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# THE IMPLICATIONS OF A WEAK PUBLIC EXTENSION SERVICE FOR THE PRODUCTIVITY PERFORMANCE OF KAROO AGRICULTURE

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***ABSTRACT***

*This study used data on farmers' preferred sources of information in three areas of their business to investigate what happens to farm productivity when the public extension service is dismantled. The majority of the farmers interviewed preferred the public sector service for grazing information. The group was divided on the best source of animal husbandry advice; 30% preferred the public extension service while 35% indicated that input salesmen, buyers, producers' organisations or the media were their preferred source. In these two areas one in five farmers indicated that they trust their own experience most, while 13% felt unsure of where to get good advice. These farmers seemed to find it more difficult to find good information on predator management than on either of the other two topics. Nobody considered the state to have any predator management expertise, while 35% of the group preferred advice from professional hunters and 37% indicated that they rely on their own experience. There was an inverse relationship between coverage and the degree of privatisation as expected, but surprisingly a preference for private sources of advice was associated with much better productivity outcomes than a reliance on the public extension service.*

**Keywords:** information preferences, productivity, privatisation, extension coverage

## 1. INTRODUCTION

Hoag (2005) attributed American agriculture's strong productivity performance to their Cooperative Extension Service's excellent track record. According to Ahearn *et al.* (1998) output per unit input grew at 1.96% per year over the second half of the twentieth century. However, Hoag (2005) feared that budget cuts resulting from agriculture's declining political importance would cripple the American extension service, thereby undoing a century of good work. There are several reasons why a weak public extension service might cause farm productivity to fall. Firstly, there is a coverage issue, since providing a service to all farmers might not be profitable. Smaller and more remote operations, where the unit cost of extension would be higher, are the most vulnerable. Secondly, society's objectives and planning horizons may not coincide with that of private advisors, which does not bode well for sustainability. For example, according to Burch *et al.* (1999) Australia's fragile soils were almost destroyed by lucrative, but short-sighted, production recommendations from multinational food companies out of the global north. The state was practically powerless to avert disaster and only community action which later gave birth to the Land Care movement saved the day. Thirdly, private advisors might overstate their own expertise in order to compete in congested markets (Prokopy *et al.*, 2015), or as Hoag (2005) pointed out, in some cases private advisors might find it profitable to distribute the wrong information.

South African agriculture's productivity performance over the second half of the twentieth century was almost as good as that of America; according to Thirtle *et al.* (1993) South

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Africa's total factor productivity grew at 1.25% between 1940 and 1990, although this average hides substantial regional variation (Conradie et al., 2009). In the period since 2002 both producers and the public extension service on which they rely have been under pressure. Producers have had to contend with the twin challenges of globalisation and increased domestic regulation (Barrientos & Kritzinger, 2004), while the extension service has had to take on the main responsibility for the racial transformation of South African agriculture, albeit on the same budget as before. Düvel (2001) called for close monitoring of the effects of these changes on farm productivity, but admitted that gathering adequate data to do so might be a challenge.

This analysis took advantage of existing TFP estimates for the Karoo to investigate the degree of extension coverage, the extent to which this coverage has been privatized and the correlation between a farmer's choice of information source and his farm's productivity performance in 2012.

## 2. DATA AND METHODS

The data used here come from an interdisciplinary investigation of the impact of predators on livestock farming, called the Karoo Predator Project. This study will continue until the end of 2016 in the Laingsburg district of the Central Karoo. This region is an arid landscape that is only suitable for extensive sheep and goat production. The farm management survey was conceived as a four-wave panel study, which collects data on farm and farmer characteristics, the workings of the farming system and its financial performance. Wave 1, on the 2012 season, approached 66 farmers of whom 60 agreed to be interviewed (91%) and 58 (88%) produced useable responses. The total of 37, 000 sheep and goats on which these farmers reported, amounts to 78% of the small stock recorded for this district in the 2002 farm census (Statistics South Africa, 2006).

A subset of 46 observations from this dataset was previously used in a data envelopment analysis to calculate the total factor productivity of full-time sheep farms in the area (Conradie & Piesse, 2015). Data envelopment analysis is a linear programming model that constructs a piecewise-linear best-practice frontier which minimises the Farrell efficiencies of participating farms (Farrell, 1957; Fare *et al.*, 1985). Each farm's overall productivity performance is expressed as a ratio of actual to best practice performance, with the best farms said to be 100% efficient. This ratio is sometimes referred to as a total factor productivity score, as it is calculated jointly over all inputs and outputs in the system. Mutton and wool income, hired labour costs, the cost of other purchased inputs and the amounts of grazing land and family labour used in production were included in the frontier. All variables were expressed per breeding ewe in the flock. The group's mean overall efficiency was 67%, comprising technical and scale efficiencies of 81% and 80% respectively. The overall efficiency scores were used in this analysis.

Wave 1 also included three open-ended questions about farmers' preferred sources of information in key areas of their operations. The question was: "*Wie of wat is the beste bron van inligting as dit by weiding-, vee- en roofdierbestuur kom*? [Who or what do you consider to be the best source of information on matters of rangeland management, animal husbandry and predator management?]. Obviously managers use multiple sources of information to come to a decision (Afful & Lategan, 2014) but it was assumed that farmers would give most consideration to the source that they consider best in a particular domain.

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Conceptually, extension transmits information from its site of production (research institutions) to its site of adoption (farms). Traditionally this role was played by the public extension service, but now the internet allows farmers to access research results directly. For example, funding arrangements in New Zealand encourage researchers to contract directly with farmers (Burch *et al.*, 1999). Since most research institutions in South Africa are public entities, it seemed obvious that a preference for information directly from the research source should be counted as part of the public sector's service delivery. When the public service is dismantled one of two things can happen. In Europe Klerkx & Leeuwis (2008) reported that public sector services were replaced by a rich network of private service providers, which to some degree now operate formal extension programmes. South Africa is reasonably well off too; Terblanché (2013) listed several industries which are already well served by private advisors, normally free of charge. However, in a developing country context access to external sources of information is not guaranteed in which case farmers might have to rely on friends and family or their own experience (Sani *et al.*, 2015; Afful & Lategan, 2014).

Two measures of the degree of transformation of the extension service were employed in this analysis, namely the degree of coverage and the degree of privatisation of existing coverage. To calculate the degree of extension coverage, all preferences for formal (external) sources was expressed as a percentage of the total sample size. To calculate the degree of privatisation, the number of references to private sources was expressed as a percentage of the number of formal private and public sources mentioned. Since it was not always possible to tell if a response of "own experience" indicated a lack of access to external sources or the consideration of many alternatives, own experience was kept separate from the informal sources category, which included responses of "unsure", "none", "friends and family" and "staff". Three single variable analysis of variance (ANOVA) tests compared within group variation in productivity to the variation in productivity across extension channels for each of the knowledge domains. Although this procedure does not imply causality, it allowed as a first step to see if a preference for private over public sources of information increased or decreased a farm's productivity performance.

Farm performance could alternatively have been measured as net farm income per breeding ewe in the flock, but this metric was considered not quite as good as the TFP data as unit profitability was only available for 34 of the Wave 1 observations (Conradie & Landman, 2015).

## 3. RESULTS AND DISCUSSION

Almost 40% of the farmers interviewed mentioned a different preferred source of information for each of the three extension topics, while 22% gave the same answer in all three cases, which was usually that the best information source was own experience. Table 1 below reports the frequency of responses by extension domain and preferred source of information.

### 3.1 Rangeland management

The survey found that in 2012 the public extension service was still quite influential in the rangeland management domain. In this area farmers need to know which plants have the highest grazing values, when to rotate and how densely to stock the land. The resident extension agent was identified as the best source of this kind of advice by 37% of the 46 farmers interviewed. This individual's recognition in this community derives from his insider status and wealth of practical experience. He grew up on a sheep farm in the district and has

been farming there part-time since his return from university to take up the local extension position. This person has since retired and was succeeded by a transformation candidate. It is unlikely that the importance of the public extension service will be maintained during this transition as the new incumbent is a young African woman who does not speak the local language and has little practical experience of local production conditions. This illustrates how variable the quality of South Africa's public extension service currently is and how quickly inappropriate transformation can allow a good quality service to collapse.

**Table 1:** A classification of farmers' preferred sources of information by extension topic (n=46)

| | Rangeland management | Animal husbandry | Predator management |
|---|---|---|---|
| Stated preferred information source | | Frequency | |
| | | | |
| PUBLIC SOURCES | | | |
| | | | |
| *Grootfontein* Agricultural College | 4 | 5 | - |
| Resident extension officer | 17 | 6 | - |
| State veterinary service field officers | - | 3 | - |
| Soil conservation committee | - | - | - |
| Conservation authorities | - | - | - |
| | | | |
| PRIVATE SOURCES | | | |
| | | | |
| *Landbouweekblad* | 5 | 3 | 2 |
| Other media | 2 | 2 | - |
| Input suppliers or buyers | 1 | 7 | - |
| Consultants incl. professional jackal hunters | - | - | 16 |
| Producers' organisations | 3 | 4 | 1 |
| | | | |
| INFORMAL SOURCES | | | |
| | | | |
| Friends and family | 4 | 4 | 6 |
| Staff | - | - | 1 |
| None / unsure | 2 | 2 | 3 |
| | | | |
| OWN EXPERIENCE | 8 | 10 | 17 |
| | | | |
| *Degree of formal coverage* | 70% | 65% | 41% |
| *Degree of privatisation of formal coverage* | 34% | 53% | 100% |
| | | | |

Grootfontein Agricultural College and Research Station was identified by four farmers as the best source of rangeland management information. It was also the only institution of tertiary training to be mentioned. This was not too surprising as Grootfontein is a dedicated training facility for the extensive grazing areas. Eleven of the farmers interviewed were educated there and their diplomas represent 44% of the total tertiary education reported by participants in the survey. One strategy for strengthening the influence of the public sector extension

service would be to encourage other universities to reach out to these farmers and the public extension service as well.

Formal private sources of information received 24% of the votes in the rangeland management domain. The media was the most important private source of information mentioned and attracted seven of the votes. Of those who mentioned the media, 71% referred to the Afrikaans-language farmers' weekly trade magazine, Landbouweekblad. Other minor private sources were one mention each of books, the internet and a well-known animal nutritionist. Landbouweekblad's prominence is no doubt attributable to the fact that the study area is almost entirely Afrikaans-speaking. However, local farmers can speak English and with a national circulation several times that of its English language equivalent, South African farmers obviously consider Landbouweekblad to be a reputable source of sufficiently practical information.

Formal extension coverage amounted to 70% of farmers interviewed in the rangeland management information domain and their responses indicated that 34% of the formal coverage was provided by private advisors in 2012. Two people said that they were unsure of where to find good advice on rangeland management, while four said that they consider friends and family to be the best sources of information on this topic.

There were two parts of the public sector with notable expertise in rangeland management which did not come up, namely Land Care and Cape Nature. Land Care evolved out of the Soil Conservation and Technical Services Division of the Department of Agriculture after South Africa's transition to full democracy in 1994. Before 1994 the service responded to extension agents' calls for infrastructure development on white farms, which meant that its technology transfer was always backed up by extension input. In the Karoo the service sank boreholes and built fences and soil conservation works on condition that the recipient farmers would afterwards follow the correct stocking density and grazing rotation for their area. The resident extension agent was responsible for seeing that this happened, which explains his reputation as rangeland expert. After 1994 the service's focus shifted to black emerging farmers and for a while limited funding prevented Land Care from having much influence in the Karoo. However, in 2012 a group of local farmers successfully applied for public works funding to refurbish fences under the direction of Land Care (Nattrass *et al.*, 2015). This time the resident extension officer was not involved and it remains to be seen if technology transfer unsupported by extension can work.

Cape Nature is the provincial authority responsible for off-reserve conservation in the study area. The fact that none of the farmers considered its service to be a good source of rangeland management advice suggests that the organisation might be more focussed on conserving the vegetation of the Cape Floristic Region than on conservation of the study area's Nama Karoo biome, which falls mainly outside of its jurisdiction (Mucina & Rutherford, 2006). The Cape Floristic Region is the smallest of the world's five plant kingdoms and is characterised by exceptional levels of plant biodiversity and endemism (Cowling and Holmes, 1992), which makes it of global importance to conserve all of it. Given the enormity of the task and the restrictions imposed by Cape Nature's limited budget, this organisation needs all the help it can get in the Karoo, for example from botanists who work in the area. Some farmers who participated in this study were aware of long-term vegetation monitoring at Tierberg Karoo Research Centre in Prince Albert and spoke with great appreciation of the botanists involved in it but also indicated that fees payable are problematic This points to a possible reluctance

to pay for private sources of advice, or alternatively, to the fact that most farmers do not understand how biodiversity conservation benefits rangeland productivity.

### 3.2 Animal husbandry

The area of animal husbandry involves factors that contribute to reproductive efficiency such as animal health, nutrition and breeding decisions. In this area the public extension service had a less dominant position than it had in the rangeland management domain; fourteen farmers preferred the public service while sixteen indicated that they like a private source of information best. This gave 65% extension coverage and implied a 53% degree of privatisation of the existing coverage.

The resident extension officer received six votes, while Grootfontein had five votes and the state veterinary service received three votes.

On the private side, Landbouweekblad was the preferred source of information of three people, while two referred to books or the internet and four mentioned producers' organisations. Of the seven farmers who preferred to rely on input suppliers or commodity buyers, five (71%) mentioned a famous animal nutritionist, attached to Tongaat Hulett's Voermol division, by name. Voermol is the only brand on animal feed stocked by the local cooperative, which suggests that even when farmers access private sources of information they tend to do so passively.

The 35% of farmers that did not have access to external information on animal husbandry consisted of two individuals who said that they were unsure of where to find information and four people who preferred to rely on friends and family. In addition, ten people believed that their own experience was the best source of information in this area.

It is possible that the preference for own experience over external sources of information could be the result of having learnt from a good public extension service in the past. If this was so, those who now prefer own experience should be systematically older and more experienced, and even perhaps better educated that those who still prefer a formal external source of information. There was no difference in age or practical farming experience, while the marginal differences in formal education and management experience were the opposite of what was hypothesised. People who said that they rely on external advice on average reported 13.3 years of formal education compared to 12.5 years for those who indicated that they prefer their own experience ($p = 0.1155$ on the one tailed t-test). Furthermore, people who preferred external advice had 23.4 years of management experience compared to just 18.2 years for those who said that they rely on their own experience ($p = 0.0933$ on the one-tailed t-test). There is a slight possibility that schooling improved substantially for a while during the 1970s and 1980s which might have made younger individuals more efficient at learning by doing, although it is much more straightforward to interpret this data as suggesting that a preference for own experience in this dataset signals a lack of access to information.

The explanation for the greater degree of privatisation in animal husbandry than in rangeland management is simply that advising farmers to win their trust is a good way to promote one's services and increase one's employer's profitability. Even the National Wool Growers Association's private field service is a profit maximisation strategy as it builds critical mass in the industry which increases everyone's performance. Hoag (2005) argued that it is in

everyone's interest to allow the private sector to provide the advisory services it can provide profitably. While he may have a point regarding the cost effectiveness of private extension, the real issue is not the cost of delivery, but coverage. If the public extension service is expected to only ever deal with the basket cases and never be exposed to best practice, it cannot ever be expected to be very good. Therefore, it is in the interest of the broader transformation agenda in South Africa to maintain a strong public extension service, which can push back on the various private extension initiatives.

### 3.3 Predator management

Predation management is a relatively new challenge for the current generation of Karoo farmers. After several decades of absence from the Central Karoo, black backed jackals reappeared there during the late 1990s where their predation on sheep escalated into a full-blown crisis by the mid-2000s (Nattrass & Conradie, 2015). The survey found that in 2012 none of the farmers interviewed considered the public sector to be the best source of information on jackal management. Perhaps the reason for this is that Cape Nature is tasked with wildlife management and that farmers were fighting with Cape Nature over permissible control methods. The majority of farmers interviewed either thought that they know best about predator control (37%) or that professional jackal hunters were the experts (35%). Two people mentioned Landbouweekblad while one other person mentioned the National Wool Growers' Association. Six people referred to friends and family, whilst one person said he thought his staff knew more about predators than he did himself. Three people indicated that they were unsure of where to find good information on predator management. This data implied a privatisation rate of 100% and a shockingly low degree of coverage of just 41%.

At the time of this survey there was a lack of clarity on how the Karoo's medium-sized predators ought to be managed. The state's jackal hound breeding facility and research station closed in 1989 (Nattrass & Conradie, 2015), while the last predator studies to be conducted on farmland appeared in the mid-1990s (e.g. Kok, 1996). Most farmers relied on their fathers' or grandfathers' experience to respond to the initial crisis, although quickly a few enterprising individuals came forward to offer "professional" hunting services. With the exception of a former employee of the hound breeding facility who set up a private consultancy and trap factory after retirement, none of the "professional" hunters uncovered by the survey were professional in the sense of having a formal ecological qualification or working in the job full time. They were mostly just farmers who happen to be good shots or have an interest in the matter. The National Wool Growers' Association endorsed the services of one of these hunters, also a farmer in Loxton district in the Northern Cape. This individual is clearly quite influential as his training course was identified as the best source of information by eleven of the farmers who participated in the survey. The one person who indicated a preference for the National Wool Growers' Association as source of information on this topic was probably referring to him too.

It is problematic that there is so little research available on which to base the control of black-backed jackals, because the literature on coyote control shows that indiscriminate culling could trigger compensatory breeding which often aggravates predation problems (Knowlton et al. 1999; Mitchell *et al.,* 2004). Locally Conradie & Piesse (2013) used farm-level data to show that increased levels of culling of other predator species aggravated predation. We also know that juvenile black-backed jackals can easily disperse over distances of a hundred kilometres or more (Drouilly, in prep.), which implies that any attempts to coordinate control will be difficult and expensive to organise. The first step to rectifying this situation is

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research, which is now underway at several South African universities. The second step is regulation, where given the high transaction costs involved, government will only be successful if it can get the existing provincial conservation services to develop a stronger presence on commercial farms. This might take a while and be strongly resisted unless organised agriculture, particularly the Predator Management Forum, rolls out a clear extension programme.

### 3.4 Linking the choice of information source to productivity

Table 2 shows how the mean total factor productivity scores of farms in the sample varied with the farmers' choice of type of information source.

**Table 2:** Total factor productivity by preferred extension channel and knowledge domain (n = 46)

| | Rangeland management | Animal husbandry | Predator management |
|---|---|---|---|
| Preferred source of information | Mean ± standard deviation | | |
| | | | |
| Public extension service, research | 57 ± 30 | 55 ± 32 | - |
| Private sources | 83 ± 29 | 80 ± 25 | 76 ± 32 |
| Informal sources | 57 ± 9 | 55 ± 15 | 57 ± 24 |
| Own experience | 78 ± 23 | 70 ± 29 | 66 ± 27 |
| | | | |
| ANOVA F-statistic | 2.91 | 2.32 | n.a. |
| p-value | 0.0456 | 0.0851 | |
| | | | |

In the case of rangeland management, the overall productivity difference across information categories was statistically significant ($p = 0.0456$). Farmers who said that they rely on private sources of information recorded the highest mean productivity score of 83%, followed at 78% by those who said that they rely on their own experience. These two groups did much better than people who still rely on the public extension service or advice from friends and family, whose mean scores were just below 60%. In the case of animal husbandry, the difference was more marginal at a probability of $p = 0.0851$, but the pattern was virtually identical. Here people who indicated a preference for private sources of advice recorded a productivity score of 80% while individuals who said they rely on their own experience had a score of 70%. The same gap in productivity was found between the mean performances of the users of these two sources of information and those who rely on friends and family or the public sector, whose mean scores were 57% and 55% respectively. Since the public sector category was empty in the case of predator management, the same ANOVA test could not be conducted for this domain. The mean scores for the remaining three categories fitted the same pattern observed for the other two domains. A preference for private sources of information was again associated with the highest mean total factor productivity score, albeit at a slightly lower mean level. Those who preferred own experience had the second highest score, also at a somewhat lower mean level, followed by those who trust friends and family, where the score was similar to the scores for the other two domains.

At first glance it seems that these results, which show that farmers who prefer private information sources perform better than those who still use the public sector, support the position of Hoag (2005) and Klerkx & Leeuwis (2008), who argued that the private sector should be allowed to replace the public service where it wants to. However, because the ANOVA tests do not imply causality, it is not possible to claim that private information sources confer a productivity advantage; it could simply be that more competent managers have options that others do not. Moreover, if coverage decreases as a result of privatisation, former clients of the public service might end up having to rely on informal sources of advice, which was shown here to be associated with low levels of farm productivity.

## 4. CONCLUSION

This analysis investigated the degree to which private sources of information are currently preferred over the advice provided by the public extension service. It also asked if extension coverage was related to the degree of privatisation of extension and how a farmer's choice affected his farm's productivity. The study found gaps in extension coverage of 30% and 35% respectively in the areas of rangeland management and animal husbandry and a gap of 59% in the area of predator management. There was an inverse relationship between coverage and the degree of privatisation, but at least initially privatisation was not associated with lower levels of productivity, although further privatisation might negatively affect future coverage. Farmers, who said that they trust their own experience most, had productivity scores similar to that reported for the users of private information sources. In contrast, relying on friends and family was associated with productivity scores similar to that of the users of the state extension service. The main implication of these results is that we should guard against a further decrease in coverage. More work is needed to establish causal links between better quality information and better productivity outcomes.

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