



The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

ENTREPRENEURSHIP AND THE BOTTOM LINE: HOW MUCH OF AGRICULTURE'S PROFITS IS DUE TO CHANGES IN PRICE, HOW MUCH TO PRODUCTIVITY?

J van Zyl

Faculty of Agricultural Sciences, University of Pretoria, Pretoria

HD van Schalkwyk

Department of Agricultural Economics, Extension and Rural Development, University of Pretoria, Pretoria

C Thirtle

Department of Agricultural Economics and Management, University of Reading, Reading

Abstract

Conventional financial analysis shows that profit comes from the difference between revenues and costs. A sector can generate profit growth through productivity growth or price over-recovery, or both. The course that is taken, however, has important implications for its longer-term competitive positioning. The South African agricultural sector showed a steady decline in its performance since 1973. The decline is attributed to the cost-price squeeze; increases in productivity did not compensate for decreases in price recovery. The decline reached its lowest in 1983 when the growth in productivity overtook the negative effect of the terms of trade.

Uittreksel

Konvensionele finansiële ontledings wys dat wins die verskil is tussen inkomste en koste. 'n Sektor kan groei in wins genereer deur produktiwiteitsgroei of deur prysoorverhaling, of deur beide. Die koers wat ingeslaan word het egter belangrike implikasies vir die besigheid se langtermyn winsgewendheid. Die Suid-Afrikaanse landbousektor toon 'n konstante afname in sy prestasie sedert 1973. Die afname is die gevolg van die koste-knyptang effek; toenames in produktiwiteit het nie vir die afname in prysverhaling gekompenseer nie. Die afname het 'n laagtepunt in 1983 bereik toe die groei in produktiwiteit die negatiewe effek van die landbouruilvoet uitgeskakel het.

1. Introduction

Concern about the condition and future of agriculture is no new phenomenon. Trends should therefore regularly be observed and analyzed in order to forecast and understand crises. Only then is proper and timely remedial action possible.

The agricultural sector is presently struggling with problems that have their origin in the structure of the South African economic system. South Africa has undergone a structural transition that is part of normal economic development in which the industrial sector overtook the agricultural sector in its contribution to income.

Agriculture nevertheless supported the ailing South African economy throughout the business downswing of the seventies. With the prevailing good rains of the decade, farmers who, even in normal years produce in excess of domestic needs, improved their export performances substantially. The comparative advantage of the agricultural sector relatively to some other sectors in the South African economy, was however eroded by inflation during the seventies. Leading analysts concluded that the financial position of farmers deteriorated due to increasing costs and higher risks in farming and that this resulted in liquidity problems for farms (see, amongst others, Louw, 1981; Groenewald, 1982; 1985; Liebenberg and Groenewald, 1990). Most of these factors fall outside the farmers' domain in the sense that the farmer cannot control them.

However, a company's or farm's financial performance is the result of the interactions of the multitude of controllable and uncontrollable factors. Within a business environment dictated by many uncontrollable factors, a manager or farmer seeks to improve the firm's profit performance by judiciously allocating and utilizing those resources under his or her control. Among the typically uncontrollable factors are (1) the economic environment; (2) climate; (3) industry/market growth or decline; (4) inflationary resource prices (where resources include categories of labour, materials, energy, and capital inputs or expense items); and (5) different rates of inflation between product prices and resource prices (i.e. between selling prices and purchase prices). Among the typically controllable factors are (1) the introduction of new technologies; (2) resource substitutions; (3) training and motivation of employees; and (4) asset redeployment (Boehlje and Eidman, 1984).

The uncontrollable factors can impose significant positive or negative impacts on a firm's profitability. It is, however, possible to measure explicitly the profit impacts of these factors and to determine how various management strategies could increase or decrease profitability. This paper examines how profits in the agricultural sector have grown or declined by analysing the sources of profit change.

2. Sources of profit change

Conventional financial analysis shows that profit comes from the difference between revenues and costs (see

Figure 1(a)). Common sense, therefore, tells us to raise revenues faster than the rate of cost increase. But underpinning all companies or a sector's revenues and costs are networks of controllable and uncontrollable factors. Therefore, the mere monitoring of revenue and cost changes will not provide insight into the interactions of these various factors - interactions that are ultimately translated into the firm's bottom line.

However, with the same basic accounting information used to calculate revenues and costs, it is possible to gain more insight into precisely what is driving profits (see Figure 1(b)). Examining the top row of Figure 1(b), we identify product quantity (output) and resource quantity (input). In the most elementary sense, **productivity** is the product quantity divided by resource quantity. Thus, there exists a unique productivity relationship for each resource contributing to a business operation. Viewed in this context, labour productivity - by far the most commonly quoted productivity statistic - is but one of many aspects of a total factor productivity analysis.

A business unit or economic sector can achieve productivity improvement when product quantity increases at a faster rate than resource quantity, but will experience productivity decline if resource quantity increases at a faster rate than product quantity (see Figure 1(c)). All other factors held constant, productivity improvement will translate directly into profit improvement.

There exists an analogous relationship between product price and resource price (i.e., cost per unit of input) which is called the "price recovery" relationship, with price recovery being the product price divided by resource prices. A unique price recovery relationship exists for each resource contributing to a business operation. When product price increases at the faster rate than resource prices, the result is "price over-recovery". All other factors held constant price over-recovery will translate directly into increased profits in the short term (see Figure 1(d)). "Price under-recovery" occurs when resource price increases at a faster rate than product price. All other factors held constant, price under-recovery translates directly into a decrease in profits, in the short term. Instead of the conventional profit analysis represented by the middle row in Figure 1(d), business units should rather analyse profit changes as the result of changes in productivity and price recovery, as represented by the middle column. This is exactly the objective of this paper: To determine how much of agriculture's profits is due to changes in price and how much to changes in productivity.

Change in productivity consists of two distinct and measurable components, namely change in capacity utilization and change in efficiency. A capacity utilization gain typically arises when a business or sector holds certain resources fixed while increasing production. Productivity improvement results because product quantity increases while fixed resource quantity is constant. Change in efficiency is the other component of a change in a firm's productivity. Efficiency is improved by reducing the quantity of fixed resources and/or by reducing the consumption of variable resources per unit of output. Efficiency gains are often achieved through the introduction of new technologies, learning curve effects, training, or the substitution of resources. The productivity factor provides a valuable measure of management's operating performance when the controllable contributions to efficiency change are distinguished from the uncontrollable contribution.

Figure 1(e) illustrates the measurable sources of profit change in a business unit or sector. As business profits

change from year to year, it can be measured to what degree earnings growth has been generated from changes in capacity utilization, efficiency, and price recovery. In this manner, a business can isolate the controllable factors which affect profits and then measure their contribution to productivity growth. Using this framework, it is clear that a sector can generate profit growth through productivity growth or price over-recovery, or both. The course that is taken, however, has important implications for its longer-term competitive positioning.

3. Productivity in South African agriculture, 1947-1991

The ratio of aggregate output to an aggregate of all inputs combined gives a measure of total factor productivity (TFP) or multifactor productivity. TFP measures of multiple input production systems describe the overall rate of productivity growth as a single series. The methodology followed here is perhaps closest to that of Ball (1985), which arose from the recommendations of a USDA (1980) report. Recent TFP calculations of a similar nature include Thirtle and Bottomley (1992), which covers the UK and Thirtle *et al* (1993), which is for the commercial farms and the communal lands in Zimbabwe.

The data used to calculate TFP are largely from the Abstract of Agricultural Statistics (AAS) (Republic of South Africa, 1993), supplemented by historical material and some greater detail, from the Department of Agriculture. The AAS data are used to provide agriculture's contribution to the National Income accounting system (see Table 73), but the accounting conventions used are not readily apparent. The book-keeping arrangements and methodologies that have been used in this study to keep the series consistent, as well as problems encountered in the analyses are discussed in detail by Thirtle *et al* (1993) and are not repeated here. Figure 2 shows the results of the TFP calculations, while Table 2 reports the average annual growth rates of the output, input and productivity indices, which are used to interpret the results. The TFP index plotted in Figure 2 is the ratio of the chained output index to the chained input index.

Over the entire period, the output index has grown by nearly 350%, at a rate of 3% per annum. The index of inputs has more than doubled, growing at 1.8% per annum, but as Table 1 shows, this aggregate hides the fact that inputs grew at over 2.5% p.a. until 1979 and since then have been falling at 0.9% per annum. This fall in inputs explains the recent growth in the TFP index. Over the full period, TFP grows rather slowly, at 1.3% per annum, but Table 1 shows that there was no growth until 1965, then 2.15% until 1981 and fairly rapid growth of 2.88% per annum since 1981. This is most easily seen in Figure 2. Table 1 also reports that the partial productivity index for labour grew at 3.6% per annum and that land productivity increased at 3.13% per annum. These indices are included, partly because they may be more familiar and also because they confirm the conventional wisdom, that the productivity growth with respect to the primary factors will be higher than TFP growth, precisely because of the substitution of non-farm inputs for labour and land (Groenewald, 1964).

These TFP results are meaningful and extremely useful. The growth rate is greater than would be expected on the basis of Liebenberg and Groenewald's (1990) preliminary study of productivity in grain production. The increasing rate of growth over the period is in accordance with Van Zyl and Groenewald's (1988) perception that farmer's profits came under increasing pressure as inflation gathered pace.

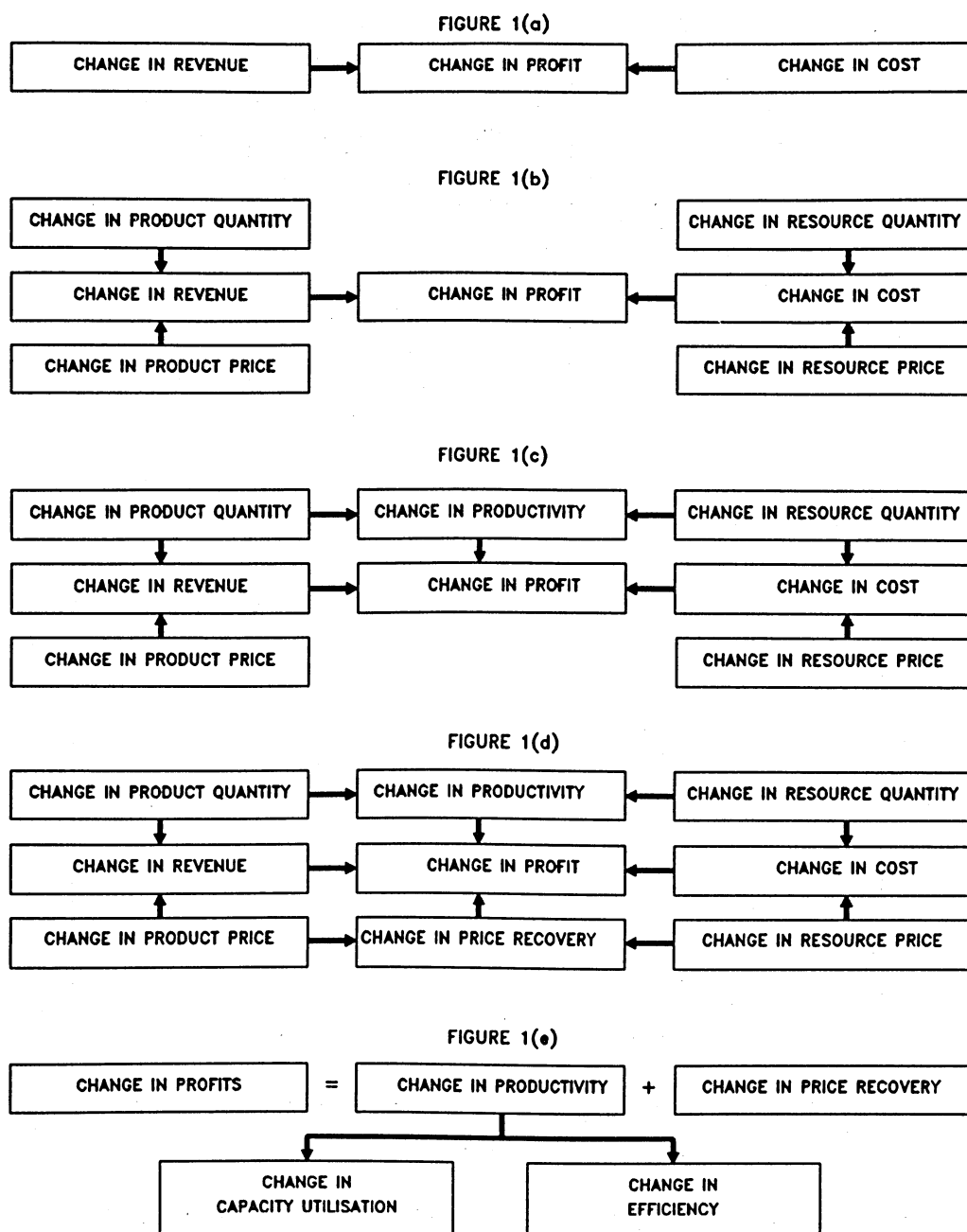


Figure 1: Sources of profit change

Table 1: Average annual growth rates by period, 1947-91 (%)

Output	Input	TFP	Labour	Land
1947-91 3.02	1947-91 1.79	1947-91 1.26	1947-91 3.60	1947-91 3.13
	1947-79 2.52	1947-65 0.00		
		1965-81 2.15		
	1979-81 -0.90	1981-91 2.88		

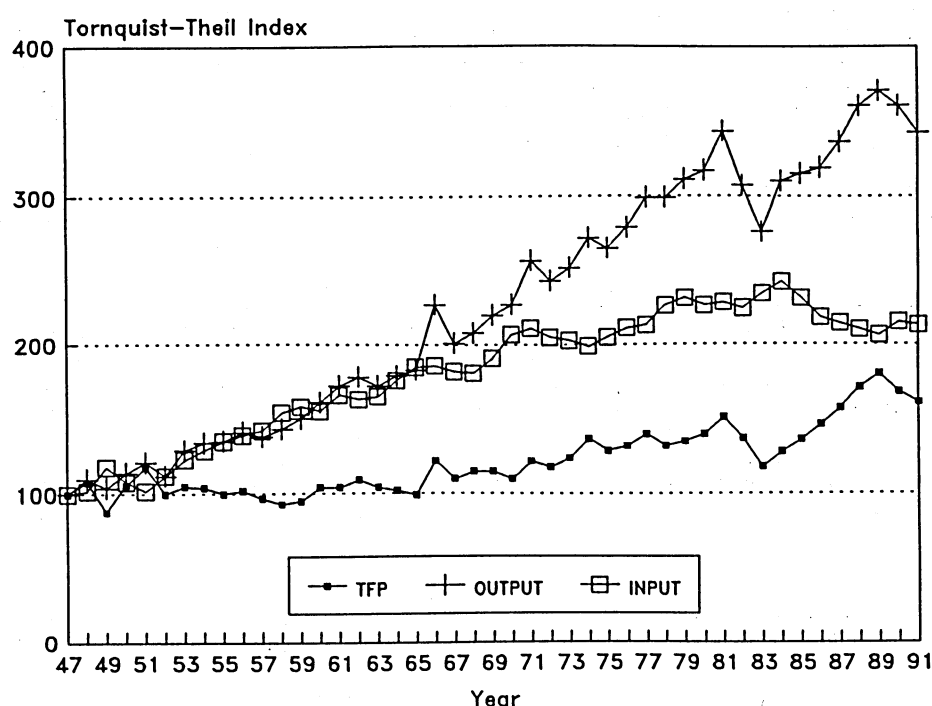


Figure 2: Agricultural input, output and Total Factor Productivity (1947 - 1991)

The rapid growth of productivity since 1983 is in agreement with the regional econometric study by Van Schalkwyk and Groenewald (1992), which found evidence of substantial growth in some regions, since 1981. This can be explained by the increasing competitive pressures and the removal of price distortions caused by credit, tax and macro policies.

4. Price recovery in South African agriculture, 1947-1991

Inflation, as measured by the general consumer price index, has been higher than 10% since 1973. Prices of agricultural inputs and outputs in South Africa did not increase proportionally. Before 1968 inflation rates were

lower than has been the case since then. The period 1968 to 1974 was characterised by moderate inflation with larger increases in product than input prices. Since 1974 highly inflationary conditions prevailed. Input prices have risen faster than product prices and a cost-price squeeze has been experienced. This cost-price squeeze obviously exerts considerable pressure on the income and hence, also on the purchasing power of producers. The period needed for net income of farm businesses to become negatives, is a function of differences in rates of increase between input and output prices, as well as the original margin of income above cost. With an original margin of 20% and a 7,5% faster increase in input than in output prices, it would take only four years (Van Zyl, 1986). Figure 3 and Table 2 depicts the situation.

Table 2: Growth rates in prices of agricultural inputs, outputs and the terms of trade, 1947-1991

Period	Output	Input	Terms of trade
1947-91	6.33	7.03	-0.69
1947-73	2.17	2.15	0.02
1968-74	9.92	7.05	2.86
1974-91	11.26	13.72	-2.45
1983-91	10.28	13.40	-3.11

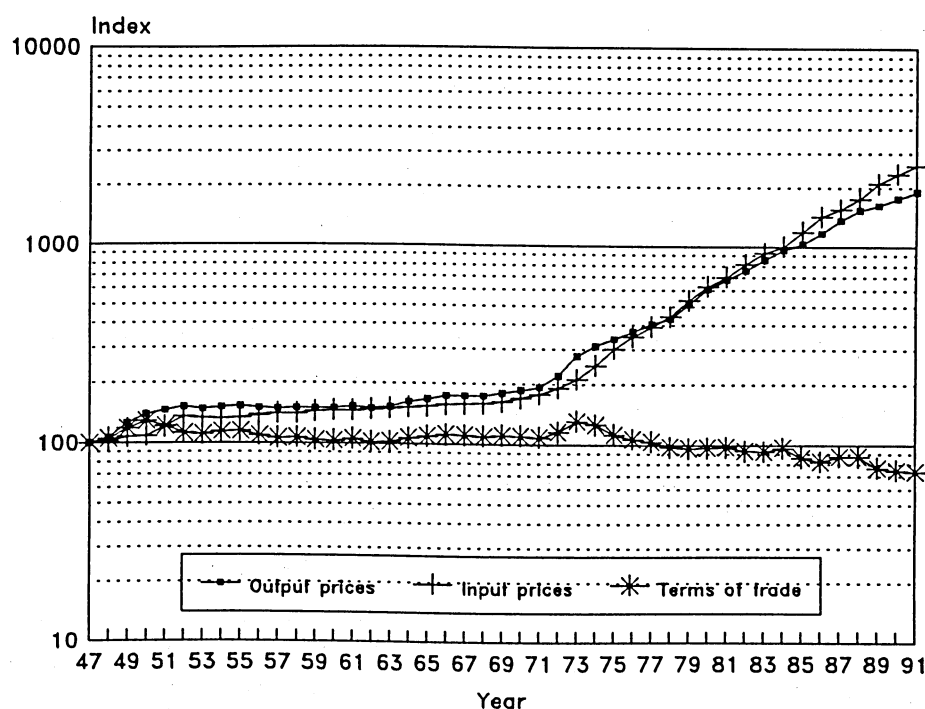


Figure 3: Prices of inputs, outputs and terms of trade, 1947 - 1991

The structural dimensions of the inflation process in the South African economy are basic to the above-mentioned problems of the agricultural sector. All imported intermediate inputs and capital goods become more expensive due to inflation, but so also wages and domestic administered prices of transport and electricity. These changed the pattern of South African secondary industries. Their growth used to be mainly extensive, and was based on the utilization of more inputs rather than on increased productivity (Van Zyl, 1986).

Import substitutable growth could thus be sustained only at a higher cost. The disruptive result of increasing costs was reinforced by the restriction of a small domestic market and the strong trend towards monopolisation that is characteristic of the South African economy. The

success of the new conservative governments in the USA and England in their battle against inflation also resulted in the loss of the competitiveness of South African products. The higher gold price in the seventies together with cost disadvantages to other traditional export sectors increased South Africa's dependence on foreign gold earnings. Economic activity was also stimulated, and in 1980 a record gold price coincided with a general economic growth rate of 7.3% (Van Zyl and Groenewald, 1988). Increases in the supply of money followed. Because little has been done to control the growth of expenditure, the inflationary effect of a high gold price continued even after the price of gold dropped. Inflation increased the prices of industrial inputs.

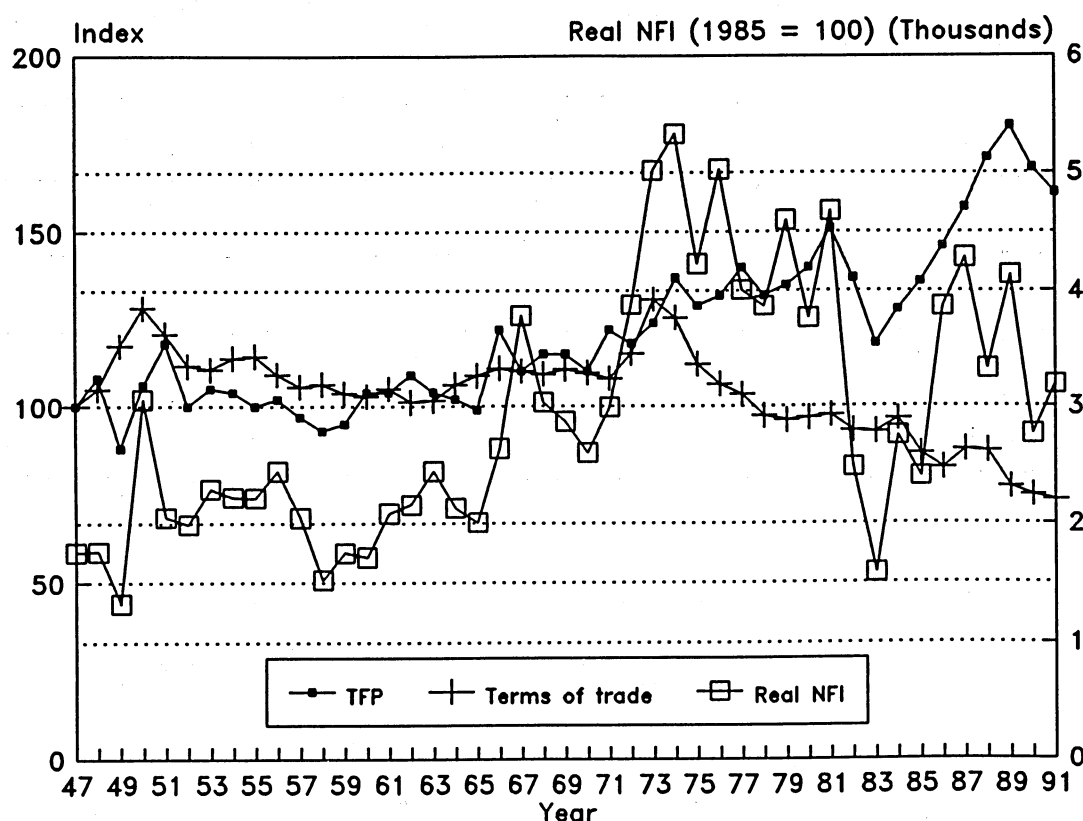


Figure 4: Total factor productivity, terms of trade and real Net Farm Income (1947 - 1991)

Prices were increased according to the cost/plus principle, thereby increasing the competitiveness of imported manufactured articles. Tariff protection against the competition resulted in additional costs for the agricultural sector and farmers' profit margins between revenue costs decreased drastically. Inflation undoubtedly affected agriculture severely with a sharp decrease in purchasing power parity of agricultural products and a weakening of agriculture's competitive position on international markets (Liebenberg and Groenewald, 1990).

5. How much of agriculture's profits is due to changes in price and how much to changes in productivity?

The two sections above described trends in agricultural productivity and price recovery during the period 1947-91, respectively. These changes can no be linked to changes in net farm income over the same period in order to explain how much of agriculture's profits is due to changes in price and how much to changes in productivity. Figure 4 shows indexes of TFP and price recovery, as well as real net farm income (1985 basis), while Table 3 shows selected annual growth rates of the above.

Real NFI has grown by nearly 181% over the entire period. This is ascribed to the growth in TFP of nearly 161% which countered the decline of 27% in terms of trade. However, Table 3 shows that this aggregate hides the fact that real net farm income declined since 1973 by 1.06% per annum until 1991 and with 8.14% from 1973 to 1983. This decline was a direct result of the unfavourable growth rate in the terms of trade, -2.63% and -3.27% per annum respectively during the same

period. The annual growth of 4.63% in TFP since 1983 countered the decline of -3.11 in terms of trade during the same period and a growth of 6.24% in real NFI resulted. The growth in productivity since 1983 can be ascribed to a gain in capacity utilisation which can amongst others, be attributed to a longer replacement period of tractors.

6. Conclusion

The procedure followed in this paper allows one to determine the sources of profit growth in a firm or for a whole sector. More specifically, it can be determined how much of agriculture's profits is due to changes in price and how much to changes in productivity.

From the analysis it is clear that the agricultural sector showed a steady decline in its financial performance since 1973 with the largest downswing in 1983 when a recovery phase started. The decline is attributable to the cost-price squeeze which obviously exerts considerable pressure on income. The negative trend was however countered by an annual growth in productivity of 4.63% since 1983. Agricultural policy, especially issues like import substitution, import protection, price policies of marketing boards and general macro-economics resulting in high inflation should however be addressed in order to rectify the unfavourable terms of trade of the agriculture sector if a sustained growth in profit is wanted. The agricultural sector today is poorer and leaner because of the inflections, but it is also fitter and in excellent shape to meet the challenges of higher rates of economic growth that will hopefully materialise in the not too distant future.

Table 3: Average annual growth rates in real net farm income by period, 1947-91 (%)

Period	NFI	TFP	Terms of trade
1947-91	1.44	1.26	-0.69
1947-73	2.54	0.64	0.02
1973-91	-1.06	1.48	-2.63
1973-83	-8.14	0.27	-3.27
<u>1983-91</u>	6.24	4.63	-3.11

References

- BALL, V E. (1985). Output, Input and Productivity Measurement in US Agriculture, 1948-79. *American Journal of Agricultural Economics*, Vol 67, No 3:475-86.
- BOEHLJE, M D AND EIDMAN, V R. (1984). *Farm Management*. John Wiley and Sons, New York.
- GROENEWALD, J A. (1964). Changes in Primary Resources in the South African Agriculture. *Agrekon*, Vol 3, No 3:22-29.
- GROENEWALD, J A. (1982). Changes in the parity position of South African agriculture. *Agrekon*, Vol 21, No 2:8-14.
- GROENEWALD, J A. (1985). The South African agriculture and the inflation phenomena. *Agrekon*, Vol 24, No 1:30-36.
- LIEBENBERG, G F AND GROENEWALD, J A. (1990). Die RSA landbouuilvoet. *Agrekon*, Vol 29, No 3:178-184.
- LOUW, A. (1981). Business growth in agriculture III: The effect of inflation on business growth. *Agrekon*, Vol 20, No 1:1-5.
- REPUBLIC OF SOUTH AFRICA. (1993). Abstract of Agricultural Statistics Department of Agriculture.
- THIRTLE, C; ATKINS, J; BOTTOMLEY, P; GONESE, N; GOVEREH, J AND KHATRI, Y. (1993). Agricultural Productivity in Zimbabwe, 1970-90. *Economic Journal*, Vol 103, No 417:474-480.
- THIRTLE, C AND BOTTOMLEY, P. (1992). Total Factor Productivity in UK Agriculture, 1967-90, *Journal of Agricultural Economics*. Vol 43, No 3:381-400.
- THIRTLE, C; SARTORIUS VON BACH, H J AND VAN ZYL, J. (1993). Explaining total factor productivity growth in South African commercial Agriculture, 1947-91. Staff paper (93/02). University of Reading, Department of Agricultural Economics and Management.
- UNITED STATES DEPARTMENT OF AGRICULTURE (1980). Measurement of US Agricultural Research Productivity: a Review of Current Statistics and Proposals for Change. Technical Bulletin No. 1614, Economics, Statistics and Cooperatives Service, Washington, D.C.
- VAN SCHALKWYK, H D AND GROENEWALD, J A. (1992). Regional Analysis of South African Agricultural Resource use and Productivity. *Agrekon*, Vol 31, No 3:116-127.
- VAN ZYL, J. (1986). Duality and Elasticities of Substitution II: An Empirical Application. *Agrekon*, Vol 25, No 3:65-69.
- VAN ZYL, J AND GROENEWALD, J A. (1988). Effects of Protection on South African Commercial Agriculture. *Journal of Agricultural Economics*, Vol 39, No 3:387-401.