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The valuation of commercial grain silos

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Abstract

A grain silo is a unique form of real estate because of its construction, use and income generation. The study is based on vertical concrete silos built for the sole purpose of storing grain. Silos are, in essence, income-producing properties, but because the tenant is the owner of grain and oilseed, the income produced by the silo fluctuates from year to year depending on the size of annual grain harvests. The purpose of this qualitative study is to establish which valuation methodology is best applicable to grain silos and to explore the factors that make grain silos unique in the determination of their value. Sources of information include historical research, unstructured interviews and case studies. The results of this study indicate that grain silos should be valued using the income capitalisation method. Income is calculated based on a long-term trend; expenses are calculated on financial information, and a capitalisation rate is calculated by adding risk to a baseline capitalisation rate. This study provides a guide to valuers and silo owners on how to determine the value of silos. The study focuses on grain silos that store maize and soya beans in the Highveld of Mpumalanga. The principles determined will be the same if other silos in other regions charge for storage and handling in the same way as used in this study.

Keywords: Grain silo, valuation methodology, income capitalisation method, occupancy, capitalisation rate

Abstrak

'n Graansilo is 'n unieke tipe eiendom as gevolg van konstruksie, gebruik en hoe inkomste verdien word. Die studie fokus op vertikale beton graansilos gebou uitsluitlik vir die stoor van graan. Silos is inkomsteproduserende eiendomme, maar omdat die huurder die eienaar van graan en oliesade is, is die inkomste wat 'n silo kan produseer wisselend gebaseer op die grootte van die jaarlikse oes. Die doelwit

van hierdie kwalitatiewe studie is om te bepaal op watter waardasiemetode 'n graansilo waardeer moet word en om die faktore te bepaal wat 'n silo uniek maak in die bepaling van die waarde. Die studie is gebaseer op historiese navorsing, ongestruktureerde onderhoude en 'n gevallestudie. Die bevindings van hierdie studie is dat graansilos op die gekapitaliseerde-inkomste-metode van waardasie gedoen moet word. Inkomste word bepaal deur 'n langtermyn gemiddeld of tendens in besetting te bepaal. Uitgawes word bepaal uit die finansiële inligting van die silo. Die kapitalisasiekoers word bepaal deur risiko by 'n basis kapitalisasiekoers te voeg. Die studie is 'n gids om waardeerders en silo-eienaars te help om die waarde van 'n graansilo te bepaal. Die studie konsentreer op graansilos in die hoëveld van Mpumalanga wat meestal mielies en sojabone stoor. Die beginsels wat bepaal word deur die studie sal dieselfde wees in ander areas van die land asook vir ander graantipes indien die stoor en hanteringsfooie op dieselfde manier toegepas word.

Sleutelwoorde: Graansilo, waardasiemetodes, gekapitaliseerde-inkomste-metode, besetting, kapitalisasiekoers.

1. Introduction

The valuation of grain silos is a complex exercise when one considers all the variables that affect their value.

Grain silos provide storage space for harvested grain products. These storage spaces are leased by farmers who have harvested their grains, larger grain-processing companies, traders, importers or exporters that have purchased the grain and need to store the grain until it is needed. The storage space is leased to the lessee at an amount-per-ton basis either at a daily rate or on a longer term rate. Grain silos are, therefore, income-producing properties of a specialised nature, due to their unique characteristics, construction, buyers and sellers.

The demand for this type of storage is driven by the supply of grain which needs to be stored; the supply of grain, in turn, is dependent on the yield that the farmer has on his farm; the yield is dependent on numerous factors such as rainfall, temperature, soil conditions, hail occurrence, new cultivars, and new fertilisers. As the harvest is dependent on so many variables, the demand for storage in grain silos is also related to these factors and is a fluctuating demand.

When determining the value of a grain silo, it is important to include the equipment (conveyor belts, lifts, weighing equipment), since these are an integral part of the functioning of the silo and are essential for the silo to produce income. Without equipment, a silo would have a negative value and would have to be demolished, as there is no alternative use for such a silo.

The valuation of all properties for market value is based on the International Valuation Standards Committee (2011: 12) definition of market value:

> The estimated amount for which an asset of liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's length transaction after proper marketing and where the parties had each acted knowledgeably, prudently and, without compulsion.

Should a valuation comply with the above definition, the valuation is viewed as market related.

There are three main approaches to valuing any property: the comparable sales approach, the income approach (income capitalisation and discounted cash flow), and the depreciated replacement cost method of valuation (Collins & Ghyoot, 2012: 270). The profits method of valuation should also be considered and is used to value properties with unique characteristics based on financial information (Scarrett & Osborn, 2014:131).

In all these methods of valuation, it is important that the information required to do a valuation is accurate and future incomes must be predictable. The future income of a grain silo is not predictable because of the variables impacting on the demand for its space. Therefore, these methods are difficult to apply to the valuation of grain silos in their standard form. Historical information is the only reliable information on which to base such a valuation.

The determination of income projections, capitalisation rates, discount rates and depreciation percentages in the three methods are virtually impossible to calculate, due to grain silos rarely being sold on the open market (Purnell, 2015). It is clear that one of the methods of valuation will have to be applied to the valuation of grain silos. The chosen method and information used will in the end determine whether a valuation is market related or not.

The aim of this study is to decide which method of valuation to apply, as well as what information can reliably be used to determine the market value of the property.

2. Limitations of the research

The study focuses on vertical concrete grain silos with a remaining lifetime of over 50 years. Grain silos that are constructed with corrugated iron, grain bunkers, silo bags and other storage systems are excluded from this study, due to their shorter lifetime.

The study concentrates on grain silos on the Highveld of Mpumalanga, which store mostly maize and soya beans. Although the study will be aimed at the silos that store maize and soya beans, the principles used should be similar if other grain types are stored in these silos on the same income principles.

The study is based on the actual occupancy figures and financial information of grain silos. The leases of an entire grain silo from one company to another are not considered for this study, due to differences in location, demand and grain types that are stored.

The study relies on certain financial and other sensitive information that has been made available by companies that own grain silos in the Highveld of Mpumalanga. The case study is based on a silo in this area, but the principles should be the same for all commercial silos. The companies that supplied the information requested that their information remain confidential.

3. Literature on the valuation of grain silos

Mooiman (2000: 5) states that, because no real comparable sales of grain silos exist, the depreciated replacement cost method of valuation is the easiest method to apply. Mooiman (2000) does not favour this method of valuation, but prefers a more defendable method of valuation, concluding that the income-capitalisation method could be applied to grain silos, as with any other income-producing property. He comments that the tricky part of the valuation is to determine the income, demand and capitalisation rate and expands on the income, expenditure, demand, vacancy and capitalisation rate.

Mooiman (2000) also points out that, due the non-existence of comparable sales of grain silos on the open market, the capitalisation rate is difficult to determine. He states that the capitalisation rate should be determined by finding the return that an investor would require, given the risk involved. He suggests that a method to determine the capitalisation rate would be to calculate the development cost of a grain silo and divide that by the net income of the silo and then calculate the return on investment of the property.

Joubert (2012: 14-17) discusses the background to grain production in South Africa and the technical background of grain silos. He states that there are challenges in the valuation methodology, because the industry demands standardisation, particularly of rates in different municipal areas, especially with the capitalisation and discount rates that are applied. He favours the income-capitalised approach or

the discounted cash-flow approach when determining the value of grain silos.

Joubert (2012) states that it is impossible to determine capitalisation and discount rates, because no real comparable sales exist in the market. A valuer should try to use the return that an investor would expect in such a venture, given the risk involved and bearing in mind that the rates differ from area to area. Joubert estimates that capitalisation rates should be approximately 20%.

In his presentation, De Leeuw (2003) did not refer directly to grain silos, but stated that churches, schools, universities and property with specialised characteristics such as refineries and mills could be valued using the depreciated replacement cost method of valuation. Because, under normal circumstances, mills include grain silos, it is assumed that De Leeuw included silos in this method of valuation. In the presentation, he discussed the depreciated replacement cost method of valuation in detail. He concluded that valuation of a mill needs to be qualified by stating that, for the purposes of the valuation, the "willing and informed" purchaser was assumed as a miller who required a facility such as the subject property in the specific location of the subject property (De Leeuw, 2003).

Pienaar (2015: 376-377) suggests that grain silos on a farm can be valued using either the depreciated replacement cost method or by capitalising the opportunity cost of having a silo on a farm. In his discussion on the depreciated replacement cost, he suggests that care should be taken to ensure that physical depreciation, functional and economic obsolescence, as well as purchaser's resistance are taken into account. He also points out that a concrete silo can be replaced by a steel silo, which is much cheaper to erect.

In discussing capitalised opportunity cost, Pienaar showed that the method is a hybrid of the income capitalisation method of valuation and is based on the same principle of net income that is divided by a capitalisation rate in order to obtain the value. He argued that a farmer could have stored his grain in a commercial grain silo, but he now stores the grain on his farm in his own silo, therefore saving the storage fee. The difference between the cost of storing the grain in a commercial silo and the operating expenses of the silo on his own farm is the opportunity cost. The grain would normally be stored on a farm for no longer than eight months and, therefore, the calculation would have to be done on that time frame and not a full year, as per equations 1 and 2.

Value (per ton) = (Cost per ton to store grain in a commercial silo [say for 8 months] – cost of operating the silo on the farm) divided by the capitalisation rate 1

Total value = Value per ton x ton capacity 2

3.1 Summary of existing literature

Literature on the standard methods of valuation suggests that the following standard methods of valuation exist:

- the comparable sales method of valuation;
- the income method of valuation (income capitalisation and DCF);
- the cost method of valuation, and
- the profits method of valuation.

From the literature, with specific reference to the valuation of grain silos, it is clear that the income-capitalisation method, the discounted cash-flow method and the depreciated replacement cost method of valuations have been applied to the valuation of grain silos. Both Mooiman (2000) and Joubert (2012) have suggested that the income-capitalisation method of valuation would be the preferred method for the valuation of commercial grain silos.

Mooiman (2000) indicated in his presentation that, in order to determine the rental income, one would have to determine what the rental rates (Rand per ton per day) of a silo would be. To determine the demand for the storage space, he suggested that a longer term (minimum 12 months, but preferably 4 years) should be used to determine the income of the property. He did not indicate how to analyse the data obtained (seek upward and downward trends in occupation or base the data on an average). Neither did he consider the risk that the fluctuations in income can have an effect on the capitalisation rate of a grain silo.

In determining the capitalisation rate, Mooiman (2000) suggested that one should either note the return an investor requires when purchasing the property or determine the capitalisation rate based on replacement cost divided by the net income of the silo.

The limitation to the explanation of the capitalisation rate is that the capitalisation rate is based on what return an investor would require; this would be guesswork, because silos do not change hands.

In terms of the determination of the capitalisation rate based on net income divided by the development cost, Mooiman (2000) did

not indicate how to calculate the development cost. In addition, no indication is provided of the impact of cheaper alternative storage systems (steel silos, grain bunkers and silo bags) on the development cost.

When considering the discussion by Mooiman (2000) on the capitalisation rates, the two methods of determining the capitalisation rate could give totally different capitalisation rates.

From the literature, it is evident that the income-capitalisation method of valuation is the preferred method of valuing grain silos.

This study will aim to determine whether the income-capitalisation method (as preferred by Mooiman (2000) and Joubert (2012)) is the preferred method of valuation of grain silos, or should the discounted cash flow (mentioned by Joubert (2012)), depreciated replacement cost (recommended by De Leeuw), profits method or comparable sales method be applied. Should the income-capitalisation method prove to be the best applicable for this valuation, the limitations from the literature will be discussed in this order:

- how to analyse the long-term occupation data to determine what the future occupation or the vacancy will be;
- how to determine the income of the silo from the most probable occupancy and apply storage rates, handling-in rates and handling-out rates;
- how to determine what expenses should be included in the valuation, and
- how to determine a capitalisation rate for a grain silo.

4. How does a grain silo derive income?

The majority of silo owners charge their clients either a daily or a long-term rate. Table 1 provides the current daily rates.

Table 1: Current daily storage rates for silo use

Fee	*Maize (R/ton)*	*Soya beans (R/ton)*
Handling (receiving)	R 7.05	R 9.45
Handling (dispatch)	R 33.15	R 34.05
Storage fee (c/ton/day)	R 0.72	R 0.75

Source: TWK budget document, 2015a

Some silos have a long-term tariff (tariff for a year's storage) so that grain can be stored for an entire season. These tariffs are provided in Table 2.

Table 2: Current long-term storage rates for storage use

Fee	*Maize (R/ton)*	*Soya beans (R/ton)*
Handling (Receiving)	R 7.05	R 9.45
Handling (Dispatch)	R 33.15	R 34.05
Storage fee	R 85.00	R 95.00

Source: TWK budget document, 2015a

The above fees are those that TWK (Transvaal Wattle Kwekers, an agricultural cooperative) charge for the handling of storing grain. The majority of silos in South Africa charge their fees in the same way. Grading and testing fees are charged at intake and dispatch of the grain. The majority of silos charge their income on more or less the same method.

The marketing years for each grain type differ, because the different types of grain are harvested at different times of the year and the grain and oilseed industry charge fees on a marketing year. In the Highveld of Mpumalanga, the grain marketing year for maize is from 1 May to 30 April and for soya beans from 1 March to 28 February (TWK, 2015b: 6). The storage and handling fees of a grain silo are based on these marketing years. For example, in April, the storage cost for soya beans can be the new escalated price, whereas the price for maize is still the price for the previous year. It is important to note that there is a production year for grain; the production year differs from the marketing year. The production year for maize is from March to the end of February. This is the time when the Crop Estimates Committee estimates what the size of the crop will be. It is, therefore, important to note that the income of a silo is based on the marketing year and not on the production year.

Silos can, in some instances, have dryers that dry the grain to an acceptable standard for storing. Drying costs (charged at a R/ton basis) are only applicable if the moisture levels in the grain are too high. Some silos are equipped with sifting equipment and sifting fees are also charged on a Rand-per-ton basis (applied when the grain sample has too much foreign material in the grain). The sifting, drying and other costs will not be considered for this study, since these are viewed as pure equipment income, and movable equipment does not form part of valuations.

5. What drives the demand for storage space in a grain silo?

A regular demand for occupancy is always important in any type of property, because it satisfies the needs of potential investors (The South African Institute of Valuers, 2012: 6-3). The owners of grain silos are, in most instances, investors looking to make a profit from their property – mostly cooperatives operating as businesses.

The demand for storage space is the most significant factor in determining the value of a grain silo. Should the demand for storage in the area be low, this will directly affect the market value of the property. Investors would not want to buy a property that has a low occupancy rate.

The demand for storage space in grain silos is influenced by a combination of external factors over which the property has no control.

The location of the grain silo is the single most important factor that drives the demand for storage space in the silo. A grain silo in a game farm area will not have the same value as a silo in an intensive cultivation area. The fact that the location of the silo cannot be changed will have a long-term effect that will either increase or decrease its value. If the silo is not in a grain-cultivation area, there is nothing that can be done as the area will not become a grain-cultivation area.

Access to and from the silo is also an important factor when considering the demand for storage space. In South Africa, the majority of silos are situated next to access roads and railways.

The business of planting grains is another important factor that drives the demand for storage space in a specific silo in an area.

The weather, mostly rainfall, has the obvious biggest impact on the supply of grain. In a dry season, the amount of grain produced is lower than in a season with an average rainfall, and an excessively wet season would also reduce the amount of grain produced. The climate in an area and on a specific farm differs from year to year. Therefore, the demand for storage space differs each year. Based on rainfall, there is no specific trend in the supply of grain on a year-on-year basis.

The advancement of technology in the grain industry should improve the yields that are obtained each year. New technology gives the famer the opportunity to produce more grain on the same land.

Demand for storage space can be summarised as follows:

- The location of the grain silo is a constant factor that will not change (demand can change if an area should change from a grain-cultivation area to another focus area).
- Rainfall causes the demand to fluctuate from year to year; no single year has the same harvest as the previous year.
- Technological advancement can have a positive impact on grain production.

The demand for storage space is the single most important factor that determines what method of valuation should be applied to the valuation of grain silos. The above information clearly shows that it would be difficult to estimate the future income of the property. The various methods of valuation will be studied to determine how demand will affect the method to be used to value a grain silo.

6. Valuation methods and their applicability to the valuation of grain silos

There are three main methods of valuation:

- The comparable sales method of valuation compares the subject property directly with other properties that have recently been sold on the open market between willing buyers and willing sellers.
- The income approach consists of:
  - the income-capitalisation method of valuation, where the net income of the first year of the property is capitalised at a market capitalisation rate;
  - the discounted cash-flow method of valuation, where all future income (including a reversion calculation) is discounted to present value.
- The depreciated replacement cost method of valuation values the subject property by determining the current replacement cost of the improvements and deducting physical, functional and economic depreciation/obsolescence and adding the vacant land value.

According to Scarrett and Osborn (2014), however, five methods of valuation can be used to determine the value of properties. The five methods include those mentioned above as well as the profits method of valuation and the residual land value method of valuation. Although the profits method and the residual land value method are not as generally accepted as the main methods, they are useful tools in the valuation industry.

- The profits method of valuation is a derivative of the income-capitalisation method of valuation, but determines income as a portion of profit or net income (Scarrett & Osborn, 2014: 131).
- The residual land value method of valuation is used to determine the value of land based on the potential development that can be made on the property (Scarrett & Osborn, 2014: 113). This method is used mostly to determine the value of undeveloped land and is not applicable to the valuation of grain silos.

From the above, it is clear that there are five methods of valuation that can be tested to determine whether a grain silo can be valued, using one of the standard methods of valuation, or whether further research should be conducted to determine how to value grain silos. The following methods will be discussed further:

- the comparable sales method of valuation;
- the income-capitalisation method of valuation;
- the discounted cash-flow method of valuation;
- the depreciated replacement cost method of valuation, and
- the profits method of valuation.

6.1 The comparable sales method of valuation

This method of valuation is based on the fact that the market value of a property can be determined by comparing the subject property with similar (comparable) properties that have recently been sold (Collins & Ghyoot, 2012: 271). The comparable sales method of valuation would be the preferred method to value grain silos.

If a silo property is sold, the subject silo can be compared with the property that sold. The occupancy figures of the two properties can be compared to determine a sales price that can be applied to the subject silo.

As indicated by Purnell (2015), silos do not change hands in the open market. She is unaware of any sales of grain silos in the past five years. She did, however, point out that two agricultural companies have merged, but no sale was involved. Therefore, the comparable sales approach will be virtually impossible to apply to the valuation of grain silos. If these silos trade, it may be difficult to obtain the detail occupancies, income and expenses.

6.2 The income-capitalisation method of valuation

This method of valuation was developed, because the majority of income-producing properties are rarely comparable, due to their different physical, location, design, accommodation and institutional attributes (Collins & Ghyoot, 2012: 272). If a property produces income or has the ability to produce income, the income-capitalisation method of valuation can be used.

This method of valuation can be described as the net income of the first year a property operates divided by a market-related capitalisation rate.

In applying the income-capitalisation method of valuation on grain silos, it is difficult to determine the probable annual income of a grain silo, due to the fluctuating production figures in the grain industry, as described in section 4.2. To determine the gross income of a grain silo, it is suggested that long-term occupancy figures should be used to calculate what the most probable occupancy of the silo would be. This can be based on an average or a trend if a clear trend in growth or decline can be observed.

Additional income is also derived from the handling of the grain either into or out of the grain silo. This calculation is based on the trends and should also be estimated by taking a longer average view rather than using one year's information.

From the financial information supplied by the owner, it will be evident which expenses can be allocated to the silo property and which should be excluded, because the latter are part of the business and not part of the property.

Some expenditure items that are normally excluded from a valuation will, however, form part of the silo valuation calculation, because the fixed silo equipment will always form part of the silo. Valuers should have an in-depth knowledge of grain silos and the business of handling grain to know which expenses should be included and which should be excluded from the valuation to ensure that property-related expenses are included, but that business-related expenses are excluded.

The calculated expenses are deducted from the gross annual income to determine the net annual income of the silo.

The Rode Report defines a capitalisation rate as follows:

> A standard capitalisation rate is the expected net operating income for year 1, assuming the entire building is let at open-market

> rentals, divided by the purchase price. This calculation ignores VAT, transfer duty and income tax, and assumes a cash transaction (Rode and Associates (Pty) Ltd., 2015: 7).

Under normal valuation circumstances, a capitalisation rate will be determined by analysing a recent sale of a comparable property. But, because silos rarely change hands, it would be virtually impossible to determine a capitalisation rate from a comparable sale.

A capitalisation rate is, in essence, a risk-free return with a risk premium added (Scarrett & Osborn, 2014: 74). Without comparable sales, it is difficult to determine the risk premium. The capitalisation rate will be based on the general capitalisation rate of storage spaces together with added risks associated with grain silos. These risks are described in section 7.3.

The income-capitalisation method of valuation is one method to consider for the valuation of a grain silo, but the capitalisation rate can be difficult to determine without comparable sales.

6.3 The profits method of valuation

The profits method of valuation is used mostly to determine the value of a property that is unique and cannot be valued using the standard methods of valuation (Scarrett & Osborn, 2014: 144).

This method of valuation is based on the income-capitalisation method of valuation, but income is not determined by actual leases or on market information, but on information from the financial statements of the business. To determine annual income, a percentage of the net or gross income is applied to determine what the likely rental of the property would be. The method can be applied as a net or gross rental and, therefore, in some instances, the outgoings would not have to be deducted. The rental (either net or gross) is then capitalised by a market-capitalisation rate in the same way as with the income-capitalisation method of valuation (National Property Education Committee, 2004).

The limitations in determining the value of a grain silo on the profits method of valuation would be that to base the income on the financial information could give a distorted income. Silos should be valued on a longer term occupancy figure (profits method usually use one year). To include financial information in the longer term could distort the income calculation due to escalation in prices and inflation. Therefore, the profits method of valuation would not be a suitable method of valuation of grain silos.

6.4 The discounted cash-flow method of valuation

The discounted cash-flow method of valuation (DCF) is part of the income approach to valuation and can be described as follows: all future income is discounted to present-day values by using a market-related discount rate to determine the present value of all the income (Scarrett & Osborn, 2014: 101).

According to the International Valuation Standards Council (IVSC) (2012a: 4), the DCF method can be used to value the majority of assets that generate a cash flow. The IVSC further states that the DCF method provides a more accurate value than other methods,

- when the property is in a significant growth period and still has to reach its full potential;
- where the cash flows are inconsistent in the short term, or
- where the property is a specialised property and the economic life of the property is short.

This method of valuation would be difficult to apply to the valuation of grain silos because of the unpredictability of the income of a grain silo. As discussed in section 4.2, the occupancy of a grain silo is hardly ever the same for two consecutive years.

Because the DCF method makes use of a cash-flow forecast and the cash flow of a silo is unpredictable, this method would not be suitable for use in the valuation of a grain silo.

6.5 The depreciated replacement cost method of valuation

The challenge in the valuation industry is to determine the value of properties that rarely change hands. If there are limited transactions with which to compare a property or there is no definite income stream or capitalisation rate, the valuer makes use of the depreciated replacement cost method of valuation (International Valuation Standards Council, 2012b: 4).

The method can be described as follows: the valuer uses the replacement cost of a building or structure, less physical depreciation, functional obsolescence and economic obsolescence; added to the depreciated value of the buildings is the value of the land as if it is vacant to determine the market value of the property (Collins & Ghyoot, 2012: 280).

This method of valuation could be applied to the valuation of grain silos (as recommended by De Leeuw (2003)) and would give an indication of the value of the grain silo.

To determine the replacement cost of the silo, one would first establish whether there were any silos constructed in the recent past in order to work out a construction cost per ton or volume. Should there be no silos constructed recently, one would employ the services of a quantity surveyor to determine the replacement cost of a grain silo. This would, however, be an expensive exercise. One should also take into consideration new technologies that are used to store grain, such as steel silos, silo bins and bunkers which are much cheaper to erect than silos.

There are numerous methods to determine the factor of physical depreciation. The straight line method is one of these methods, but it could be difficult to determine the amount of maintenance carried out and the economic life.

Two other difficult factors to consider are the determination of the economic and functional obsolescences that have to be deducted from the replacement cost. Functional obsolescence can be described as the factor that causes the value of a property to decrease as a result of its inability to satisfy the purpose for which it was designed (The South African Institute of Valuers, 2012: 5-3).

Under the functional obsolescence factor, one would consider the use of upright silos and whether they are still able to function or to serve their purpose. In most cases where a silo is well maintained, the functional obsolescence will be minimal, because the silo is still functional as storage space. The fact that there are cheaper alternatives, however, increases the functional obsolescence and makes it virtually impossible to quantify the depreciation factor or functional obsolescence.

Economic obsolescence is a type of depreciation that cannot be controlled by the property and is external to improvement. It is normally caused by factors such as the character of the locality, rezoning, etc. (The South African Institute of Valuers, 2012: 5-4).

Economic obsolescence of a grain silo can be caused by changes such as in:

- the main agricultural area surrounding the silo (grain production, livestock, game, etc.);
- the location of the silo in relation to other amenities (roads, railways, etc.);
- the climatic conditions in the area, including rainfall;

- technological advancement in the agricultural industry (higher yields), and
- competition (other silos and bunkers constructed).

The extent of economic and functional depreciation is determined from comparable sales, but because silos do not change hands, it is not possible to estimate economical and functional depreciation accurately.

On the other hand, the land value of the property on which the silo is situated should be fairly easy to value, based on comparable sales.

The depreciated replacement cost method of valuation can be applied to grain silos, but the factor of functional and economic obsolescence is difficult to determine accurately and, therefore, makes the method inaccurate. This method can be used as a backup method to check that the value derived using another method (such as the income-capitalisation method) is correct.

6.6 Summary of the methods of valuation that can be used to value a grain silo

From the valuation methods described earlier, it is clear that all five methods have their shortcomings when applied to the valuation of grain silos. These shortcomings are summarised below.

The comparable sales method of valuation cannot be applied, because there are no sales of comparable properties.

The discounted cash-flow method of valuation cannot be applied, because the method relies on a relatively predictable income stream. Income of a grain silo is dependent on the amount of storage space that is used. The demand for the storage space is dependent on the production of grain. Because of climatic and other conditions, grain production varies greatly each year.

The profits method of valuation relies on the actual financial information of a business. To apply the actual financial information of a grain silo on the valuation would ignore the long-term trends in the occupancy and the income is not tested against market information.

The depreciated replacement cost method relies on deductions from the replacement cost for physical, economic, and functional obsolescence. Although physical depreciation can be calculated accurately, the economic and functional obsolescence can only be determined from comparable sales. This method was used in the past, because no alternative method could be applied (Winckler, 2015: personal interview). The percentages applied seemed to be

an educated guess rather than sound evidence. The method should not be completely ignored in the valuation of grain silos, but should rather be used as a test to determine whether the value arrived at by another method is accurate.

The income-capitalisation method of valuation would appear to be the only method that can accurately be applied to the valuation of a grain silo. This supports the opinions of Mooiman (2000: 5) and Joubert (2012: 14-17). The income-capitalisation method requires substantial financial and business information. This information might be difficult to obtain and, in most instances, the silo owner would not want to divulge this information. A further challenge in applying the income-capitalisation method is that valuers are not sure how to apply the information obtained from financial documents.

The main limitation in using the income-capitalisation method is the determination of the capitalisation rate of a grain silo. There are no sales of grain silos (Purnell, 2015) from which to calculate a capitalisation rate; alternative methods to do so must be used. The capitalisation rate is determined by basing it on normal storage and light industrial properties, with added risk.

The income-capitalisation method of valuation is, therefore, the only applicable method to test in a case study, but the determination of the income and capitalisation rate needs further testing.

7. The application of the income-capitalisation method of valuation to a grain silo

7.1 Background on the silo used in this study

The silo used in this study is situated on the Highveld of Mpumalanga, where mostly maize and soya beans are produced. The silo is the property of an agricultural co-operative which has requested that its financial and other information on the silo remain confidential. The silo has a capacity of 50 000 tons.

7.2 Determining the net annual income of a grain silo

7.2.1 Determining the gross annual income of a grain silo

To determine the most likely income a silo produces, the different items from which a silo derives its income must be considered. The income generated by a grain silo is normally from storage costs, handling grain in and out of the silo, drying costs, sifting costs, and the issuing of storage certificates.

The income of drying and sifting is excluded from the valuation, because this income is derived from the use of equipment. This equipment can be removed from the silo at any given time when the potential to derive the income is removed. The issuance of storage certificates is also not included in the determination of the silo's income, because this is a purely administrative income and is normally performed by the head office.

To calculate the income from the storage of grain, the valuer would examine long-term occupancy figures of the grain silo to work out what the most likely occupancy would be in the year of the valuation. The actual income of the previous year of the silo cannot be used because of the fluctuations in the production of grain (see section 5). The silo manager would, in most instances, be in a position to supply occupation figures of the past few years. It is suggested that figures of not less than five years be used to determine the income potential, but ten years would be preferable if these are available.

Information supplied by the South African Grain Information Service (SAGIS) (2015) on the subject silo indicates the occupancy of the grain silo as follows (the marketing years for maize and soya beans differ by two months – the marketing years were applied at the same time from May to April of each year [soya data are two months delayed]):

Table 3: Subject silo occupancy

Year	*2010-2011*	*2011-2012*	*2012-2013*	*2013-2014*	*2014-2015*
% Occupancy	51%	57%	74%	63%	27%

Source: SAGIS

Illustrated, the information can be displayed as follows:

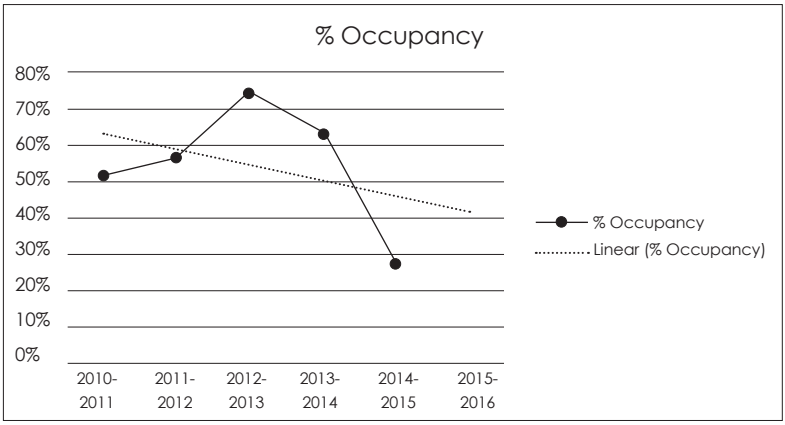

Figure 1: Subject silo occupancy illustrated

Figure 1 clearly shows that 2014-2015 was a bad season for producing grains.

To determine the most likely income for the 2015-2016 year, the average income of the past five seasons is used. The average occupancy for 2015-2016 is expected to be 54%.

When calculating the trend, it suggests that the occupancy of the silo would be 42%. Due to the high fluctuation in the occupancy of the silo, the average is preferred. The season with the lowest occupancy is the last season. This season severely affects the trend and will give a distorted occupancy. The trend line should give a more accurate occupancy, if occupancy rates over a longer term are available.

The income can, therefore, be based on an average of 54% occupancy during the year.

The average weight of grain stored in the silo is:

54% x 50000 ton = 27 000 tons (average in the silo throughout the year).

Of the grain stored in the silo, 26% is soya beans and the balance is white and yellow maize. White and yellow maize is charged at the same rate per ton by the silo so no split has to be made. The average storage of the two grains is:

Soya beans: 27 000 x 26% = 7 020 tons

Maize: 27 000x 74% = 19 980 tons

The potential income from storage is twofold: the income from day-to-day storage and long-term storage (seasonal tariff). According to the budget and the discussions with the silo owner, an average of 15.5% to 16% of the income derived from storing soya beans is in the form of seasonal storage. The income from storing the soya beans is shown in Table 4.

Table 4: Income from storing soya beans

Soya bean storage income					
Storage type	*Amount (ton)*	*Cost (Rand)*	*No of days*	*Total income*	*% of income*
Daily storage	4563	R 0.75	365	R 1 249 121.25	84.3%
Season storage	2457	R 95.00		R 233 415.00	15.7%
Total	7020			R 1 482 536.25	

Source: Author

The same calculation applies to maize. The norm for long-term storage of maize is between 18% and 21%.

Table 5: Income from storing maize

Maize storage income					
Storage type	*Amount (ton)*	*Cost (Rand)*	*No of days*	*Total income*	*% of income*
Daily storage	11388.6	R 0.72	365	R 2 992 924.08	80.4%
Season storage	8591.4	R 85.00		R 730 269.00	19.6%
Total	19980			R 3 723 193.08	

Source: Author

According to the silo manager and the budget documents, the amount of intake and offloading of the silo is the same as the amount of grain that is stored in the silo. Should the quantity differ in one year from the receiving side to the dispatch side, the calculation is expected to balance out in the next year. The total quantity of soya beans that will be loaded and offloaded is 7 020 tons and the quantity of maize is 19 980 tons. This is based on the long-term occupancy of the grain silo. Table 6 shows the income from the handling of the grain.

Table 6: Income from handling grain

Grain	*Amount (ton)*	*Handling in*	*Handling out*	*Total income*
Soya beans	7020	R 9.45	R 7.05	R 115 830.00
Maize	19980	R 34.05	R 33.15	R 1 342 656.00
Total				R 1 458 486.00

Source: Author

The rates that a silo charges can be checked to ensure that the rate is market related by contacting grain silos or grain bunkers owned and operated by other companies in the same area as the subject silo. Market-related information should be used to determine the income of the grain silo.

Table 7 provides the total income of the silo.

Table 7: Total gross income of the silo

Type of income	*Income*
Income from storage of soya beans	R 1 485 236.25
Income from storage of maize	R 3 723 193.08
Income from handling of grain	R 1 458 486.00
Total income	R 6 666 915.33

Source: Author

The total income of the grain silo is therefore R6 666 915.33.

7.2.2 Determining which expenses to deduct from the gross annual income

The silo manager should be in a position to supply the valuer with a list of expenses of the grain silo. These would normally include numerous business-related expenses such as vehicles, clothing, meals and snacks. The valuer should have an in-depth knowledge of the operation of a grain silo and should be able to distinguish between property-related expenses and business-related expenses. Should the valuer find it difficult to determine the actual expenses that have a direct influence on the property, he should discuss these expenses

with the silo manager to clarify which should be included and which should be excluded.

Certain costs, such as fumigation, should be included in the expenses, although these might seem to be a business expense; without fumigation, the silo would not be in a position to generate income.

All the expenses should also be cross-checked to ensure that the expenses included in the budget or financial statements are market related.

According to the budget received from the silo owner, major expenses are divided into four categories:

- Administrative expenses;
- Salaries and wages;
- Maintenance expenses, and
- Financial expenses.

Table 8 shows the administrative expenses, based on the budgeted amount and the amount included in the valuation.

Table 8: Administrative expenses to deduct

Administrative expenses			
Annual expense	*Amount budgeted*	*Amount included in the valuation*	*Notes*
Protective clothing	R 12 432.00	R 0.00	Business expense and not a property expense
Printing	R 13 675.00	R 0.00	Business expense and not a property expense
Buildings rental	R 1 292 928.00	R 0.00	Internal rental. Not applicable. Income determined by income calculation.
Stationary	R 36 080.00	R 0.00	Business expense and not a property expense
Marketing (advertisements)	R 6 600.00	R 0.00	Business expense and not a property expense
Grain silo charge	R 24 000.00	R 24 000.00	Silo needs to be registered to be able to operate
Medical expenses	R 12 432.00	R 0.00	Business expense and not a property expense
Training	R 37 296.00	R 0.00	Business expense and not a property expense
Consultation	R 29 837.00	R 0.00	Business expense and not a property expense

Administrative expenses			
Annual expense	*Amount budgeted*	*Amount included in the valuation*	*Notes*
Internal audit	R 3 730.00	R 0.00	Business expense and not a property expense
Entertainment	R 3 730.00	R 0.00	Business expense and not a property expense
Programming and processing (IT)	R 62 160.00	R 31 080.00	Programming for weighing equipment and silo equipment. 50% of total budget.
Postage	R 2 486.00	R 0.00	Business expense and not a property expense
Legal fees	R 4 973.00	R 0.00	Business expense and not a property expense
Cleaning costs	R 7 459.00	R 0.00	Business expense and not a property expense
Consultation labour	R 22 402.00	R 0.00	Business expense and not a property expense
Telephone	R 31 080.00	R 0.00	Business expense and not a property expense
Refreshments staff	R 9 946.00	R 0.00	Business expense and not a property expense
Consumer material	R 24 864.00	R 0.00	Business expense and not a property expense
Credit charge	R 5 773.00	R 0.00	Business expense and not a property expense
Safety expenses	R 30 307.00	R 0.00	Business expense and not a property expense
Management	R 640 000.00	R 0.00	Business expense and not a property expense
Staff transport	R 130 536.00	R 0.00	Business expense and not a property expense
Total:	R 2 444 726.00	R 55 080.00	2% of administrative expenses are included in the total expenses of the silo.

Source: Author

Salaries and wages are excluded from the valuation, because they are considered to be business-related rather than property-related expenses.

Most of the property-related expenses fall under maintenance expenses, where the bulk of the outgoings should be. Table 9 shows the maintenance expenses included in the valuation of a grain silo.

Table 9: Maintenance expenses to deduct[1]

Maintenance expenses			
Annual expense	*Amount budgeted*	*Amount included in the valuation*	*Notes*
Insurance	R 67 219.00	R 50 414.25	According to the policy schedule, approximately 75% of the insurance is for buildings and silo-related infrastructure.
Fumigation	R 24 896.00	R 24 896.00	Included because, without the expense, no potential to derive income.
Firefighting	R 8 714.00	R 8 714.00	Equipment in the buildings
Fuel for machines	R 6 224.00	R 0.00	Business expense and not a property expense
Fuel for vehicles	R 16 182.00	R 0.00	Business expense and not a property expense
Municipal consumption	R 473 184.00	R 473 184.00	Consumption of electricity and water for the silo. Must be included, otherwise the silo will not work.
Rates and taxes	R 74 400.00	R 74 400.00	Included.
Vehicle licences	R 500.00	R 0.00	Business expense and not a property expense
Maintenance of property	R 17 427.00	R 17 427.00	Maintenance of the gardens and roads.
Pallets and packaging	R 18 000.00	R 0.00	Business expense and not a property expense
Repairs: Buildings	R 43 568.00	R 43 568.00	Maintenance of the buildings
Repairs: Machines	R 302 400.00	R 241 920.00	Maintenance of the silo equipment
Repairs: Vehicles	R 21 678.00	R 0.00	Business expense and not a property expense
Repairs: Weighbridge	R 115 614.00	R 115 614.00	Maintenance of the weighbridge
Repairs: Compound	R 12 000.00	R 0.00	Business expense and not a property expense
Repairs: Office equipment	R 31 200.00	R 0.00	Business expense and not a property expense
Repairs: Railway siding	R 12 000.00	R 12 000.00	Maintenance of the siding

1 The salaries of maintenance staff in the expense calculations, forms part of general repairs and maintenance expense that were listed. It is very difficult to distinguish this separately, as it is more often being conducted by subcontractors than in-house staff, a trend that is increasingly seen.

Maintenance expenses			
Annual expense	*Amount budgeted*	*Amount included in the valuation*	*Notes*
Coal purchases	R 200 000.00	R 0.00	Coal is used for the dryers which is considered movable equipment.
Sewer removal	R 58 506.00	R 58 506.00	Work on the septic tanks and cleaning thereof
Security services	R 205 392.00	R 102 696.00	50% is included for the protection of the property.
Hygiene in sheds	R 3 734.00	R 3 734.00	Hygiene is included, due to the fact that silos work with food products.
Replace tools	R 7 226.00	R 0.00	Business expense and not a property expense
Vehicle 1	R 44 800.00	R 0.00	Business expense and not a property expense
Vehicle 2	R 35 757.00	R 0.00	Business expense and not a property expense
New vehicles	R 36 000.00	R 0.00	Business expense and not a property expense
Depreciation: Buildings	R 0.00	R 0.00	Business expense and not a property expense
Depreciation: Equipment	R 1 332 175.00	R 532 870.00	A portion of the expense is for depreciation, which is not included, and a portion of the expense is to replace the equipment in future. Equipment included is only the grain transport and weighing equipment and not the dryers, sifts, etc.
Depreciation: Office equipment	R 43 776.00	R 0.00	Business expense and not a property expense
Depreciation: Vehicles	R 10 260.00	R 0.00	Business expense and not a property expense
Depreciation Weighbridge	R 28 452.00	R 17 071.20	Sinking fund to replace the weighbridge in due course.
Total:	R 3 251 284.00	R 1 145 406.20	35% of administrative expenses are included in the total expenses of the silo.

Source: Author

Finance costs should be excluded from the valuation, because they are business-related and not property-related expenses.

Table 10 shows the total outgoings for the calculation of net income.

Table 10: Total expenses to deduct

Item	*Amount*
Administrative costs	R 55 080.00
Salaries and wages	R 0.00
Maintenance costs	R 1 145 406.20
Finance cost	0
Total	R 1 200 486.20

Source: Author

7.2.3 The net annual income

The net annual income is determined by deducting the expenses from the gross annual income. No deduction is made from the net annual income for vacancies, since the vacancies are included in the calculation of the gross annual income.

The gross annual income is R6 666 915 and the expenses are R 1 200 486. The net annual income of the silo is, therefore, R5 466 429.

7.2.4 Determining the capitalisation rate of a grain silo

It is difficult to determine the capitalisation rate of a grain silo, because of the lack of comparable sales. The capitalisation rate will have to be calculated using information other than that of a comparable sale.

The baseline capitalisation rate for grain silos is storage space or light industrial property. It is fairly easy to determine a capitalisation rate of storage in industrial space by analysing sales of properties.

A capitalisation rate is made up of a risk-free return with the associated risk added to the risk-free rate (Scarrett & Osborn, 2014: 74).

To calculate the capitalisation rate, the South African Institute of Valuers (2012: 9-13 to 9-14) suggests that the valuer take into consideration the following risks:

- quality of tenants;
- quality of the property;
- length of the leases;
- rental level;

- terms of the lease agreement (how the rentals are renewed, escalation, etc.), and
- environmental and external deterioration.

The capitalisation rate for normal storage space would usually include a risk premium. Should the capitalisation rate for storage space be 12% and the risk-free rate 6%, 6% for risk is already added in the capitalisation rate.

In order to determine the additional associated risks with a grain silo compared with a normal storage building one would have to compare the risks involved.

Table 11 shows that the risk is slightly higher with a grain silo than with normal storage space. The higher risk is based on the fluctuations in income and the fact that the property has no alternative use.

It is not statistically provable to determine the additional risk involved with a grain silo compared with normal storage space. The same process is used by a valuer when comparing normal storage buildings that have differences in location, tenant, etc. It is based on experience and an ability to estimate risks.

Table 11: Risks to consider when determining a capitalisation rate

Type of risk	*Risk with normal storage spaces*	*Risk associated with grain silo*	*Risks compared*
Quality of tenants	Tenants can differ in their risk profile. The valuer will take the risk into consideration when doing the calculation for the value.	The tenant is grain. The risk in the quality is taken into consideration in the calculation of the income.	Risk is equal.
Quality of the property	Depends on the property. For the purposes of the study, I use a well-maintained property.	Well-maintained silo property with an economic life of over 50 years.	Risk is equal.
Length of leases	In the smaller town where the silos are situated, the leases normally are one-year leases.	The risk with the length of the lease is included in the income calculation, due to the fact that historical information was used and the most probable income was calculated.	Risk is equal.
Rental levels	Rental levels can differ, but are tested with market-related information.	Storage cost is tested with market-related information. Due to the fluctuations, the risk can be slightly higher.	Silo has a slightly higher risk, due to fluctuating income.

Type of risk	*Risk with normal storage spaces*	*Risk associated with grain silo*	*Risks compared*
Terms of the lease agreement	Short-term lease agreements are used in most instances. Escalation determined by the market.	Risk is included in the income calculation. Escalation is based on the market.	Risk is equal.
Environmental and external deterioration	The property has an alternative use and can be converted, should demand change.	Silos cannot be converted to an alternative use. It can only be converted to silos for another product such as coal.	Silo has a higher risk, due to no alternative use.

Source: South African Institute of Valuers, 2012

Analysing comparable sales of industrial and storage-space properties in the same town in which the subject silo is situated shows that the baseline capitalisation rate should be between 12% and 13%.

Taking into consideration the fluctuations in income of the silo, as discussed in section 6.2, the fluctuation is relatively high, with the occupancy varying between 27% and 75%. The capitalisation rate will be adjusted by 2% upwards because of fluctuations in occupancy and income (as discussed in rental levels in Table 14).

It is difficult to quantify in monetary terms the fact that the silo has no alternative use. One would have to consider whether an investor would purchase any property at a market-related capitalisation rate and use it for an alternative use. Under normal circumstances, the investor would adjust his capitalisation rate higher to allow for the additional costs involved with transforming the property for the alternative use.

The fact that there is the security of alternative use with normal properties reduces the risk involved. There is no such security with a grain silo. Because the subject grain silo has proved over time that it has a steady occupancy and because grain production will continue in the future, the risk with alternative use is fairly small. If the silo were located in an area with an irrigation scheme and where the occupancy of the silo is 75% or higher (an area where summer and winter grains are harvested in one year), no additional risk would probably be added. But the subject silo is situated in the highveld of Mpumalanga and there has been a substantial growth in forestry in the area. An additional 2% will be added to the capitalisation rate for the risk of no alternative use.

The method of determining the capitalisation rate was discussed with Mr Eddie Fivaz (CFO of TWK). He is of the opinion that, should the income be calculated on the long-term occupancy trends, the risk in terms of the fluctuating income is included in the income calculation, and the capitalisation rate can be determined based on a baseline capitalisation rate with added risks (Fivaz, 2016).

In this instance, the capitalisation rate to calculate the value of the grain silo is determined as per equation 3.

Capitalisation rate = Storage space capitalisation rate + added risk 3

$$= 13\% + (2\% + 2\%)$$

$$= 17\%$$

7.2.5 Determining the value of a grain silo

If the valuer is able to determine a net annual income of the grain silo and the capitalisation rate, the value of the grain silo is calculated on the basic income capitalisation method of valuation as per equation 4.

$$\text{Value of the subject property} = \frac{\text{Net annual income}}{\text{Capitalisation rate}} \quad \ldots\ldots 4$$

$$= \frac{R5\ 466\ 429}{17\%}$$

$$= R32\ 155\ 464$$

The value calculated as per equation 4 is rounded down to obtain a final value.

Rounded value = R32 000 000 (thirty-two million Rand)

7.2.6 Summary on how to apply the income-capitalisation method on the valuation of grain silos

In determining the value of a grain silo, the income-capitalisation method of valuation was used and the case study successfully determined a market value of the property.

Determination of the income:

In this study, the occupancy figures of five years were used. A longer period should have supplied a clearer trend, but this was the only data made available by the silo owner.

The data was compared to determine if there is an upwards or downwards trend in the occupation of the grain silo. The average was used, since the information in determining the trend was distorted, due to an exceptionally low occupancy in the last year of calculation.

The calculated occupancy is used to determine the income by applying market-related storage and handling tariffs in order to determine the most likely net income. In this study, the information indicated that the amount of storage and the amount of handling is the same, but care should be taken when the valuer determines the handling fees, as they are not necessarily the same as the total storage.

Determination of expenses:

In this study, the expenses are determined by analysing the financial information (budget document) of the silo in order to determine the property-related expenses. Business-related expenses are excluded from the valuation. A suitable expense amount was determined.

Determination of the capitalisation rate:

The method of determining the capitalisation rate based on a baseline capitalisation rate (storage or light industrial) supplied a successful capitalisation rate. The capitalisation rate was compared to a silo and adjusted for additional risk. The following risks were compared: the quality of tenants, the quality of the property, the length of leases, rental levels, terms of the lease agreement, as well as environmental and exterior deterioration (The South African Institute of Valuers, 2012: 9-13 to 9-14). A capitalisation rate of 17% was determined, although it is slightly lower than the rate of 20% suggested by Joubert (2012: 16). The calculated capitalisation rate is considered to be more evidence based, since Joubert (2012) did not give a clear indication of how it should be applied.

Considering the above results, the income-capitalisation method of valuation can be successfully applied to the valuation of a grain silo.

8. Conclusion

A grain silo is a specialised form of real estate because of its construction, use and income generation.

A grain silo is a vertical concrete structure built for the sole purpose of storing grain. A silo is, in essence, an income-producing property, but

because the tenant is harvesting grain, the income fluctuates. This fluctuation in the demand for storage space (income) is the result of the location of the grain silo and the yield of the crops in the area.

Grain silos are valued using the income-capitalisation method of valuation. The income is determined by analysing long-term occupancy figures and applying market-related tariffs. Financial information is used to calculate expenses and business-related expenses are deducted. The net income is capitalised at the capitalisation rate. The capitalisation rate is determined by adding the additional risk associated with silos to a baseline capitalisation rate of general storage properties.

The value of grain silos can be successfully determined by the income-capitalisation method, but the valuer should ensure that he has sufficient information available and sufficient knowledge of the grain production industry in order to perfortm the valuation as described in this study.

9. Recommendations

The following is advised for further study:

- Other valuation methods such as options pricing models be tested with the valuation of grain silos in order to also consider the effect of volatility in the market on the underlying asset.
- The impact of modern storage systems on the value of traditional concrete grain silos.
- The valuation of grain silos based on the rental of entire silos.
- A method of valuation to value silos with a lifetime of less than 50 years.

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