and provided further that the minimum falling number value prescribed in regulation 6(3) for the grade concerned is at least complied with/Beskadigde korrels met inbegrip van hittebeskadigde korrels: Met dien verstande dat sodanige afwyking individueel binne die perke is in item (h) aangegee en met dien verstande voorts dat minstens aan die minimum valgetalwaarde in regulasie 6(3) vir die betrokke graad voorgeskryf, voldoen word	2	2	2	2	5
(j) Deviations in items (d), (e), (g) and (i) collectively: Provided that such deviations are individually within the limits of the said items/ Afwykings in items (d), (e), (g) en (i) gesamentlik: Met dien verstande dat sodanige afwykings individueel binne die perke van genoemde items is	5	5	5	5	10

"

Source: NDA, 2010

GOVERNMENT NOTICE

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

No. R. 443 **21 June 2013**

AGRICULTURAL PRODUCT STANDARDS ACT, 1990
(ACT No. 119 OF 1990)

REGULATIONS RELATING TO THE GRADING, PACKING AND MARKING OF MALTING BARLEY INTENDED FOR SALE IN THE REPUBLIC OF SOUTH AFRICA

The Minister of Agriculture, Forestry and Fisheries, acting under section 15 of the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990),

(a) made the regulations set out in the Schedule; and

(b) determined that the said regulations shall come into operation on the date of publication.

SCHEDULE

Definitions

1. In these regulations any word or expression to which a meaning has been assigned in the Act shall have that meaning and, unless the context otherwise indicates --

"animal rests" means dead rodents, dead birds and dung

"artificially dried barley" means barley from which moisture has been removed by unnatural and/or mechanical means;

"bag" means a bag manufactured from - -

(a) jute or phormium or a mixture of jute and phormium; or

(b) polypropilene that complies with SABS specification CKS632;

"badly discoloured and heat-damaged barley" means barley kernels of which more than half of the kernel's husk has a distinctly lead-grey, brown or black colour or where the endosperm of the germ-end is distinctly brown to black;

"badly mould infected (rotten) barley" means barley kernels infected by storage mould and of which more than half of the kernel is covered by mould and/or is visually infected by mould or bacteria and has gone soft or are discoloured;

"barley" means kernels and pieces of kernels of the genus *Hordeum*;

"black-end barley" means barley kernels in which the colour of the germ-end is clearly dark brown to black and at least one third of the kernel is discoloured and the discolouration is visible on both sides (palea and lemma) of the kernel;

"black-hulled barley" means barley kernels in which the glumes are totally black in colour

"bulk container" means any vehicle or container in which bulk barley is stored or transported;

"**consignment**" means --

(a) a quantity of barley of the same class, which belongs to the same owner, delivered at any one time under cover of the same consignment note, delivery note or receipt note, or delivered by the same vehicle or bulk container, or loaded from the same bin of a grain elevator or from a ship's hold; or

(b) in the case where a quantity referred to in paragraph (a), is subdivided into different subclasses or grades, each such quantity of each of the different subclasses or grades;

Source: NDA, 2013

"sprouted barley" means barley in which germination has proceeded to such an extent that the husk adjacent to the embryo has been forced open and the shoot and primary rootlets are clearly visible;

"**the Act**" means the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990);

"**un-threshed ears**" means ears and bits of ears of barley, rye, triticale and wheat that still contain kernels that are completely covered with glumes;

"weather damaged barley" means barley that is visibly infected with field mould;

"**wheat**" means the kernels and pieces of kernels of the genus *Triticum*;

"wild oats" means kernels and pieces of kernels of the genus *Avena* excluding *Avena sativa, A nuda* and *A byzantina*;

Restrictions on sale of barley

2. (1) No person shall sell a consignment of barley in the Republic of South Africa --

(a) unless the barley is sold according to the classes set out in regulation 3;

(b) unless the barley complies with the standards for the classes set out in regulation 4;

(c) unless the barley, where applicable, complies with the grades of barley and the standards for grades set out in regulations 5 and 6 respectively;

(d) unless the barley is packed in accordance with the packing requirements set out in regulation 7;

(e) unless the containers or sale documents, as the case may be, are marked in accordance with the marking requirements set out in regulation 8; and

(f) if such barley contains a substance that renders it unfit for human consumption or for processing into or utilisation thereof as food or feed.

(2) The Executive Officer may grant written exemption, entirely or partially, to any person on such conditions as he or she may deem necessary, from the provisions of sub regulation (1).

PART I

QUALITY STANDARDS

Classes of barley

3. The classes of barley are –

(a) Class Malting Barley; and

(b) Class Other Barley.

Source: NDA, 2013

Standards for classes

4. (1) Notwithstanding the provisions of sub regulations (2) and (3), all consignments of barley must --

(a) be free from any toxin, chemical or other substances that renders it unsuitable for human consumption or for processing into or utilisation thereof as food or feed and may not exceed the permissible deviations regarding aflatoxin in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);

(b) contain not more poisonous seeds than permitted in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);

(c) be free from organisms of phytosanitary importance as determined in terms of the Agricultural Pest Act, 1983 (Act No. 36 of 1983);

(d) be free from musty, extreme mould infected, sour and rancid foreign matter and any other matter;

(e) be free from any undesired odour, taste or colour not typical of undamaged and sound barley;

(f) be free from animal rests;

(g) may not exceed the maximum residue levels prescribed for agricultural remedies that are allowed for the control of pests and diseases on barley in terms of Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);

(h) with the exception of Class Other Barley, be free from insects;

(i) with the exception of Class Other Barley, be free from smut infection; and

(j) with the exception of Class Other Barley, have a moisture content not exceeding 13 per cent.

(2) A consignment shall be classified as Class Malting Barley if --

(a) the barley in the consignment consists of at least 95 per cent (m/m) of one of the malting barley cultivars specified in the cultivar list; and

(b) it complies with the standards for Grade Malting Barley set out in regulation 6.

(3) A consignment of barley shall be classified as Class Other Barley if it does not comply with the standards for Class Malting Barley.

Grades of barley

5. (1) The grade for Class Malting Barley shall be Grade Malting Barley.

(2) No grades are determined for Class Other Barley.

Standards for grades of barley

6. (1) A consignment of barley shall be graded as --

Source: NDA, 2013

(a) whether it contains a substance that renders the barley unfit for human consumption or for processing into or for utilisation as food or feed; and

(b) whether it has a mouldy, sour, rancid or other undesirable odour: Provided that a working sample of unscreened barley that is ground in a grain mill to a fine meal may be used for the determination concerned.

PART V

DETERMINATION OF CLASS, MOISTURE CONTENT, NITROGEN CONTENT, GERMINATION CAPACITY AND GERMINATION ENERGY

Determination of class

13. The class of a consignment of barley shall be determined as follows:

(a) Take at least 100 g un-rubbed and unscreened barley and remove all un-threshed ears and foreign matter by hand.

(b) Obtain a working sample of at least 25 g after all un-threshed ears and foreign matters have been removed and separate the different cultivars.

(c) Determine the mass of the cultivar that belongs according to the cultivar list to the class malting barley and express the mass thus determined as a percentage of the mass of the working sample.

(d) Such percentage represents the percentage of the cultivar that belongs according to the cultivar list to the class malting barley in the consignment.

Determination of moisture content

14. The moisture content of consignment barley may be determined by any suitable method: Provided that the results thus obtained is in accordance with the maximum permissible deviation for a class 1 moisture meter as detailed in ISO 7700/1 based on the results of the 72 hour, 103°C oven dried method [AACC (American Association of Cereal Chemists) Method 44-15A].

Determination of Nitrogen content

15. The percentage of Nitrogen (on a dry basis) of a consignment of barley may be determined according to any suitable method: Provided that --

(a) the determination shall be conducted on a sample which had been sifted using a Nitrogen sieve and from which screenings have been removed through the sieving process and un-threshed ears and foreign matter have been removed by hand; and

(b) the results thus obtained are in accordance (± 0,03 per cent) with the results obtained by the European Brewery Convention EBC Method 3.3.2 (Dumas Combustion Method)

Determination of germination capacity

16. The germination capacity of a consignment of barley shall be determined according to the European Brewery Convention EBC method 3.5.2 (hydrogen peroxide and peeling method, RM)

Source: NDA, 2013

ANNEXURE 3

Table 10 – Wheat: area planted, production, producer prices, producer price index and gross value

Production year	Area planted[1]	Total production[2]	Gross value of production[2]	Producer prices[3]				Price index[6]	Marketing year: Oct. to Sep.
				BS1[4]		BL1[5]			
				Basic	Net	Basic	Net		
	1 000 ha	1 000 t	R1 000	R/ton				2005 = 100	
1970	1 930	1 396	94 118	68,17	68,15	66,63	66,52	6,3	1970/71
1971	2 010	1 670	119 372	71,31	70,65	69,66	69,00	6,5	1971/72
1972	2 017	1 746	121 469	73,58	69,61	70,28	66,31	6,4	1972/73
1973	2 025	1 871	146 050	81,09	78,78	77,79	75,48	7,3	1973/74
1974	1 865	1 596	156 631	101,21	98,90	97,91	95,60	9,2	1974/75
1975	1 839	1 792	188 895	107,80	106,04	104,50	102,74	9,7	1975/76
1976	1 959	2 248	272 927	121,35	121,24	118,05	117,94	11,2	1976/77
1977	1 828	1 879	228 408	121,35	121,24	118,05	117,94	11,2	1977/78
1978	1 895	1 699	230 071	136,35	136,18	132,26	132,09	12,5	1978/79
1979	1 903	2 092	385 567	185,21	185,00	179,65	179,44	17,5	1979/80
1980	1 627	1 490	313 765	215,20	215,00	208,74	208,54	20,3	1980/81
1981	1 812	2 356	556 089	241,40	240,40	234,16	233,16	22,7	1981/82
1982	2 013	2 448	705 031	295,00	294,00	286,75	285,75	27,8	1982/83
1983	1 819	1 786	480 935	275,00	274,00	266,75	265,75	25,9	1983/84
1984	1 942	2 346	690 202	299,00	298,00	290,03	289,03	28,1	1984/85
1985	1 983	1 691	534 916	325,00	322,00	315,25	312,25	30,4	1985/86
1986	1 946	2 333	864 521	376,80	375,30	366,00	364,50	35,4	1986/87
1987	1 749	3 154	1 257 265	405,00	403,50	393,07	391,57	38,1	1987/88
1988	2 009	3 557	1 220 682	353,75	351,75	343,25	341,25	33,2	1988/89
1989	1 843	2 033	929 947	458,25	452,50	446,68	440,93	42,1	1989/90
1990	1 563	1 709	879 422	521,43	515,14	505,79	499,50	47,9	1990/91
1991	1 436	2 142	1 321 345	653,32	620,76	643,95	611,39	57,7	1991/92
1992	750	1 324	923 083	748,24	713,09	737,09	701,94	66,3	1992/93
1993	1 075	1 984	1 492 808	801,48	750,69	789,44	738,65	69,9	1993/94
1994	1 048	1 840	1 389 553	770,50	754,90	747,38	728,14	70,2	1994/95
1995	1 363	1 977	1 568 773	846,78	802,58 [7]	821,38	777,18 [7]	73,3	1995/96
1996	1 294	2 712	2 454 054	966,02	909,44 [8]	937,04	880,46 [8]	84,6	1996/97
1997	1 382	2 429	1 986 183	817,75	#	876,00	#	76,1	1997/98
1998	745	1 892	1 529 163	808,19	#	#	#	75,1	1998/99
1999	718	1 733	1 664 750	960,60	#	#	#	84,7	1999/00
2000	934	2 428	2 829 568	1 165,35	#	#	#	102,1	2000/01
2001	974	2 504	3 559 642	1 421,61	#	#	#	126,3	2001/02
2002	941	2 438	3 832 257	1 572,05	#	#	#	142,8	2002/03
2003	748	1 547	2 209 104	1 428,14	#	#	#	136,2	2003/04
2004	830	1 687	1 841 746	1 091,43	#	#	#	109,4	2004/05
2005	805	1 913	1 978 500	1 033,99	#	#	#	100,5	2005/06
2006	765	2 114	3 222 670	1 524,19	#	#	#	152,7	2006/07
2007	632	1 913	4 794 330	2 505,58	#	#	#	273,9	2007/08
2008	748	2 149	4 957 581	2 307,46	#	#	#	228,0	2008/09
2009	642	1 967	3 161 796	1 607,67	#	#	#	168,0	2009/10
2010	558	1 436	3 308 895	2 303,68	#	#	#	232,3	2010/11
2011	605	2 014	4 771 103	2 369,08	#	#	#	229,4	2011/12
2012	511	1 878	5 474 416	2 914,55	#	#	#	271,6	2012/13
2013[9]	506	1 803	5 099 034	2 827,89	#	#	#	*	2013/14

Source: DAFF, 2013

Table 22 – Barley: area planted, production, producer prices and price index, gross value, deliveries and quantity processed

Production year	Area planted[1, 2]	Production[1]	Producer prices[3]		Price index[4]	Gross value	Deliveries[5, 6]	Processed[6]	Marketing year: Oct. to Sep.
			Basic	Net					
	1 000 ha	1 000 t	R/ton		2005 = 100	R1 000	Tons		
1975	74	69	100,19	100,08	7,7	6 685	57 811	41 087	1975/76
1976	88	73	105,00	104,89	8,1	7 786	71 287	44 149	1976/77
1977	90	106	105,00	104,89	8,1	11 598	88 606	46 853	1977/78
1978	98	135	120,75	115,58	8,8	15 089	126 032	46 707	1978/79
1979	107	141	125,75	120,54	9,2	15 871	106 970	56 879	1979/80
1980	68	60	182,92	176,97	13,5	10 146	53 311	78 424	1980/81
1981	69	106	210,02	209,02	15,9	20 259	95 770	91 631	1981/82
1982	64	110	247,50	246,50	18,7	26 696	93 780	89 896	1982/83
1983	79	154	247,50	246,50	18,7	37 712	139 826	103 143	1983/84
1984	87	173	269,00	268,00	20,4	46 220	170 380	120 372	1984/85
1985	101	256	296,00	240,00	18,2	52 716	245 816	158 322	1985/86
1986	91	199	301,50	295,00	22,4	53 328	177 219	164 982	1986/87
1987	100	280	330,00	323,50	24,6	88 186	247 806	171 764	1987/88
1988	80	126	320,00	318,00	24,2	41 081	103 329	151 745	1988/89
1989	97	266	356,20	350,00	26,6	94 449	242 822	192 322	1989/90
1990	110	262	464,15	457,39	35,1	119 252	239 338	212 075	1990/91
1991	135	170	606,00	520,18	39,9	83 458	169 145	193 090	1991/92
1992	134	265	657,70	586,12	44,5	150 160	260 264	238 616	1992/93
1993	116	230	729,72	671,29	51,0	150 703	210 186	221 659	1993/94
1994	120	275	729,04	671,79	51,0	195 676	265 799	226 616	1994/95
1995	125	300	802,78	720,11	54,7	233 469	297 904	221 243	1995/96
1996	127	174	896,27	790,87	60,1	140 409	167 919	110 422	1996/97
1997	132	178	800,00	#	60,8	145 600	277 000	258 000	1997/98
1998	112	200	750,00	#	57,0	152 866	203 821	252 738	1998/99
1999	102	92	758,24	#	59,2	70 068	92 400	262 400	1999/00
2000	78	116	800,00	#	59,7	92 961	116 200	257 200	2000/01
2001	73	131	1 000,00	#	72,2	131 400	131 400	286 300	2001/02
2002	72	180	1 200,00	#	87,3	215 863	179 900	274 700	2002/03
2003	84	240	1 433,00	#	104,4	343 920	238 400	269 600	2003/04
2004	83	185	1 342,30	#	101,9	248 326	181 400	266 500	2004/05
2005	90	225	1 142,80	#	93,5	257 129	222 800	264 900	2005/06
2006	90	236	1 576,42	#	82,7	372 036	232 600	280 300	2006/07
2007	73	223	1 381,40	#	116,3	307 360	216 900	270 800	2007/08
2008	68	224	2 300,31	#	181,3	514 400	189 800	272 100	2008-09
2009	75	216	2 125,90	#	149,4	459 194	214 100	238 600	2009-10
2010	83	194	2 006,34	#	165,4	389 230	192 100	270 700	2010-11
2011	80	312	2 277,23	#	176,8	710 495	311 600	289 000	2011-12
2012	85	298	2 502,30	#	193,3	745 684	297 423	319 443	2012/13
2013[7]	81	266	2 546,80	#	*	671 341	265 000	220 500	2013/14

Source: DAFF, 2013