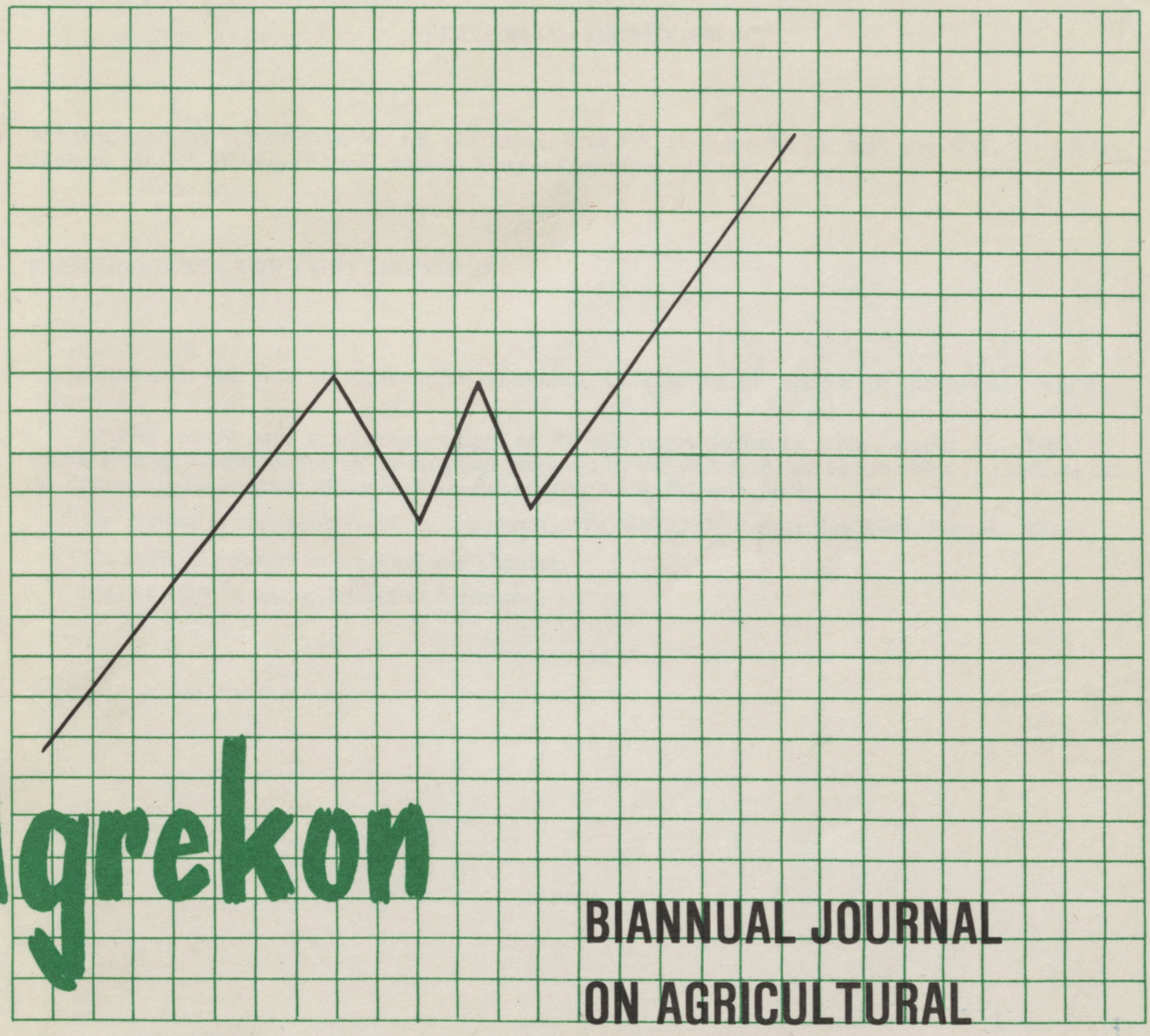
Vol. 22 No. 1
APRIL 1983

Price 50c
(48c + 2c GST)



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BIANNUAL JOURNAL ON AGRICULTURAL ECONOMICS

Issued by the Department of Agriculture, Pretoria

DETERMINING DEPRECIATION IN AGRICULTURE IN INFLATIONARY CONDITIONS

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1. INTRODUCTION

In times when prices are rising, especially the prices of implements, the question arises whether farmers will be able to continue with production when implements have to be replaced with new ones. In other words, to what extent will the farmer be able to maintain his capital position, over and above normal operating expenses.

The difference between normal operating expenditure and expenditure on durable means of production, both taken as production cost items, lies simply in the period within which the expenditure is incurred. When the latter expenditure has to be calculated for the short term, as for instance for a production year, problems arise, because the life of durable means of production, or capital items, is far longer than a production or financial year. In order to solve this problem of the fragmentation of a long-term cost into short-term amounts, depreciation for a specific short-term period is calculated by various methods.

During inflationary conditions the question of calculating depreciation frequently causes difficulties. Anxiety about this question in other countries gave rise to official investigations that led to the bringing out of reports including the Richardson Report (Davey, 1978, p. (iv)) in New Zealand and the Sandilands Report (Wanless, 1979, p. 315), in the United Kingdom. These commissions did not study depreciation exclusively, but reported mainly on possible accounting systems in inflationary times. In these cases the emphasis fell mainly on the accounting aspects of calculating depreciation in inflationary conditions. The purpose of this article, on the other hand, is to express a view on how these phenomena may effect the outlook of the agricultural economist.

2. CAUSES OF DEPRECIATION

If more clarity could be obtained on the causes of depreciation this would contribute to a better evaluation of the various definitions of depreciation and the purposes for which depreciation has to be calculated. According to Rädel and Reynders (1969, p. 39) costs may be defined as follows: "Die in geld uitgedrukte doelmatige offers wat die onderneming bring by die ruil van goedere en dienste wat deur hom aangebied word". In the light of this definition, let us briefly examine the causes of depreciation.

2.1 Physical depreciation

It is an inherent property of implements that there is a gradual physical deterioration with use that cannot easily be cancelled out by repairs and maintenance. This deterioration is due chiefly to wear and tear, rust, accidents etc. The rate at which an item depreciates physically depends on a variety of factors, such as the type of work done, storage facilities, handling practices etc.

2.2 Technological depreciation

This refers to factors other than physical factors that contribute to the depreciation of an item. In other words technological depreciation comprises the losses that take place when time is involved. Baxter (1970, p.25) speaks of time-assets and use-assets to distinguish between technological and physical depreciation. Items that can only do a certain amount of work, irrespective of the time within which this takes place, are regarded as use assets and depreciation in respect of them is generally of a physical nature. Time assets, on the other hand, are considered to be assets that have to be replaced after a certain period, irrespective of the amount of work done. Depreciation in relation to these assets may be ascribed to causes that can be summed up as obsolescence. The latter occurs chiefly as a result of technological changes and improvements and changes in consumer tastes and preferences. Implements are generally subject to both physical and technological depreciation. Physical depreciation can be counteracted to some extent by repairs and maintenance. Technological depreciation, on the other hand, depends on innovations and technological development - over which the individual has no control, in the present era of rapid development. The scrapping of capital items can therefore be attributed to technological rather than physical causes.

The above exposition of the causes of depreciation clearly shows the importance of technological as opposed to physical depreciation. Two important characteristics result from this. Firstly, depreciation is primarily a fixed cost. The value of implements drops over a period, whether they are used or not. Secondly, the economic climate should be taken into account when depreciation is determined and this climate is itself subject to change.

3. PURPOSE OF DETERMINING DEPRECIATION

There are two principal approaches to depreciation, namely an accounting approach and an economic approach. Traditionally agricultural economics has followed the accounting approach to determining depreciation costs. Kirkman (1974, p. 66) gives the following accounting definition: "Depreciation accounting is a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage value (if any), over the estimated life of the unit, in a systematic and rational manner. It is a process of allocation, not of valuation". Although differently expressed, the definitions given by other writers (Mathieson, Graham, Davey & Grant, etc.) are similar in content. This view accords with Davey's approach (1978,p.1), namely that depreciation is a measure of the consumption of capital stock. According to the economic approach, on the other hand, depreciation determination is a problem rather of valuation than of allocation. Davey (1978,p.5) is of the opinion that in terms of the economic approach depreciation is the difference between the beginning and ending capital values of a capital item within the applicable period, where capital value is defined as the sum of the discounted future net earnings of the item. In other words, it is the difference between the beginning and ending values not in monetary terms but in real value. If depreciation costs are the difference in the monetary values between the initial and end periods, in inflationary times one would generally encounter appreciation and not depreciation. Where discounted values are used this situation is largely rectified. The Department of Agriculture of the USA regards depreciation as the estimated outlay in terms of current prices that would be required by farmers if the capital items (or portions thereof) consumed during the period had to be replaced (Penson, *et al*, 1977, p. 321). According to this it is important for depreciation accounting to keep pace with changes in economic conditions and depreciation is a problem of valuation rather than allocation.

Most literature available on depreciation was written by accountants and largely embodies their point of view. Although Baxter (1970, p.27) falls into this category, it is interesting to see what his opinion on the matter is and the following passage is therefore quoted: "If depreciation is a matter of fall in an asset's value over time, then the primary step in measuring it must be to establish the successive value figures. When these figures have been found, the depreciation costs emerge as a by-product. This is another way of suggesting that accounting must not try to measure cost *in vacuo*, leaving asset value as an unimportant and possibly meaningless residual. The tail should not wag the dog: the value is the thing that matters, and the cost is the residual."

Several writers, particularly accountants, are of the opinion that the primary purpose of depreciation is to spread the initial cost over a period and not to make provision for the replacement of capital items (Kirkman, Graham). The latter is regarded by them as a secondary aim which can be associated with depreciation. The writer, however, is of the opinion that from the point of view of financial management, and particularly with a view to continuity in the production process, more emphasis should be placed on that object of depreciation accounting which is concerned with making provision for the replacement of capital goods consumed in the production process. This object, which becomes so much more improtant in inflationary times when financial problems crop up as soon as capital goods have to be replaced is a justifiable one if one assumes that survival is a basic goal of an enterprise. One can therefore only speak of a positive income if provision has been made for the survival of the enterprise and survival implies that the enterprise should be in a position to replace worn-out assets (Wanless, 1979, p.256). What it amounts to, therefore, is that where replacement of capital items is in question it is important to determine the cost of ownership as well. This is especially important from the point of view of long-term financing.

It is clear from the preceding discussion that it is necessary to determine initially what the aim of depreciation accounting under specific conditions is. This will largely determine what approach will be followed. Baxter (1970, p.64) puts it as follows: "One must distinguish between figures designed to show the cost of doing a given job, and those designed to show gain or loss due to owning assets over a period."

CURRENT VERSUS HISTORICAL COSTS

We have already taken a brief look at the accounting and economic approach to depreciation. With regard to the latter, it has been mentioned that changes in economic conditions can influence the beginning and ending capital values of an item. There are various methods of depreciation accounting aimed at determining the consumption of capital goods as a cost over the expected productive life of the item by a simple, objective and arbitrary method.

The aim of both approaches is therefore to calculate (i) capital consumption as a cost and (ii) valuations. The differences between the two approaches in respect of these aims have already been discussed. However, the following is an accepted premise in both the economic and the accounting approaches: beginning value minus depreciation costs equals ending value. Depreciation methods therefore have an effect on the income-expenditure account in terms of depreciation costs and also an effect on the balance sheet in terms of the value of capital items.

A capital item may be regarded as a stock of inputs purchased in advance. It is therefore a "stock of performance" that is gradually wiped out in the successive production processes (consumed) (Rädel, 1969, p.417). Depreciation costs are therefore an indication of the consumption of the stock of inputs. If the value (number of monetary units) of the consumable inputs rises in inflationary times, how does this affect (i) the cost and (ii) the residual value of the inputs?

Depreciation may also be regarded as a method by which the beginning capital cost is recovered annually through depreciation (Graham, 1959, p.372). Should the initial *quantity* of rands be recovered or should the capital cost be recovered by a method that takes the buying power, or in other words quality, of a monetary unit into account? The traditional methods depend on monetary units, which are notorious for their fickleness. The question arises whether in times of inflation the initial capital cost should not be recovered with the aid of depreciation in terms of a larger number of smaller rands? The preceding questions refer to the most important reason for criticism of depreciation cost accounting on the basis of historical cost, namely that in inflationary conditions it gives rise to an overdetermination of net income and an undervaluation of the balance sheet. This naturally leads to serious financial problems in the enterprise. Kirkman (1974, p.66) had the same problem in mind when he said that ".... one of the results of inadequate depreciation charges has been an overdistribution of dividends which has produced severe liquidity problems in many business organisations. This has meant that many companies cut back plans for the replacement of fixed assets."

Historical cost accounting therefore recovers, through depreciation, the number of rands invested, regardless of their purchasing power (Terborgh, 1954, p. 113). With the substantial drop in the value of the rand over the past few years, the recovery of the initial capital costs fell far short of the recovery of the full economic buying power that was originally invested (Graham, 1959,p.374). There is therefore a need to reflect costs in homogeneous units - homogeneous in terms of their buying power (Wanless, 1979, p. 119).

Further justification for the above requirements for depreciation cost accounting is to be found in the definition of income. According to Wanless (1979, p.120) income is the difference between the ending capital and the amount required to keep the capital position constant (beginning capital). Differently put, income may be regarded as the amount available for consumption within a certain period if one is just as well off at the end of the period as at the beginning. Therefore, before there can be any question of profit, the prerequisite is that the capital position should be maintained. The capital in question here should be either real or physical capital, but certainly not monetary capital (Baxter, 1970, p. 133 and Terborgh 1954, p.117).

A considerable amount of attention has been given to the shortcomings of historical cost accounting. In order to make good these shortcomings a number of techniques relating to inflation bookkeeping have been proposed, and have been implemented in a number of cases, especially overseas. Some of these methods are known as: current cost accounting, current purchasing power cost accounting, replacement cost accounting, current replacement cost accounting, current value accounting, current price level cost accounting etc. All these techniques have one common goal, namely to reveal the effect of inflation more accurately and meaningfully in the financial statements of the enterprise. In many cases the above techniques differ in respects such as the following: should an attempt be made to measure the change in prices of specific items or the change in the buying power of the monetary unit in respect of a series of goods? Many techniques employ indices - either specific or general indices - in order to adjust costs and values.

Lack of space precludes a detailed discussion of each of the various cost accounting techniques. An analysis of current cost accounting by Davey[1] produced the following results in respect of valuation and depreciation: the most reliable formula, according to him, for calculating depreciation costs is the following:

$$Xk = Vo.\frac{Ik}{Io}\left(1 - \frac{R}{100}\right)^{(k-1)}\frac{R}{100}$$

Formula for valuation:

$$Vk = Vo.\frac{Ik}{Io}\left(1 - \frac{R}{100}\right)^{k}$$

Where:

k = Number of years in possession
R = Depreciation rate (%)[2]
Io = Replacement cost inflation index at time of purchase
Ik = Replacement cost inflation index at end of year k
Vo = Initial cost (R)
Vk = Book value at end of year k (R)
Xk = Current cost depreciation in year k (R)

CONCLUSION

The effect of price rises of short-term inputs on an enterprise is realised annually in terms of increasing operating costs. The effect of price increases on durable inputs, on the other hand, is only converted into monetary terms when replacement takes place. Income is therefore calculated on a cost which is an undervaluation of the actual situation. As a prerequisite for the calculation of allocable profits, the real capital position should firstly be maintained. This necessarily requires an adjustment in depreciation cost accounting.

Inflation is a reality and cannot be argued away. If this is not appreciated and no provision is made in depreciation cost accounting, it is to be

expected that serious financial problems may arise in the course of time, especially when the growth rate in net income is lower than the inflation rate, as has been the case but for a few exceptions in the agricultural sector during the past few years.

Conventional methods of income and cost accounting and the drawing up of balance sheets were designed for a period when the economic set-up was relatively simple. The problems of today are becoming more complex and simple methods are therefore unable to supply effective management information. Although there may be problems and shortcomings in relation to the various inflation cost accounting techniques, the words of Keynes in this connection hold a great deal of truth: "It is better to be vaguely right than precisely wrong."

1. The complete statistical analysis is contained in the report by Davey
2. In this investigation a depreciation rate of 17% appeared to be the most suitable

BIBLIOGRAPHY

1. BAXTER, W.T., Depreciation - Sweet & Maxwell, London, 1971.
2. DAVEY, L.E., Current cost depreciation and the valuation of farm tractors and headers: *Agricultural Economics Research Unit*, Research Report No. 86, June 1978.
3. GRAHAM, W.J., Depreciation and Capital Replacement in an Inflationary Economy - *The Accounting Review*, July 1959, pp. 367-375.
4. GRANT, E.L. & IRESON, W.G., Principles of Engineering Economy. 5th ed. The Ronald Press Company, 1970.
5. HILL, G.P., Calculating machinery depreciation on farms during a period of inflation - *School of Rural Economist and Related Studies*, F.B.U. Occasional Paper No. 2, December 1978.
6. JOUBERT, W.A., The Sandilands Report: An Appraisal, *Chartered Accountant*, Volume 12, No. 3, March 1976, pp. 93-94.
7. KIRKMAN, P.R.A., Accounting under inflationary conditions. George Allen & Unwin Ltd, 1974.
8. MATHIESON, M.C., The Depreciation of Farm Machinery. *J. Agric. Econ.*, Volume 15, No. 3, 1963, pp. 451-461.
9. PENSON, J.B. HUGHES, D.W., NELSON, G.L., Measurement of Capacity Depreciation Based on Engineering Data, *Am. J. Agr. Econ.*, Volume 59, No. 2, May 1977, pp. 321-329.
10. RäDEL, F.E. & REYNDERS, Inleiding tot die Bedryfsekonomie, J.L. van Schaik Beperk, Pretoria, 1969.
11. REYNOLDS, I.N., An Analysis of Depreciation Methods and Bases - Paper 9, School of Business Administration, University of North Carolina, Chapel Hill, 1962.
12. TERBORGH, G., Realistic Depreciation Policy - Machinery and Allied Products Institute, 1954.
13. WANLESS, P.T. & FORRESTER D.A.R., Readings in Inflation Accouting, - John Wiley & Sons, 1979.