COMMENT:

THE RELATIONSHIP BETWEEN FARM SIZE AND THE TECHNICAL INEFFICIENCY OF PRODUCTION OF WHEAT FARMERS IN THE EASTERN FREE STATE

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Some comments are required to put in perspective the results obtained by Ngwenya, Battese and Fleming (1997). In particular, it is necessary to examine their main conclusion that in 1988/89 there was a significant inverse relationship between the technical inefficiency of wheat farmers in the Eastern Free State and farm size, because this is in direct contrast with the findings of Van Zyl, Binswanger and Thirtle (1995) who used the same dataset.

Ngwenya *et al.* (1997:298-299) attribute the differences in results to two main reasons. Firstly, they contend that the analysis of Van Zyl *et al.* (1995) is based solely on total factor productivity calculations that do "not specifically estimate technical (in)efficiency of production, but overall productivity, of which technical efficiency is a component". Secondly, land area or farm size is adjusted for quality differences by Van Zyl *et al.* (1995), while this is not done in the analysis of Ngwenya *et al.* (1997). It will subsequently be illustrated that the first statement is not the reason for the different results. More importantly, however, the failure to adjust land areas for differences in quality is a serious shortcoming and leads to erroneous conclusions. In both cases, therefore, the contentions and results of Ngwenya *et al.* (1997) should be treated with due circumspection.

METHODOLOGICAL ISSUES

Contrary to the assertions of Ngwenya *et al.* (1997), the analysis of Van Zyl *et al.* (1995) is not based solely on comparisons of total factor productivity by farm size, but also includes a breakdown of the efficiency of production in terms of three components, *viz.* technical, scale and allocative efficiency (see

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pp. 31-36 for the discussion thereof). The latter analysis is based on non-parametric procedures developed by Farrell (1957) and Afriat (1972) to estimate the efficiency frontier, similar to the analysis of Chavas and Aliber (1993). This approach has the advantage over parametric methodology (such as that used by Ngwenya *et al.*, 1997) that it does not impose *a priori* restrictions on the underlying technology. For example, it does not have the problem of depicting the underlying production technology in the Eastern Free State by means of a specific functional form with all the associated implicit assumptions, whether it is a translog, Cobb-Douglas or any other specification, as experienced by Ngwenya *et al.* (1997). As Ngwenya *et al.* (1997: 291-294) adequately illustrate, their results are dependent on the researcher's (often arbitrary) choice of functional specification of the underlying technology. In their case, they argue that the results obtained by means of the Cobb-Douglas specification should be disregarded, while those obtained with a translog specification should be accepted.

Moreover, after extensively reviewing the literature on farm-size efficiency, Binswanger, Deininger and Feder (1995) conclude that much of the methodology used to analyse farm-size efficiency and productivity is flawed, precisely for the reasons mentioned above. They also illustrate how some of these methodologies produce biased results, similar to that of Ngwenya *et al.* (1997) who use a Cobb-Douglas specification to describe the underlying technology in the Eastern Free State in 1988/89. In the light of these methodological problems, Binswanger *et al.* (1995) recommend two approaches, namely those used by Van Zyl *et al.* (1995) in their analysis. In this respect, it is important to note that none of the methodologies used by Van Zyl *et al.* (1995) are subject to the problems associated with the functional specification, and parametric estimation in general, discussed above.

However, rather than belabouring this point, attention should rather be given to the question about how the results obtained with the total factor productivity (TFP) analysis differ from those obtained with the non-parametric estimation and subsequent breakdown of the efficiency of production. Table 1 gives a summary of these results for the Eastern Free State in 1988/89. It is quite clear from the table that the various methodologies yield similar results. The mean size of scale-efficient farms is much smaller (475.3 ha) than that of inefficient farms (1 221.8 ha), while the mean total factor productivity index for smaller farms is more than 25 percent greater than that of larger farms. In addition, it also appears that differences in efficiency between small and large farms stem from differences in scale efficiency, and not necessarily from technical or allocative efficiency.

The similarity of the results contained in Table 1 indicates that the differences between the results obtained by Ngwenya *et al.* (1997) and Van Zyl *et al.* (1995) are not necessarily due to differences in the methodologies used, but can rather be attributed to more fundamental differences in the way in which the data were treated. This matter is discussed in the following section.

Table 1: Comparisons of TFP results and efficiency estimates for the Eastern Free State, 1988/89

Average relative TFP and labour/machinery indices for different farm size categories					
TFP Index (largest third of farms = 100)			Labour/machinery ratio (large farms = 100)		
Small	Medium	Large	Small	Medium	Large
129	126	100	192	113	100
Average efficiency results (1.00 = efficient, i.e. on efficiency frontier)					
Technical efficiency (TE)		Scale efficiency (SE)		Allocative efficiency (AE)	
Mean	Std deviation	Mean	Std deviation	Mean	Std deviation
0.89	0.16	0.83	0.16	0.66	0.20
Average farm size of efficient versus inefficient farms (ha)					
Technical efficiency (TE)		Scale efficiency (SE)		Allocative efficiency (AE)	
Efficient	Inefficient	Efficient	Inefficient	Efficient	Inefficient
1 226.5	1 215.4	475.3	1 221.8	1 387.3	1 188.8

Source: Van Zyl *et al.* (1995): Tables 7, 9 and 10.

DATA ISSUES

Ngwenya *et al.* (1997) acknowledge that the data on farm size are treated differently in the Van Zyl *et al.* (1995) analysis to that in their own analysis. While they used the logarithm of total farm size (net of farmyard and wasteland) in their analysis, the latter study used land values to adjust farm size in order to account for differences in quality of land within and between farms.

Anyone familiar with the Eastern Free State will know that there are tremendous variations in the quality of land within and between farms. In general, the largest portion of a typical farm in the region consists of natural

grazing, much of which is mountainous. Only a relatively small proportion is arable, while small farms usually have a larger proportion of arable land than large farms. Moreover, much of the arable land is shallow and therefore unsuitable for wheat production. Such land is most often planted to pasture. The essential consideration is that the Eastern Free State is not a homogenous wheat-producing area, but a mixed farming area that even includes a limited area of irrigated land. It is therefore incorrect to merely add various categories of land together without normalising the sum thereof for quality. If this were done, it would be similar to comparing apples with pears, or, rather, adding apples and pears together and calling the result bananas. Binswanger *et al.* (1995) cite the lack of adjusting farm sizes for differences in the quality of land within and between farms as a major reason for the mixed and often biased results obtained by many studies on farm-size efficiency.

Having established that it is necessary to adjust land area for differences in quality before making comparisons, the question to be answered is how it should be done. The only information available on differences in land quality in the available data set for the Eastern Free State is that on bare land value, that is the value of the land without taking improvements into account. Van Zyl *et al.* (1995) used these values to adjust farm size for quality differences. In theory, this approach would be adequate to differentiate between quality differences, provided that there is a perfect land market (Chavas and Aliber, 1993). While land markets are usually not perfect and characterised by entry and exit problems, the South African market for farm land is relatively active with a large number of transactions (more than 4% of all farm land changes ownership per annum) and wide variations in land prices due to buyers' reactions to a variety of factors that influence their decisions (see Van Schalkwyk and Van Zyl, 1996). The net result of this situation is that the assumption that the land market approximates a perfect market seems plausible and justified. In the light of the lack of better information on land quality, the methodology used by Van Zyl *et al.* (1995) to adjust for land quality differences is therefore acceptable and defendable. Moreover, there is no doubt that it will yield more suitable and correct farm sizes for comparison purposes than when farm sizes are not adjusted for land quality differences at all (see also the comments of Feder, 1985; Peterson and Kislev, 1991; Chavas and Aliber, 1993; Johnson and Ruttan, 1994; and Binswanger *et al.*, 1995, on this issue).

To illustrate that it matters whether farm size data are adjusted for quality differences, the TFP analysis of Van Zyl *et al.* (1995) was redone with actual (unadjusted) farm size data and with farm size data that was quality adjusted in the manner described above. Table 2 provides the results.

Table 2: Comparison of TFP indices for small, medium and large farms with quality-adjusted and quality-unadjusted farm sizes (Eastern Free State, 1988/89)

Item	Small farms	Medium farms	Large farms
Adjusted farm sizes	129	126	100
Unadjusted farm sizes	91	96	100

Note: TFP index for large farms is the norm (= 100)

Table 2 illustrates the biased results obtained if farm sizes are not adjusted for land quality differences. The results obtained when the adjustment for land quality differences (first row) has been done, are similar to those reported in Table 1, illustrating decreasing productivity as farm size increases. However, the unadjusted analysis (second row) yields results that suggest exactly the opposite, namely increasing productivity as farm size increases. The latter biased and erroneous result is similar to that of Ngwenya *et al.* (1997), who also did not adjust farm size for differences in land-quality.

CONCLUSIONS

The discussion above clearly shows that the conclusions reached by Ngwenya *et al.* (1997) are incorrect and misleading. In reality, after proper treatment of the data, it is clear that: *Productivity of large farms was lower than that of smaller farms in the Eastern Free State in 1988/89, providing some motivation for land reform on efficiency grounds.* The reason for this contradiction is not necessarily due to the methodology Ngwenya *et al.* (1997) employed, but rather to their failure to adjust farm size data for differences in land quality. What is of particular concern is that this fact was pointed out to them in the review process, but that they chose to ignore it.

Finally, the article by Ngwenya *et al.* (1997) requires the agricultural economics profession to take cognisance of at least two issues:

- Policy advice should be based on sound analysis. In the past, many policy decisions were based on unsound analysis. This yields misleading results and undermines the credibility of the profession in respect of providing advice on important policy matters. While it is advantageous to have eclectic and divergent approaches to a particular problem or issue, the agricultural economics profession should at least have consensus that

advice should be sound and that every effort should be made to ensure that it is.

- Analysts should pay much more attention to data and the treatment thereof. This also implies that time should be devoted to attempting to understand the nature of the problem being addressed within its specific context, and not devoted only to the application of a particular methodology. In this context the old adage of "*garbage in, garbage out*" is very relevant. With reference to the article by Ngwenya *et al.* (1997), it is particularly important that foreign analysts, who are usually held in high regard, should ensure that their analyses are correct before drawing potentially important conclusions about local issues. It also illustrates that foreign expertise is also not necessarily better than local expertise.

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