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Beatrice Conradie, Jenifer Piesse, Colin Thirtle, Nick Vink & Kevin Winter
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EXPLAINING DECLINING AGRICULTURAL TOTAL FACTOR PRODUCTIVITY IN THE KAROO DISTRICTS OF THE WESTERN CAPE, 1952 TO 2002

Beatrice Conradie*, Jenifer Piesse**, Colin Thirtle***, Nick Vink**** and Kevin Winter*****

ABSTRACT

Conradie et al. (2009a and 2009b) identified the Central Karoo as the worst performing area in the Western Cape, but left the reasons for the region’s declining total factor productivity (TFP) unexplained. The current paper uses a combination of literature review and analysis of anecdotal evidence to evaluate a set of hypothetical reasons for the decline. The world wool price clearly affected farm-level profitability, putting up to 50% of sheep farms out of business in some parts of the Central Karoo. If census data were properly collected, this in itself should not have affected TFP. The evidence for overgrazing and increasingly ineffective predator control was less convincing. For example, there is no conclusive evidence yet on whether game and lifestyle farms exert any negative externalities on remaining sheep operations. The cost-price squeeze resulting from falling prices and rising input costs has led to an extension of production systems and poor maintenance which will no doubt lead to a further decline in productivity. We concluded that the rate at which the Central Karoo is shedding sheep farming, and the reasons for and effects of it, should be investigated further.

Keywords: TFP, productivity, arid environments, sheep farming, land ownership, social change

JEL codes: Q15, Q16, O13, O33, Q53

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1 INTRODUCTION

Total factor productivity (TFP) is a measure of technical efficiency which accounts for all inputs and all outputs. TFP growth reflects technical progress, which is usually in the order of 1 to 2% per annum. For example, technical progress delivered TFP growth of 1.3% per annum for South African agriculture as a whole over the period 1947 to 1991 (Thirtle et al., 1993), while UK agriculture grew at a rate of 1.8% per annum over more or less the same period (Amadi, 2000). The UK estimate was later revised downwards to 1.3% per annum when better data became available (Thirtle et al., 2004). As long as TFP growth is positive, there is a chance of agriculture keeping up with its weakening terms of trade, but when TFP turns negative alarm bells should sound.

Furthermore, national averages hide substantial regional TFP variation. For example, Amadi et al. (2004) showed TFP in the eastern counties of the UK to grow at twice the national rate. For Botswana, in the period 1979 to 1991, Irz and Thirtle (2004) recorded a TFP growth of +1.2% and –2.3% per annum in the commercial and traditional sectors respectively. Conradie et al. (2009a) uncovered large differences in TFP across the Western Cape between 1952 and 2002. In the leading districts of the Western Cape, TFP grew at more than 2% per annum, while the majority of districts performed worse than the national average. The Karoo districts of the Western Cape experienced negative growth. Three of the five Western Cape districts with negative growth are in the Central Karoo, and the fourth is adjacent in the Little Karoo. The only Central Karoo outlier, Prince Albert, recorded a modest positive growth of 0.7% per annum, which places its performance in the range typical for the Little Karoo. Negative TFP growth means that the Karoo now produces less aggregate output per unit of aggregate input than it did fifty years ago. While it was obvious that there was some agri-climatic foundation for the spatial pattern in TFP performance, Conradie et al. (2009a) was only able to attribute the results to the availability of irrigation water and distance to markets. Conradie et al. (2009b) simply identified the groups of districts which shared a similar experience. One of the major gaps left by these analyses is to explain why the Karoo’s productive capacity shrank, while agriculture in the other provinces became more productive. Unfortunately no data exist to test the kind of hypotheses outlined in Thirtle et al. (2004). Rather a combination of literature review and carefully interpreted anecdotal evidence collected from farmers in the Central Karoo are used here to begin to fill this gap.

Section 2 briefly describes the process of calculating a Tornqvist-Theil TFP index and Section 3 reviews the key results from Conradie et al. (2009a) to highlight the extent of the problem in the Karoo. Sections 4 to 7 describe the changing context of Karoo sheep farming over the last fifty years and provide examples of the impacts of these changes on farm-level productivity. Each of these sections
reviews the relevant literature appropriate to these changes and links them to the reasons for the low productivity growth in these districts. The paper concludes with some policy issues, which may help to reverse this downward trend.

2 THE TORNQUIST-THEIL TFP CALCULATION

The Tornqvist-Theil TFP index uses a discreet approximation of the Divisia index for a change from period t-1 to period t. In the input index individual input growth rates, \( \ln(x_{jt}/x_{jt-1}) \) are weighted by the share, \( c_{jt} \), of a given input in total nominal inputs at a given point in time. The weights are an arithmetic average of the two periods and adjust each year, avoiding the errors involved in indices like the simple Laspeyres, which uses the base period prices as weights.

\[
\text{Input index} = \frac{1}{2} \sum_j (c_{jt} + c_{jt-1}) \ln \left( \frac{x_{jt}}{x_{jt-1}} \right) \quad \text{(1)}
\]

Where annual data series are available, the calculation is normally one year, but since no such data existed for magisterial districts, the interval was from one farm census to the next. The censuses selected for the calculation were 1952, 1956, 1960, 1965, 1971, 1976, 1981, 1988, 1993 and 2002. The input index was calculated using three types of labour, eight categories of intermediate expenditures, plus land and machinery. The current price series was used for the weights and the constant price series or quantities for the indices themselves. Since the indices are ratios the constant price elements cancel out to give quantity ratios.

The same approach was used to construct the output index, where \( s_{it} \) is the share of a given commodity i in nominal output in year t and \( \ln(y_{it}/y_{it-1}) \) is the growth rate of commodity i based on physical outputs or the constant price series.

\[
\text{Output index} = \frac{1}{2} \sum_i (s_{it} + s_{it-1}) \ln \left( \frac{y_{it}}{y_{it-1}} \right) \quad \text{(2)}
\]

The output index was aggregated up from nine field crops, twelve horticultural crops and ten animal and animal product commodities. For each commodity data were collected on physical quantities of output, prices and gross values. Where any of the three was not available at the district level, estimates were made based on the Department of Agriculture’s national price and quantity series. For example, in a year for which district-level milk production was not available, but dairy cows were, a given district’s share of national milk production was calculated based on its share of the national dairy herd. Once physical outputs were available, they were multiplied by the national price to estimate district-level revenue from this commodity. For more information about the specific data sources and individual data transformations, see Conradie et al. (2008).
The TFP index is the output index divided by the input index. A starting index value of 100 is customary on the assumption of zero profits at that point. This assumption was used for the aggregated Western Cape index, from which district level starting values were calculated by expressing each district’s ratio of outputs to inputs as a proportion of the provincial aggregate. So, for example, Clanwillian started off 18% above the provincial aggregate and Laingsburg 60% below it. Separate indices were calculated for the 24 districts which were reported on for the entire period as well as for a further 16 from which seven aggregated districts could be constructed. In addition, TFP indices were calculated for nine statistical regions and the province as a whole. See Table 1 for a list of districts and regions. The growth rates were estimated by regressing logged index values on the years.

3 THE KEY FEATURES OF DISAGGREGATED TFP IN THE WESTERN CAPE

The irrigated districts of the Breede River Valley and the Boland mostly experienced strong growth in agricultural productivity over the period 1952 to 2002 (see Table 1). Exceptions include the Somerset-Strand and Stellenbosch districts, largely because these had been developed by the 1950s, and the boom in the wine industry continued at the time of the 2002 census. Caledon-Hermanus (deciduous fruit, wine grapes) and Vredendal-Van Rhynsdorp (citrus, wine grapes and vegetables), although strictly outside of the Breede and Boland statistical regions, share key characteristics: significant access to irrigation water on areas where export crops are grown.

Moving away from the well-watered valleys of the Cape Fold Mountains, TFP growth peters out. In the Swartland and West Coast regions this is masked by the rise of small horticulture industries along the lower reaches of the Berg and Olifants Rivers. Since wine grapes and export fruit have a much higher value than grains, the physical extent of horticulture underestimates its contribution to the value of total output. The landscape may look arid, but the district appears affluent in TFP terms. In particular, Vredendal-Van Rhynsdorp benefitted from the Olifants River irrigation scheme built during the 1970s and early 1980s, which transformed the region from the extremely arid conditions typical of Laingsburg to something comparable to Robertson. On the eastern side, the same mixed character is present in Caledon-Hermanus and Swellendam, but the majority of the Overberg and Southern Cape districts reflect the weaker performance of livestock and grains. In the Little Karoo, where fruit is grown but development is severely limited by a lack of irrigation water, the performance is also mediocre. Performance is poor not because the region grows low value crops, but because it was relatively well developed at the beginning of the period. However, it is too dry to reap the benefits of scale like the rest of the fruit and wine industries.
Table 1: TFP indices ranked by growth rate

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<td><strong>Vredendal Van Rynsdorp</strong></td>
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Source: Table A2 in Conradie et al., 2009a
In the Karoo rainfall levels are low and extensive sheep and goat production are the only viable options\textsuperscript{3}. However, over the last three decades sheep farming has experienced insufficient productivity growth to keep up with weakening terms of trade, while incurring additional costs associated with a growing interest in animal welfare (Elliot et al., 2011). Figure 2 shows a strong negative relationship between share of output from extensive livestock and TFP performance, regardless of whether measured at the beginning or end of the period under review. Laingsburg and Prince Albert experienced significant transitions out of extensive livestock into horticulture. For Laingsburg, canned fruit, wine and vegetables contributed 3\% of output in the beginning of the period and 37\% at the end. Local farmers say the Laingsburg cooperative, which was established by sheep farmers, is now run by fruit farmers. However, the area on which fruit is produced is barely 5 000 hectares, which suggests that the real reason for the dramatic change is the collapse of the sheep industry rather than the rise of fruit. For Prince Albert the change was less drastic and the contribution of canned fruit, wine and vegetables rose from 5\% in 1952 to 16\% in 2002, although this district is unique in the Karoo for having started out with relatively diversified production at the beginning of the period. Several reasons for this diversity are suggested in Conradie et al. (2009), including
initial conditions, the physical environment and the attempts made to overcome this constraint, human developments such as farmer and workforce education and market conditions. However, the real problems for the remote deserts of the Karoo remain lack of water and distance from major markets. A prohibitively high level of investment would be required to make the Karoo resemble the irrigated Breede River Valley and Cape Town remains too many kilometres distant.

Finally, the technical innovation that enhanced TFP in some regions is largely absent in the Karoo. For example, the spread of activities such as poultry rearing and the technological change in intensive animal rearing does much to explain the success of the Wellington district. However, there is a strong correlation between extensive animal rearing and low TFP growth and the scope for technological change in the region is limited. There have been improvements in the quality of the breeding stock, but this is a slow process. Better use of veterinary inputs has improved survival rates in sheep, although losses to predators are a serious disincentive to investment of this kind. Thus, not much can be expected from technological innovation in the region and looking at the reasons why the successful regions had high TFP growth does not produce any elements that are easily transferable to the Karoo.

The next four sections discuss reasons for the current low levels of agricultural productivity in the Karoo, including the market for sheep, both wool and mut-
ton breeds; farm management practices; social and environmental changes; and changes in the distribution of farm ownership. Some of these factors are supported by anecdotal evidence from discussions with local farmers but these are for illustration only and have not been formally verified.

4  CHANGING WORLD MARKET CONDITIONS AND LIVESTOCK HOLDINGS

World wool prices increased sharply during the second half of the 20th century, largely due to increased demand, plus the Australian industry was ill-prepared to face the resulting challenges posed by cheaper synthetic fibres and cotton. As a result the world wool industry stagnated for a few decades, until China entered as a major producer in the 1980s (Massy, 2011). Then production quadrupled from around 100,000 tons in 1961 to 400,000 tons in 2010 (see Figure 3). Despite this increase in domestic production, China also became the world’s largest importer, replacing the UK as the biggest destination for Australian wool. The Chinese wool textile industry grew by over 10% annually from 1980 to 1994, while wool imports increased by 17.8% annual, due to increases in household income.

This rapid growth in exports proved too tempting for the Australian Wool Corporation, which introduced a reserve price for wool in 1974. This was a classical commodity stabilisation scheme (Bardsley, 1994) to provide a guaranteed outlet and minimum price for farmers. A tax on wool farmers allowed the Australian
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Wool Corporation to purchase the excess supply. In theory, the Corporation would make a profit when the price was high by selling excess stocks, making the scheme self-financing. However, because the Corporation was owned and managed by wool farmers, there was a temptation to set the minimum price too high and this is exactly what happened and the reserve price increased by 70% in the two years to 1991 (Richardson, 2001). Predictably, stocks built up and there was an increased demand for further funds from farmers or the state. Not surprisingly, the scheme broke down in less than 20 years and was abandoned. Wool prices in Australia fell precipitously (from a government-set 700 cents per kilo (c/kg) to an auction price of 430 c/kg). A stockpile of 4.7 million bales of wool, almost a year’s production, and debt of A$2.7 billion, between 60% and 90% of the value of annual sales remained. Because Australia was the world’s biggest producer of wool, this had an impact on the world industry and South Africa was no exception. The Wool Reserve Price Scheme has been described as “Australia’s biggest business disaster” and “one of the worst government-generated policy calamities in Australian history” (Massy, 2011).

In South Africa, the wool price collapsed from more than R60 to about R40 per kilogram of greasy wool when the Australian government introduced their wool price (panel a, Figure 4). From the 1970s onwards the Rand wool price became more volatile, fluctuating between R20 and R40 per kilogram with the occasional spikes. In contrast the price of mutton rose steadily at 0.3% per annum in the same period. In 1974, the mutton price exceeded that of wool for the first time. Wool sales in South Africa declined from 97,500 tons in 1991/2 to 55,400 tons just five years later (Abstract, 2011). Current wool output remains under 45,000 tons.

Panel b, Figure 4 translates the relative product prices into income for wool sheep (Merinos) and mutton sheep (Dorpers). Surprisingly, product income varies little with prices. Wool sheep outperformed mutton sheep throughout the 1950s and 1960s, but since the early 1970s there has been very little difference between the two breeds. In Laingsburg, wool sheep share of total small stock was 63% in 1952. By 1956 it was above 80% and stayed at that level until 1965. Between 1971 and 1993, the wool sheep share of total small stock was around 60%, with some recovery by 2002. Given the similar levels of income from wool and mutton sheep more variation in farm level strategies is expected.
Figure 4(a) and (b): Commodity prices and lifetime produce income per ewe in constant 2010 rand
Source: Abstract, various years

Figure 5 reports the number of breeding ewes per type of small stock in the four magisterial districts of the Central Karoo. The trend is the same in all four. Stock numbers were high in the beginning of the period, but decreased sharply between 1965 and 1971, in part due to a government subsidized stock removal scheme.
This scheme was timely as there was a devastating drought in the Karoo during the second half of the 1950s followed by a collapse in prices in the late 1960s. As a result of the scheme stock numbers came down by a third, but for example in Beaufort West, half of the initial reduction was reversed by 1976. The changing ratio of wool sheep to mutton sheep reflects the change in relative commodity prices, but the continued decline in total livestock numbers cannot be explained by market factors.

Figure 5: Number of small stock breeding ewes per Karoo magisterial district, 1952–2002

Source: Farm Census, Conradie et al., 2008

5 FARM MANAGEMENT RESPONSES TO FALLING PRODUCT PRICES

Given the limited opportunities for technical change in the Karoo noted above another approach is to consider farm management practices. Archer (2000) reports that the first windmills were erected in the Karoo in the late 19th century and quotes the 1918 farm census claim that “15 000 farms ‘wholly fenced’ and 13 000 ‘partially fenced’ out of 31 000 farms in the Cape Province”. Accounts from Laingsburg seem to suggest much later investment in this part of the Karoo, with the wool boom of 1947 to 1953 identified as a period of significant investment in fencing and artificial watering points.

Elliott et al. (2011) list 23 strategies noted by Australian Merino farmers for increasing lamb survival. Under the heading “genetics”, the most common practices are to cull ewes that do not raise a lamb, select ewes with good mothering characteristics or good temperament and to use rams from breeds associated with high lamb survival rates. Under “flock management”, farmers identified “mothering
up lambs and ewes” (ensuring the bond), minimising disturbance caused by handling during lambing and the use of shearing just before lambing to encourage shelter seeking behaviour in ewes. It was also considered important to provide shelter either in the form of bush cover or a standing crop. These care strategies are combined with the use of teaser rams during short mating periods. With respect to “feed and nutrition”, the best ways to improve lambing rates are pregnancy tests (which separates ewes into three groups: dry ewes, ewes carrying singletons and ewes carrying twins) and managing them differently. Other management practices involved synchronising lambing periods with optimal fodder availability and the use of supplemental pasture or feeding. It is also considered important to maintain ewe weight and provide supplemental feed just before lambing to stimulate colostrum production. Elliot et al.’s (2011) remaining strategies include “predator control” and combining flock protection (with alpacas) with lethal control (baiting, shooting, culling predator populations).

But in the Central Karoo, where lamb survival is lower now than ever, anecdotal evidence suggests pregnancy tests are not in universal use and neither do all farmers keep records of the number of lambs sold. One example of poor record keeping comes from a retired sheep farmer’s account of his neighbour’s flock management practices:

Ek vra vir die werksman, “Het die baas die skaap getel toe julle hulle daar bymekaar gemaak het?” “Nee meneer.” “Het die baas die skaap op die pad getel?” “Nee Meneer”. “Het die baas die skaap getel toe julle hulle [daar op die nuwe plaas] in die veld ingestoot het?” “Nee Meneer.” Dis geen wonder dat die man nie lammers aankry nie.

[I asked the workman “Did the owner count the sheep when you collected them?” “No sir.” “Did the owner count the sheep on the road?” “No sir.” “Did the owner count the sheep when you arrived at the new pasture?” “No sir.” It is no surprise then that so few of his lambs survive.]

Record keeping is usually associated with more intensive production systems, which extends to supplemental feeding and lambing under controlled conditions. At the other extreme, there are cases of open season mating, infrequent handling of sheep (and fewer opportunities to count them), no supplemental feed or pregnancy scans and rudimentary recordkeeping. Farmers who have opted for extensive production systems claim that they are cost effective given the high cost of labour.

6 EVIDENCE OF ENVIRONMENTAL CHANGE IN THE KAROO

Some people have interpreted Figure 5 as evidence of overgrazing. Others, especially farmers, blame inadequate predator control for this state of affairs.
Both factors could potentially affect the secondary productivity of the system and through that contribute to falling TFP.

6.1 Grazing conditions

There has been much debate about the extent and timing of the Karoo’s overgrazing, and the mechanisms for its recovery. One view is that the Karoo has been overgrazed since as early as 1875 (Acocks, 1953; Milton et al., 1994), but the negative impact of climate change cannot be ruled out (Dean et al., 1995). While fencing and boreholes are considered good for productivity, Archer (2000) raises the possibility that they contribute to overgrazing because they allow farmers to carry more sheep during droughts. A minority voice even disputes the evidence of overgrazing, claiming that veld cover has improved during the last fifty years (Shearing, 1994).

The definition of overgrazing is a worsening of the ratio of palatable to unpalatable plants, accompanied by soil erosion (Milton et al., 1994; Shearing et al., 1994; Dean et al., 1995; Jones and Esler, 2004). According to Milton et al. (1994) it is a four-stage process. One starts out with perfect productivity, where severe climate events regularly cause mass extinctions, but seedling recruitment afterwards is certain. In Stage 1 of degradation palatable plants are grazed more frequently than toxic plants. This means that the palatable plants set less seed and recruit less frequently. In Stage 2 palatable plants disappear and carrying capacity suffers, but perennial cover remains intact. From then onwards removing sheep alone is not enough to guarantee recovery (Jones and Esler, 2004). In Stage 3 perennial cover begins to disappear. Extreme temperature variations on bare patches mean that almost no seedling recruitment occurs, except ephemeral and weedy species that cannot support animal populations throughout the year. Stage 4 is characterised by desert conditions with low or no vegetation cover, salinized soil and accelerated erosion.

Although theory is well stated and accepted, it has proved very difficult to establish a link between animal stocking rates and deteriorating rangelands. There are several reasons for this. First, as Archer (2000) points out, selective light grazing is one of the surest ways to change the range of palatable to unpalatable plants. The widely accepted remedy for this kind of overgrazing is high density grazing systems, which force livestock to graze on unpalatable plants and promote the recruitment of palatable species with the use of long rest periods (Tainton et al., 1999). Unfortunately, the adoption of these systems is hampered by their capital intensity. Secondly, climate mediates the relationship between stocking density and rangeland quality. Since the Karoo has thirty year climate cycles, one needs enormously long grazing experiments to capture this three-way relationship (O’Connor and Roux, 1995). Thirdly, for this kind of grazing experiment to work
outside experiment stations, one would need farmers to follow a single recipe about stocking decisions over thirty years, which they do not (Archer, 2004). For this reason we are unable to tell to what extent, if at all, overgrazing has contributed to the TFP decline recorded in the Central Karoo.

Figure 6: Total rainfall and rainfall intensity, Koup 1956 to 2010
Source: Farm rainfall series northwest of Laingsburg

While rangeland scientists are still struggling to relate stocking density to overgrazing and future carrying capacity, climate change might explain some of the decline in livestock numbers in the Central Karoo. Climate change predictions for the Karoo include a greater volume of rain in a single rainfall event, increased variability of rainfall and up to a 20% increase in the duration of dry spells (Hewitson, 1996). Figure 6 shows no discernible trend in total annual rainfall but there is a clear increase of 0.07% per annum in daily rainfall intensity between 1960 and 2010. As rainfall intensity increases, erosion accelerates and recruitment declines for a given stocking history.

6.2 Changes in predator management
Over the last fifty years the international debate on optimal predator management has shifted from government supported eradication to an anti-lethal control position (Martinez-Espineira, 2006; Treves and Karanth, 2003). Karoo farmers have experienced a similar policy change over the same period. In the 1950s, fencing facilitated eradication. By the early 1980s there were still government-supported hunting clubs operating on the southern fringes of the Karoo (Conradie, 2012). By the mid 1990s these have been abolished and permits were required for the removal of damage-causing endangered species, such as Cape leopards.
By 2008 lethal control of even the most common predators were tightly regulated (Cape Nature, 2008).

The international evidence of the effect of lethal control of coyotes suggests that killing does not reduce stock losses and instead selects a “super predator” which is virtually impossible to control. Coyotes kill sheep when the ranges of the two species overlap, but the killing is done by the alpha pair only, and even then by only some of the alphas (Sacks et al., 1999). Therefore removing a coyote breeding pair in the lambing season causes a respite from predation of a few months, although the effect is insignificant during the following season (Blejwas et al., 2002). Stocking density does not affect predation (Gusset et al., 2009). Knowlton (1972) and Crabtree (1997) propose a variety of compensating mechanisms, including immigration, larger litters, younger breeding ages and higher pup survival. Chapron et al. (2003) found wolves quickly recolonize an area when prosecution stops and Balme et al. (2009) reported leopards compensating through faster reproduction. Bingham and Purchase (2002) reported rapid jackal recovery after rabies. We have no systematic evidence on the effect of sustained lethal control efforts on predator behaviour and sheep losses, but we can say with certainty that the fractured nature of land use in parts of the Karoo is likely to have exacerbated the negative effect of predators on productivity in sheep farming. However, given that predators are said to have reappeared in the Central Karoo only in the late 1990s, they can hardly be blamed for the majority of the region’s TFP losses between 1952 and 2002.

7 SOCIAL CHANGE

Two aspects of social change matter for farm productivity: changes in farm labour relationships and changes in land use. Both potentially have a serious negative effect on the productivity of sheep farming.

7.1 Changes in farm labour relationships

Compared with the fruit industries of the Western Cape, little is known about farm labour relations in the Karoo. In the mid 1970s labour relationships on fruit farms were characterised by low levels of development and by paternalism (Graaff, 1976; Van der Merwe, 1976). Men in full-time permanent jobs formed the core of the labour force, which was supplemented with the services of farm women and children or contract workers from the Eastern Cape during the harvest season (Levy, 1977). Kritzinger and Vorster (1996) documented the gains made in gender equality and the development of on-farm social services during the early 1990s. Some of these gains were undone by land tenure reform introduced in 1997 and a statutory minimum wage introduced in 2003. The rising cost of permanent staff relative to casual labour caused job losses, casualisation and mechanisation (Du S1 16
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Toit and Ewert, 2002; Du Toit and Ally, 2003; Barrientos and Kritzinger, 2004; Conradie, 2005; Ewert and Du Toit, 2005).

The Karoo lagged behind the fruit industry with respect to farm labour development. In 1988 the average permanent farm wage for example was 63% higher in Paarl than in Laingsburg. The average level of education of Coloured males in the 25 to 29 age group was 5.2 years for Laingsburg and 7.6 years for Paarl. Although it looks as if the Karoo had caught up with the fruit industry by the end of the period in terms of wages (in Laingsburg the average permanent farm worker earned R27 717 per annum in 2002 compared with R13 430 in Paarl), it lost many jobs. In Laingsburg permanent farm employment was down to 27% from its 1988 level by 2002, while in Paarl jobs grew by 8% over the same period. The net effect was a large influx of displaced farm workers into many of the Karoo towns, where people are now almost completely dependent on government grants and perhaps greatly tempted by stock theft. Some workers are rehired on a casual basis by their former employers, but much more of the work is now done by the farm owner and his family. Where Karoo farmers’ children are homeschooled, they potentially become a ready source of cheap labour. While we have not yet found any examples of children being homeschooled explicitly in order to help on the farm, there is anecdotal evidence of major operations, such as tail docking, being saved up for holidays when children were home from boarding school. Although many farmers indicate that they prefer to do the work themselves, it seems unlikely that family labour would fully substitute for hired labour. The net effect may be a productivity loss as a result of less closely monitored stock, poorly maintained fences and less labour-intensive, but less profitable, breeds.

7.2 Land use changes

Commercial sheep farmers perceive changing land use around them to exert negative externalities on their businesses and threaten their livelihoods. Figure 7 captures the perceptions of a group of commercial sheep farmers about land use changes in Laingsburg. The group identifies four types of land use, namely occupied sheep farming (blue), unoccupied sheep farming (green), lifestyle farms (orange) and game areas (pink).
Occupied sheep farms are now perceived to be in the minority of land use in Laingsburg, probably due to the cost-price squeeze experienced by sheep producers. There are at least two possible reasons why the blue farms have survived as occupied sheep farms, while their neighbours failed. The first reason is that they may not actually be very profitable, but that their owners may have poor off-farm prospects and therefore continue to farm under subsistence-like conditions. Alternatively, these blue farms may have had a single heir over the last few generations or may combine the inheritances of both husband and wife. Once a farmer is slightly more profitable than his neighbours, he might be able to buy more land in time of drought, giving rise to the phenomenon of unoccupied sheep farms. The extent to which farms managed at a distance will be less productive than farms with resident owner-operators, explain the extent to which falling Karoo productivity may be the result of the spread in green farms.

The map represents a snapshot of a dynamic process of change in land use, the history of which has not yet been recorded. However, there is reason to believe that this change has been quite rapid. For example, the 1988 and 1993 farm censuses still reported the majority of the Central Karoo’s land to be used for production, but listed no land use data in 2002. On the other hand, Archer (2004) recorded about 10% of farms in Graaff Reinet to have been bankrupt all at once in the early 2000s.

The distinction between game areas and lifestyle farms drawn by farmers in Figure 7 is not always entirely clear, and this lack of clarity probably means that significant inaccuracies remain in the map. Nonetheless, the map amply
explains the fractured nature of land use in the Central Karoo and hence the potential for conflict between those who want to farm the land and those who want to conserve it (Treves and Karanth, 2003). In the Karoo, the conflict arises over the issues of fence maintenance and the acceptability of lethal control of predators. On the Agulhas Plain, lifestyle farmers have been shown to own smaller properties than commercial farmers, to derive almost no income from traditional farming enterprises and to be more conservation oriented than commercial farmers (Conradie, 2010). The owners of some of the properties classified as lifestyle farms buy land in the Karoo for holiday purposes, perhaps with a view later to conserve it more formally. Others are tempted away from their inheritance by better jobs and better schooling for their children in town. In both cases the result is that farms lie empty, with their fences falling down, which allows local game populations to slowly recover. In formal game areas, fences come down for other reasons while sometimes significant investments are made in tourist infrastructure and game stocking. Unfortunately little of this investment is perceived to have any influence on the local economy.

Sheep farmers vehemently oppose lifestyle farms, for two reasons. Lifestyle farms are seen as a breeding ground for predators and other evils, such as stock theft. We know of several sheep farmers who have sold their farms where they were surrounded on three sides by lifestyle farmers to buy land in a part of the district which is still predominantly owned by sheep farmers. Lifestyle farmers also are accused of not shouldering their share of fence maintenance and of not contributing to the upkeep of the local community. Sheep farmers dislike game farmers for the same reasons, but are slightly more ambivalent about them because they are well known to pay top prices for game farms.

8 CONCLUSIONS

This paper was motivated by the results of the formal analysis in Conradie et al. (2009), which measured district-level TFP performance in the Western Cape, and considers the reasons for the TFP decline recorded for the Central Karoo districts between 1952 and 2002. The specific focus here is on elements that were not captured in the census data but which shed light on this fall in performance for the region. Evidence was presented of a sharp decline in livestock numbers in all four districts and significant amounts of land transitioning out of agriculture in one of the districts. The possible decline in productive capacity was explained with a decline in the world wool price that resulted in a large proportion of farms becoming unprofitable. The evidence for overgrazing and declining predator control was less convincing. For example, there is no conclusive evidence yet on whether game and lifestyle farms exert any negative externalities on remaining sheep operations. The predator and overgrazing issues were judged to remain open
questions. The cost-price squeeze resulting from falling prices and rising input costs has led to an extension of production systems and poor maintenance, which will no doubt lead to a further decline in productivity. We conclude that the rate at which the Central Karoo is shedding sheep farming, and the reasons for and effects of it, should be investigated further, as should the reasons for and effects of shedding permanent farm labour.

This study was limited to the Central Karoo, but the TFP picture is likely to be similar in other parts of the Karoo. It could be argued that the regions north of Ceres and east of Van Rhynsdorp are not showing the decline recorded for the Central Karoo, but one should remember that the TFP aggregation process causes the district average to be pulled up by a thriving horticultural sector. The extent to which other parts of the Karoo are subject to the same pressures as the Central Karoo will determine the extent which productive capacity in these other parts will be similarly affected.

Of course the reasons for poor productivity and for reversing this trend are very different. Some changes in policy may help. Education is clearly important, both in farm management measures that help to reduce soil degradation and to improve lambing practices. These are reasonable policy objectives that can be achieved through extension services at fairly low cost. Education and constructive discussions between the opposing parties in the conservation debate can reduce the predator problem for farmers while supporting tourism and CapeNature in their wish to maintain animal diversity and welfare. However, a far greater problem is changes in land ownership and societal problems remain the most difficult to address. Recreational farmers cannot be forced to participate and contribute to local communities but there is a need for responsible ownership that includes maintaining property and not allowing negative spill-overs from non-active to active farms. It is clearly well within the ability of local authorities to ensure that this takes place and that good governance is strongly encouraged and monitored. This may raise the costs associated with recreational farming but would be less disruptive in the long run.

NOTES
1 These were the most recent disaggregated data available at the time.
2 The Karoo districts of the Western Cape Province consist of the magisterial districts of Laingsburg, Beaufort West, Murraysburg and Prince Albert, an area referred to as the Central Karoo. Uniondale, while strictly classified as Little Karoo, shares many of the features of the four Central Karoo districts, while Prince Albert is more similar to the Little Karoo.
3 Between 1952 and 2002 sheep and goats, including animal, wool and mohair sales, made up 82% of the Central Karoo’s gross farm output. The average share of all livestock and livestock products was 90%.
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4 A first pregnancy at 18 months and a final weaning rate of 75% is assumed for both breeds. Wool sheep were assumed to have a single pregnancy in a 12 month cycle and mutton sheep to have three pregnancies within two years. Both kinds of ewes remain productive for 4 years. Each lamb is assumed to have a carcass weight of 17 kilograms. Dorper ewes are assumed to yield 30 kilograms of mutton and Merino sheep to yield 20 kilograms of mutton at the end of their productive lives. Wool production consists of 0.5kg of hogget wool for the ewe plus the four lambs she is expected to raise during her productive life. Each ewe’s adult wool production is 6 kilograms for 5 years. Mutton and wool are valued at the average national price, with hogget wool expected to bring twice the average price.

5 This is discussed further below.

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