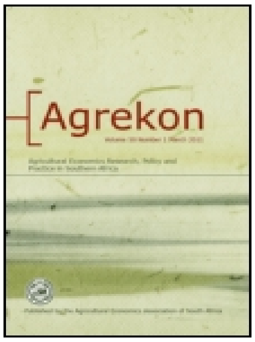

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Effect of selection on the production of day-old ostrich chicks in the Klein Karoo

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EFFECT OF SELECTION ON THE PRODUCTION OF DAY-OLD OSTRICH CHICKS IN THE KLEIN KAROO

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ABSTRACT

The main farming system in use for the production of day-old ostrich chicks around Oudtshoorn in the Klein Karoo is the flock breeding system. This system does not present an opportunity for farmers to practise genetic selection. An alternative system, the small-camp system, would allow the farmer to practise genetic selection. However, for the farmer to switch from the flock breeding system to the small-camp system, an investment in fencing material is required. The main aim of this study is to find out if the higher expected productivity and resulting higher income due to genetic selection could compensate for the investment in fencing material. Typical farm models for the study area were developed for this purpose. The results of this study showed that the higher income due to genetic selection compensates for the investment in fencing material.

Key Words: day-old ostrich chick production; genetic selection; typical farm model; flock breeding system; small-camp system

JEL Classification:

1 INTRODUCTION

About 50 per cent of the total number of ostriches in South Africa are found in the Oudtshoorn district. About 10 per cent are found in the rest of the Western Cape, 34 per cent in the Eastern Cape, and 6 per cent in the other provinces (Oudtshoorn Municipality, 2005:14–15; Department of Agriculture Forestry and Fisheries,

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2010:2). Oudtshoorn is thus rightly referred to as the ostrich capital of the world (ECIAfrica, 2010:5).

Ostrich chicks are produced by breeding birds kept mostly on the veld. The veld provides mainly space, and contributes a limited share of the total feed intake of the ostriches, which live chiefly on lucerne-based feed rations. Because the ostriches do not depend on the grazing capacity of the veld, which is the case with other livestock, producers tend to use the flock breeding system to stock their veld at rates far exceeding the prescribed stocking rate of 22.8 ha per ostrich. Input prices rising faster than the prices of ostrich products are a major motivation for overstocking the veld. The resultant degradation of the veld, more due to trampling than overgrazing, can clearly be seen. Loss of ground cover and deepening dongas, mainly along footpaths near camp fences, are growing problems, justifying serious attention.

In order to avoid penalites on export markets for environmental degradation, the South African Ostrich Business Chamber requested an investigation of the financial viability of a gradual change from extensive flock breeding to intensive production in small camps. Sacrificing a small part of the farm to small camps, and restoring the remaining veld through greater or lesser restoration efforts, is implied. Restoring the veld will prevent damage to the image of the South African ostrich product.

The various phases of ostrich production are breeding and hatching eggs to produce day-old chicks, rearing chicks, raising birds, and the final phase of weight addition to slaughter. The various phases are often undertaken by different producers. The phase that is considered in this study is the production of day-old chicks. There are two systems that can be used for producing day-old ostrich chicks, namely the flock breeding system and the small-camp system. Shifting from the flock breeding system to the small-camp system will enable the farmer to practise genetic selection. This switch from the flock breeding system to the small-camp system requires the farmer to invest in fencing material. This study was aimed at finding out if higher productivity (due to genetic selection) and the resultant higher income could compensate for an investment in fencing material.

The paper is structured as follows. The second section gives a brief history of the South African ostrich industry. The third section presents the benefits and costs of genetic selection using the small-camp system. Examples of the benefits of genetic selection in the sheep and beef industries, as examples of extensive livestock industries, are given in the third section, in motivation of a switch to the small-camp system. The methodology used in this study is presented in the fourth section. The fifth section provides the structure of the typical farm models used in this study. The results obtained in this study are presented in the sixth section. This is followed by the conclusions.

2 History of the South African Ostrich Industry

South Africa started exporting ostrich feathers to Europe in 1838. After a decrease in the numbers of wild ostriches around 1850, efforts were made to tame and breed them. As a result of this, the ostrich industry came into being around 1863, with lucerne production and the invention of the incubator following in 1869. The incubator stimulated ostrich farming to such an extent that from 1870 ostrich farming became a very profitable business (NAMC, 2003:14). Between 1900 and 1914, there was an increase in the supply of feathers and an improvement in their quality. In 1913, the export of ostrich feathers was in fourth position in terms of all South African exports, after gold, diamonds and wool (Murray, 2007:4).

In 1914, there were about one million ostriches in South Africa. World War I, changing fashions, the over-production of feathers, and disorganised marketing led to the collapse of the South African ostrich industry. By 1930, the number of ostriches had plunged from 770 000 to 23 000. After World War II, around 1945, the ostrich industry started to grow again, focussing mainly on skin production. From there onwards, ostrich production picked up in other parts of the world like the US, Australia, Canada, China, the Philippines and Israel (Oudtshoorn Municipality, 2005:14). The ostrich industries in these countries are mostly production-oriented and depend on South Africa to undertake market development on their behalf (NAMC, 2003:4).

Other historical developments worth noting include the establishment of the one-channel marketing system in 1959, the first abattoir in 1964, a tannery in 1970, and the deregulation of the industry in 1993 (Murray, 2007:4). Since 1993, ostrich meat has contributed increasingly to the total value of the carcass.

3 BENEFITS AND COSTS OF SELECTION MADE POSSIBLE BY THE SMALL-CAMP SYSTEM

Ostrich farmers and specialists consulted in this study were convinced that once farmers start to practise genetic selection, they could increase the average number of chicks per female bird per annum from 24 to 40 within ten years.

The flock breeding system does not allow for record keeping of the number of chicks per female bird, and hence no opportunity for genetic selection exists. The farmer cannot identify non-productive ‘passengers’, with no or lower-than-the-average number of chicks per bird, and the increasing feed costs per day-old chick produced.

The small-camp system allows the farmer to select those females that produce relatively higher numbers of chicks per annum. The main cost that comes with the small-camp system is the investment in fencing material. The farmer has to build the small camps gradually, not only to avoid financial strain, but also to bring only young, new breeding trios (two females and a male) into the small camps, allowing the breeding birds on the veld to finish their productive lives. (Experience has taught farmers that veld ostriches do not adapt well to small camps, and therefore this risk must be avoided.)

There are two types of small camps, namely small 0.25 ha camps and the combination system. In the small-camp system, the farmer keeps a breeding trio in each small camp of 0.25 ha. With the combination system, the farmer keeps the best breeding stock in small camps (0.25 ha), and the best chicks produced are, in turn, used for breeding the mother stock. The farmer keeps the second-best day-old chicks in the big camp to be sold or to be reared for slaughtering.

Examples of the serious application of selection practices in the South African ostrich industry are limited to a few cases. One example of the successful genetic selection of ostriches can be found on a farm near Still Bay in the Western Cape province. The producer is an experienced beef farmer who ventured into ostrich production. This farmer uses the small-camp system, and keeps records of the chicks produced by each female bird, thereby eliminating the non-performing ostriches. This has enabled him to increase the average number of chicks per female from 25 to 44 within ten years (Nel, 2010). His success has already motivated other farmers in Oudtshoorn to start experimenting with genetic selection.

Where the ostrich industry has paid limited attention to genetic improvement, other livestock industries also based mainly on extensive veld grazing have made remarkable progress in this regard. An example of the positive impact of selection on productivity can be illustrated by a Merino sheep breeding programme followed at Middelburg in the Eastern Cape. Extensive Merino sheep farming in the Karoo is similar to ostrich farming, also taking place in the veld with a relatively low carrying capacity. The Grootfontein Merino Breeding Programme had three main selection objectives, namely reducing fibre diameter, increasing live weight, and increasing fleece weight. Selection between 1968 and 1985 resulted in a pleasing improvement of 34 per cent in hogget live weight and 48 per cent in clean fleece weight relative to the overall phenotypic means. For the period 1986 to 1999, live weight increased by 11.18 per cent and clean fleece weight increased by 3.12 per cent, while fibre diameter decreased by 4.29 per cent (Cloete & Olivier, 2010).

Similarly, genetic selection has been practiced for a long time in the beef industry. For example, Bonsmara is a beef breed that was scientifically bred and strictly selected mainly for growth, fertility and functional efficiency. This made Bonsmara beef production profitable in the extensive grazing regions of South Africa (Embryo Plus, 2002:1). Estimated Breeding Values (EBV) have been used for the past four decades by livestock breeders to improve their selection decisions. Leighton (1999:1) defines EBV as the "statistical prediction of the relative genetic merit of animals in a breeding population". With beef animals, farmers have managed to improve significantly the production of lean meat by genetically increasing the weight of animals at a year of age and by increasing their amount of muscle tissue (Leighton, 1999:1). Figure 1 shows the trend of the average daily gain in the EBV for the Bonsmara breed from 1975 to 2005. From Figure 1, it can be deduced that genetic selection has had a very positive impact in terms of improving the EBV and productivity.

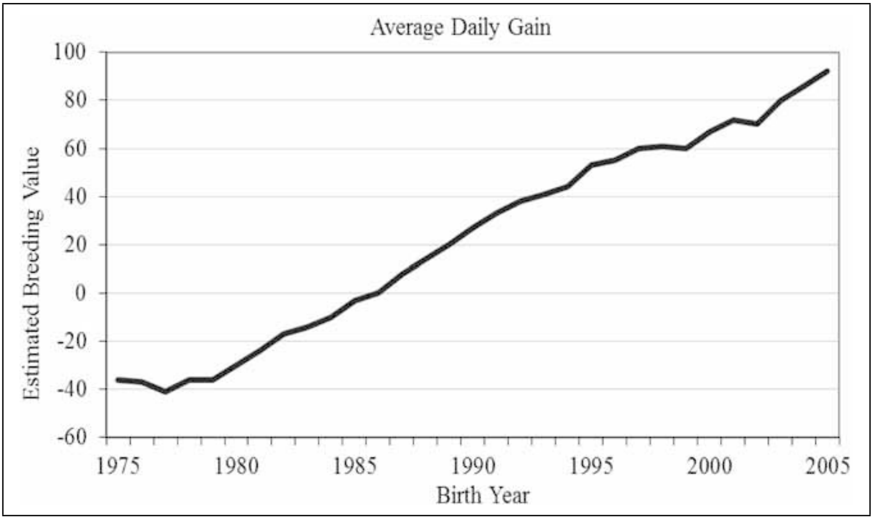

Figure 1: Trend of the average daily gain in estimated breeding values for the Bonsmara breed from 1975 to 2005
Source: King, 2009

4 METHODOLOGY

Typical farm models for the study area were developed to show the effect of selecting superior females on day-old chick production and income. Income and costs were discounted to accommodate project effects occurring at different points in time. All the costs and benefits were valued at constant prices, assuming that the rate of inflation was the same for the prices of inputs and outputs.

Three farm-scale models are used to show the profitability of producing day-old chicks for three different periods. The first period is "before" veld restoration, where the farmer uses the flock breeding system on degraded veld. The second period is "after" veld restoration, where the farmer uses the small-camp system. The third period is "during" the transitional period, while shifting from the flock breeding system to the small-camp system. All the periods were assumed to be 15 years long.

The first model shows the profitability of producing day-old chicks with the flock breeding system for a period of 15 years, implying that the farmer does not practise genetic selection. For this model, the stocking rate used is 22.8 ha per ostrich, as recommended by the Department of Agriculture. This model allows for various levels of feed obtained from the veld, because some of the farmers claimed that their veld provides up to 30 per cent of the feed required by the birds. Other farmers claimed that the veld merely provides space, and contributes insignificantly to the diet of the birds.

The second model determines the effect of selection on the profitability of producing day-old chicks for a period of 15 years, given that the farmer has already fully invested in the small-camp system, that it is fully operational, and that chick production from the veld no longer plays a role. The profitability of producing day-old chicks using the two types of small-camp system, namely, small 0.25 ha camps and the combination system, was determined.

The third model shows the impact of a gradual shift from the flock breeding system to the small-camp system during the transitional period, as the investment in fencing material places a heavy burden on the farmer. In other words, this scenario shows the financial implications of carrying the cost of fencing material, from a cash flow perspective, during the transitional period. This includes the real flow of funds when buying fencing material for small camps. It was assumed that the fencing material would be replaced after 30 years. The cost of fencing material for a single small camp is R5 518.01 (see Table 1).

Table 1: Capital cost of a 0.25 ha breeding camp

Item		Quantity	Total Cost
3.6 m gate	1	825.47	825.47
2.1 m Class 4 pole	19	48.27	917.13
2.1 m Class 3 pole	16	39.79	636.64
1.5 m tar droppers	160	2.24	358.4
1.5 m Class 3 strut poles	5	28.73	143.65
1500 m steel wire		1314	1314
Anchor, pole and wire		195	195
Cement	2	63.86	127.72
Labour		at R5/m	1000
Total			**5518.01**

During the transitional phase, the farmer erects the small camps gradually as new breeding trios enter the small-camp system and old birds on the veld are allowed to finish their productive lives there. Experience has shown that older birds reared on the veld do not adapt readily to small camps.

It was assumed that the farmer is able to increase the average number of chicks per bird from 24 to 40 over a period of 10 years. This was based on one example of the successful genetic selection of ostriches on a farm near Still Bay, discussed previously.

5 STRUCTURE OF THE TYPICAL FARM MODEL

The basic structure of the model can broadly be divided into three parts, as is shown in Figure 2. The first part of the model shows the description of a typical farm, the inventory, assumptions, and the prices of the inputs and outputs for producing day-old chicks. The farm inventory includes the land, machinery, breeding ostriches and equipment found on a typical ostrich farm. This section also shows the fixed costs as well as the machinery replacement schedule. Some of the important assumptions are the average number of chicks per female ostrich and changes in productivity (number of chicks per bird produced over a given period). To allow for flexibility, these assumptions can be relaxed within certain ranges.

The second part of the model contains the gross margin budget for producing day-old chicks, that is, total gross revenue less the total allocatable variable costs.

The third part of the model contains the multi-period budget. The multi-period budget shows the cash inflows and outflows for the production of day-old chicks over a period of 15 years. The figures in the previous two parts of the model feed into this part. The net present value (NPV) and internal rate of return (IRR) are calculated in this part of the model. The NPV, IRR, and benefit cost ratio (BCR) were used as the decision criteria. Figure 2 describes the basic structure of the model.

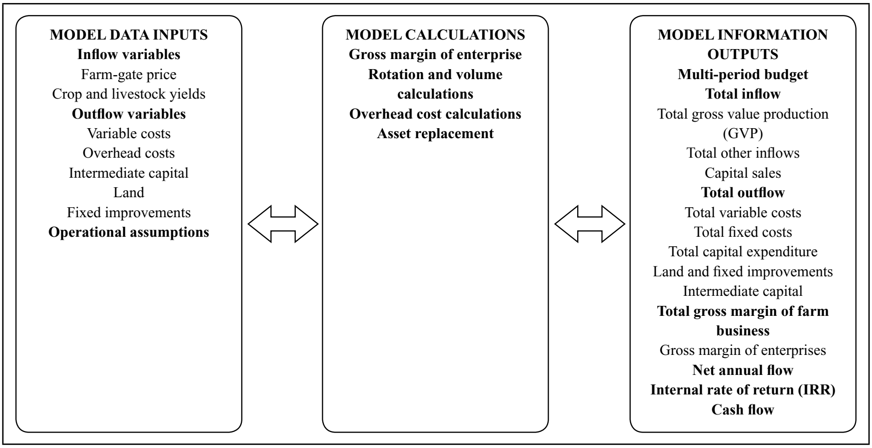

Figure 2: Basic structure of a farm model
Source: Von Doderer, 2009:31

6 RESULTS

6.1 Profitability using the flock breeding system at the prescribed stocking rate

Table 2 shows that if the birds do not obtain any feed from the veld, the IRR is -9 per cent. The corresponding NPV and BCR are –R4 470 683 and 0.786 respectively. If the birds do not obtain any feed from the veld, the farmer will not make a profit.

The NPV for a scenario where 15 per cent of feed is obtained the veld is still negative (NPV = -R3 643 401). The IRR for this scenario is -7 per cent, and this shows that for every R1 invested by the farmer, a loss of R0.07 will be made. The BCR is 0.830; thus, the discounted benefits are less than the discounted costs.

If the birds get 30 per cent of their feed from the veld, the NPV is -R2 816 119; hence, such an investment is still not financially viable. The IRR of -5 per cent means that the farmer will make a loss of R0.05 for every R1 invested in this business. The BCR of 0.880 implies that the sum of discounted benefits is less than the sum of discounted costs; hence, the investment is not profitable.

Table 2: Profitability using the flock breeding system without genetic selection

Feed obtained from the veld (%)	NPV (R)	IRR (%)	BCR
0	–4 470 683	–9	0.786
15	–3 643 401	–7	0.830
30	–2 816 119	–5	0.880

Note: A stocking rate of 22.8 ha per bird is assumed

6.2 Effect of genetic selection on profitability using the small-camp system

6.2.1 Use only of small camps of 0.25 ha per breeding trio

The IRR for a farming system involving only using 0.25 ha small-camps is 11 per cent. Therefore, the farmer gets a return of R0.11 for every rand invested. For the same system, the NPV is R1 952 612; thus, the net present value of future benefits is positive. The BCR is 1.196; therefore, the sum of discounted benefits is greater than the sum of discounted costs.

6.2.2 Combination system

The combination system is more profitable than the system using only 0.25 ha small camps. The combination system yields an IRR of 12 per cent. The return per rand invested using this system is greater than it is for the system using only small camps. The NPV is R2 171 963; thus, the net present value of the future value of streams of benefits is positive. The BCR is 1.206; hence, the sum of discounted benefits is greater than the sum of discounted costs. The profitability of the two types of small-camp systems is summarised in Table 3.

Table 3: Profitability using only the small-camp system

Type of small-camp system	NPV (R)	IRR (%)	BCR
Only small camps of 0.25 ha per breeding trio	1 952 612	11	1.196
Combination system	2 171 963	12	1.206

Note: It is assumed that birds do not get any feed from the veld.

6.3 Profitability during the transitional period, while switching from the flock breeding system to the small-camp system

6.3.1 Only small camps of 0.25 ha per breeding trio

With the system using only 0.25 ha small camps, the IRR is 7 per cent; thus, for every rand invested, the farmer gets a return of R0.07. The NPV for this system is R1 719 874, and this implies that the NPV of the future streams of income is positive, and hence, the project is viable. The sum of discounted benefits is greater than the sum of discounted costs, since the BCR is 1.158 (see Table 4).

6.3.2 Combination system

The IRR for the combination system is 9 per cent, and thus, for every rand invested, the farmer realises a return of R0.09. The NPV for the same system is R2 727 390, which implies that the project's present value of future streams of benefits is positive. The BCR for the combination system is 1.208 (see Table 4).

The increase in productivity made possible by the small-camp system exceeds the depreciation cost of investment in small camps. The small-camp system is clearly far more profitable than the flock-breeding system at the prescribed stocking rate.

Table 4: Profitability during transition from flock breeding to small camps breeding, with passive veld restoration

Small-camp system	NPV (R)	IRR (%)	BCR
Small camp of 0.25 ha per breeding trio	1 671 977	7	1.158
Combination system	2 727 390	9	1.208

7 CONCLUSION

This study has shown that it is financially viable to shift from the flock breeding system to the small-camp system. The small-camp system allows the farmer continuously to select the best breeding stock, and by doing so, the farmer is able to increase the profitability of producing day-old chicks. The two types of small-camp systems have different profit levels, with the combination system being more profitable than the system using only 0.25 ha small camps. This is because the combination system requires less capital for fencing material, compared with the system using only 0.25 ha small camps. The study concludes that the higher productivity and higher income due to selection compensate for the investment in fencing material.

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