Genetic, Nutritional and Management Effects on Ostrich Hide Quality

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Summary

Over the last 3-5 years the value of ostrich meat and leather has slumped on global markets due largely to supply levels exceeding the demands of existing established markets. Subsequently, a significant reduction in global production occurred and this, combined with the development of new meat and leather markets, has given rise to substantial increases in world prices for ostrich meat and especially, leather during the last 12 months. Hide return still represents the dominant component of the overall return to ostrich farmers at commercial processing. However, farmers will only achieve increased profitability via these new higher ostrich leather prices through producing hides of **high quality**. Poor quality hides will continue to have low values and it is thus, imperative that the farmer must strive to reduce and, hopefully, eliminate poor quality and defective hides.

This paper looks at the genetic, nutritional and management influences on ostrich hide quality and gives insight into how these influences may be manipulated in order to achieve better hide quality.

Introduction

In a recent study by *Pieter van Zyl* , looking at a specific ostrich farm in Oudtshoorn, South Africa the following factors were found to have the greatest affect on profitability:

1.	INCOME/SLAUGHTER BIRD:	10% increase = 55% increase in profit
2.	MORTALITY:	10% increase = 35% reduction in profit
3.	EGGS/HEN & HATCHABILITY:	10% increase = 31% increase in profit
4.	FEED COST:	10% increase = 27% reduction in profit

In this study, other factors such as the costs of labour and drugs/vaccines/parasiticides had significantly less impact on profitability compared to the four factors listed above. The magnitude and ranking of these factors will vary from farm to farm and from country to country. However, it is easy to see that some factors, especially the income/slaughter bird, can have a major impact on profitability.

Currently, in Australia, the income per slaughter bird is almost entirely based on the returns from saleable meat yield and hide. Although, there is significant potential additional value in feathers, fat and offal, this potential value is yet to be realised in Australia. More than 60% of potential return to ostrich producers from processing is from the hide. Although good returns are currently available for high quality Grade 1 and Grade 2 hides, returns on poorer quality hides are insufficient to cover costs of production, let alone provide any level of profitability in ostrich (Atkins). There is no profitability in ostrich

farming if farmers cannot gain good returns for ostrich hides. The factors influencing the quality of ostrich hides need to be identified and steps taken to ensure that these factors are manipulated to maximise hide quality.

Factors Influencing Ostrich Hide Quality

Currently, the majority of Australian ostrich producers have difficulty in producing ostrich hides of consistently high quality in large numbers. This compares unfavourably with the situation in South Africa where ostrich producers are generally able to produce much higher percentages of high quality hides (Rayner, Atkins).

Factors that can influence hide quality include:

1. **Farm management practices**
    - Chick rearing techniques
    - Handling facilities
    - Fencing
    - Ectoparasite control
    - Stocking rates
    - Husbandry methods

2. **Genetics**
    - Filoplumes
    - Follicle density/pattern
    - Follicle size and shape

3. **Nutrition**

4. **Transport conditions**

5. **Processing techniques**

6. **Post-slaughter skin handling**

7. **Tanning techniques**

Each of these factors vary in the degree of influence they exert on hide quality and also vary significantly in the degree to which they themselves can be modified.

Farm Management Practices

Chick Rearing Techniques

Hide surface area is obviously directly proportional to body mass and, consequently, any chick rearing program that results in inadequate growth rates and poor ultimate body size at slaughter, will lead to diminished hide surface area and lower returns. Currently, the optimum hide surface area is between 13 and 17 square feet.

Also, overcrowding, poor handling, stress and inadequate fencing can all result in scarring to the chick's

skin through trampling, fence trauma etc. These scars, even small in size and/or inflicted at a young age, will lead to downgrading of the hide and a lowered value. The current International Standard is listed in Appendix I.

Handling Facilities

Throughout Australia today, there are very few commercial ostrich farms with excellent facilities for handling birds of all age groups. Poorly designed, inadequate handling facilities are dangerous to both birds and handlers and can lead to significant hide damage through bruising, lacerations and scarring.

Fencing and Stocking Rates

Barbed wire should never be used in confining ostriches, as it will inevitably cause skin damage and subsequent hide devaluation. The requirement for high quality fencing is directly proportional to the numbers and density of ostriches and inversely proportional to the size of the paddock. In other words, in large and especially, sheltered paddocks the fencing standard can be slightly lower without necessarily leading to significant skin trauma. However, in paddocks housing large numbers of birds at high stocking rates the fencing needs to be of a very high standard.

Ectoparasite Control

If burdens of feather lice and quill mites are allowed to become excessive, then hide quality may suffer. This affect on hide quality can be due to direct skin damage by the mites themselves or it may be secondary to self trauma by the birds in response to excess lice/mite burdens.

Husbandry Methods

Fighting, insufficient feed or water access, overcrowding, feather picking due to incompatibility and/or boredom are all examples of basic husbandry issues that should be continually monitored and corrected. Without correction excessive skin damage will result and downgrading of hides at slaughter is inevitable.

Genetics

Filoplumes

Filoplumes are hair-like feathers that are considered to be normal in most orders of birds (Cooper & Harrison). They generally occur in association with other feathers – mainly contour feathers – over the body and rarely on bare apteria. A filoplume arises from the neck of a feather follicle or close by. A filoplume has a slender rachis that arises from the edge of its superior umbilicus. The greatest thickness of the rachis is at the tip where a tuft of barbs persists. Barbs are generally absent from the remainder of the rachis. They are believed to serve a proprioceptive function through their location in close proximity to avian lamellar corpuscles (Herbst corpuscles). Filoplumes moult, as do other feathers of the body; the time of which closely parallels that of the feathers with which they are associated (Sisson). Interestingly, Sisson and Grossman states that "filoplumes are absent in ostriches, emus and cassowaries and are said to be absent in pelicans and anhingas". Bristle feathers are characterised by a stiff, tapered rachis, thick at the base and tapering to a point. Bristle feathers have no barbs, except at the base during development. They are usually found around the mouth, nares and eyes only.

I have seen feathers that could be classified as filoplumes and also as bristle feathers in the crown area of ostriches. The presence of filoplumes in ostriches is one of the most important traits that requires immediate attention to improve hide quality. Excessive numbers of well-developed filoplumes on ostrich skins will lead to the presence of tiny “pin holes” on the tanned hides corresponding to the follicles from which the filoplumes originated. If significant, the hide will be considerably devalued and, in some instances, may well render the hide worthless! In affected birds, 6-8 filoplumes are generally found in an arc around each main follicle in the crown (back) area of the hide. In severe cases, filoplumes are found between follicles over the entire quill area. It is not unusual to also find filoplumes in the unfeathered (apteric) centre-line of the skin, but filoplumes in this area are not generally detrimental to hide value. Also filoplumes are very common on the skin of the follicle itself, but again this does not lead to visible pinholes or a reduction of value on a tanned hide. However, the presence of well-developed, coarse filoplumes on the follicle of breeders may well be significant and worth considering as an undesirable trait.

Estimates of the incidence of filoplumes in South Africa are approximately 3-5% of processed birds. The incidence of filoplumes in Australia is much higher. It is especially common in Australian stock and in some flocks the incidence may be as high as 40 to 60%!

Over recent years there has been an increasing amount of research into genetic selection and heritability of certain traits in ostriches (Bunter et al), Cloete et al). However, at this point in time we do not know the precise nature of the heritability of filoplume presence and research is yet to be undertaken in this area in ostriches (Berger).

Based on observations I have made, it appears to be a trait that is highly heritable and not sex-linked, but as to whether the gene involved is dominant or recessive, cannot be stated as yet. However, it is obviously very dangerous to breed with ostriches with significant filoplume affected skin. The breeder selection program should focus on this issue, as it’s first priority. It is important to be careful in assessing filoplumes in ostriches less than 12 months of age, as some filoplumes are naturally lost as the bird matures.

I am currently using the following grading system for assessing filoplumes in ostriches:

0 = absent
1 = fine filoplumes in small numbers around follicle
2 = coarse filoplumes around follicles
3 = coarse filoplumes around follicles and also present between follicles.

Ideally, breeders with any filoplumes should not be bred, but at the least, breeders should be culled if they have a grading of 2 or above. It may be possible to breed birds with minor filoplume problems with birds without filoplumes, but this is yet to be proven.

Follicle Characteristics

The density, size, pattern and shape of the follicles of the crown are all characteristics that are taken into account in assessing the suitability of an ostrich hide for a specific market. For example, the American boot market requires a strong, thicker hide with large follicles that have wide margins between them, whereas ostrich leather destined for the garment industry needs to have a thinner, flexible hide with a smaller follicle size and follicles that are much more densely distributed.

Some of these follicle characteristics can be manipulated with age and nutrition. Ostriches that are

processed at an earlier age (less than 10-12 months of age) will have follicles that are generally smaller and more closely located. By improving the overall energy and quality of the feed given to birds in the growing phase, a certain amount of accelerated maturation in the hide may occur. This will result in slightly larger, better developed and less densely distributed follicles compared with birds of the same age on a poorer diet (Jarvis).

The degree to which genetics can influence these follicle characteristics is yet to be determined. However, it is widely accepted that certain strains of ostriches, for example the "red-necked" strains, have larger follicles that are separated by greater margins.

Nutrition

Although there has been some significant research projects directed specifically at ostrich nutrition, we still do not have clear and concise figures for the nutrient requirements of ostriches under various conditions and at various phases of production. The direct influence of nutrition on hide quality has not been determined but certain indirect affects are clearly established. Generally poor nutrition – especially low energy and inadequate protein/amino acid levels – will retard growth. This will result in a hide at slaughter that is smaller in area and hence the return to the farmer will be diminished. As stated above, by improving growth performance through the feeding of higher quality nutrition, hide maturation and certain follicle characteristics will be also influenced (Jarvis).

Equally the production of ostriches with high levels of fat at slaughter is also deleterious to hide quality. A large amount of subcutaneous fat can make hide removal during processing more difficult leading to knife trauma and poor "fleshing" technique. If the excessive amount of fat has to be removed after the hide has been taken off the bird, further knife damage can occur. If the excess fat has not been adequately removed bacterial damage to the hide during or after the salting process is more likely.

Transport Conditions

Ostriches are generally easily stressed and specific focus on the conditions of transport is necessary to avoid bruising, injury or even death of ostriches during transport. Ideally the area in which the birds are transported should be well ventilated and relatively dark. Birds can be transported in small groups to each compartment but care needs to be taken in locating easily stressed birds or birds that tend to sit readily. These birds can be trampled readily or can "stir up" other birds within their close proximity. No sharp projections or objects should be located on the inside of the vehicle where birds can rub, bruise or even lacerate themselves. Ideally the birds should be transported at night. Drivers need to avoid sudden braking or accelerating and all movements need to be as smooth as possible. The birds need to be checked regularly for heat stress, anxiety or recumbency (in compartments with more than one bird). Unlike the transport of other stock, it is not advisable to stop too often and certainly it is not advised to unload or attempt to feed or water the birds during a trip. The floors should have non-slip surfacing and it is preferable for the vehicle to have some form of cooling available e.g. air-conditioning or water sprayers.

In South Africa it is legally allowable to have several human workers present in the bird areas of trucks during road transport. These workers identify stressed or "downer" type birds during the trip and can take immediate measures e.g. "hooding" the stressed birds or lifting the recumbent birds, to avoid undue injury or hide damage. This situation is not legal in Australia and, unfortunately in this country, ostrich abattoirs are often located hundreds or even thousands of kilometres from many ostrich farms. Thus, transport injuries – especially tail rubbing – are not uncommon in Australia.

For these reasons location of the grower/finisher stages of ostrich production should be in relatively close proximity of the ostrich abattoir. In some instances it may even be preferable to walk the birds to the abattoir!

Processing Techniques and Post-Slaughter Skin Handling Techniques

The most common factors that can affect hide quality in these areas include:

- *Knife damage*

  Many hides are still devalued by knife damage at the abattoir during removal of the skin from the carcase. If this knife damage involves the main follicle area (crown) of the hide it will devalue the hide according to the number, size and location of the knife cuts (see Appendix I). This damage is generally a result of inexperienced or poorly skilled abattoir personnel. It can be minimised by using a technique that involves subcutaneous injection of air prior to skin removal.

- *Inadequate salting and bactericide exposure*

  If soaking in a cold brine/bactericide is not utilised or if the hides are not covered with sufficient salt bacteria will build up in numbers and begin to attack the skin.

- *Inadequate fleshing of the hides at time of processing*

  After removal from the carcase, any remaining muscle and fat needs to also be removed from the hide. If this is not done it is impossible for the bactericidal action of the brine/bactericide solution or the granular salt to be effective as it cannot penetrate to the hide itself.

- *Exposure to high environmental temperatures*

  After removal the hides need to be treated as listed above and then stored in cool temperatures. By lowering the temperature the growth of bacteria is again inhibited. However, if the hides have not been adequately prepared prior to storage, the bacterial action will slowly occur, regardless of temperature.

- *Inappropriate packing of hides*

  If hides are packed inappropriately significant bacterial degradation may again occur. If hides are folded such that any untreated skin surfaces of one hide are directly apposed to the crown portion of the hide immediately adjacent to it

  Unfortunately, lower levels of bacterial damage normally present as a more generalised change over the surface of the hides **after** tanning. In many cases the bacterial damage is often not grossly detectable before tanning, but is sufficient to downgrade a hide to a Grade 4 or Reject. In hides that are very badly contaminated and poorly handled the degree of bacterial damage is often such that it is easily grossly detectable **before** tanning. Grade 4 hides are very difficult to sell in the current ostrich leather market and generally can only be sold if they are graded this low because of excess cuts, bruising or scars and **NOT** generalised bacterial damage.

Tanning Techniques

Surprisingly, the actual tanning process, provided it meets certain minimum standards, has a relatively lesser influence on hide quality. While it is true that experienced and skilled ostrich hide tanners will maximise the value of the hide by providing the quality of finish that is most saleable in the very discerning market, these tanners are unable to produce that level of quality if the hide is presented to them in an already less than ideal state. Tanners will finish the hide in colours and finishes that the market and targeted product dictates. Certain colours and finishes (e.g. alanine vs sprayed on colour) will suit certain countries (e.g. Japan vs USA) and certain products (e.g handbags vs boots or accessories).

As stated above, if there is already significant scarring, bruising, abattoir knife damage or bacterial contamination in the hides before they reach the tannery, the hide value is unlikely to be significantly improved by skilled tanning. On the other hand poor tanning can greatly devalue the hides and basically render them unsaleable in the current discerning market.

Conclusion

Ostrich hides are a highly valuable commodity in today's market and it is imperative for farmers to consistently produce hides of high quality in order to attain adequate levels of profitability. Some research projects are currently focussing on hide quality issues and this is important in identifying the ways in which producers can maximise ostrich hide quality and value.
In Australia the most important issues that need immediate attention by ostrich producers are:

1. Breeder selection to minimise the incidence of filoplumes on hides.

2. Construction of adequate and "safe" handling facilities on farm.

3. Location of grower properties close to ostrich abattoir.

4. Use of ostrich transport facilities that minimise bird injury and stress.

5. Monitoring of abattoir performance to ensure hides are handled correctly prior to tanning.

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APPENDIX I

INTERNATIONAL MINIMUM GRADING STANDARD OF OSTRICH SKINS

AIM

The aim of this grading standard is to stipulate a minimum norm for different grades of ostrich leather.

DEFINITIONS

1. A **defect** can be: a hole, a scratch, a loose scab, a healed wound or bacterial damage.

2. The **crown** is the area with quills, except in the neck, down to wingfold and also the stomach quill area.

3. For grading purposes the crown is divided into four **quarters**.

4. **Dividing lines**: The lines dividing the crown area in 4 quarters will be 25 mm wide. The vertical line will stretch from base of neck to the bottom of crown and horizontal line will stretch between the widest quill on either side of crown area.

5. **FIRST GRADE**

   - A defect in one of the quarters as long as it is not larger than approximately 40 mm x 40 mm.
   - At least three quarters must be free from defects.
   - Defects on the cutting lines do not affect the grade.
   - A few less visible scars are allowed as long as they are outside the crown area.

6. **SECOND GRADE**

   - A skin with defects affecting two quarters.
   - At least half the skin must be free from defects.
   - Visible defects outside the crown area are allowed and will not affect the grading.

7. THIRD GRADE

   - At least one quarter of the skin must be free from defects.
   - Visible defects outside the crown area are allowed.

8. FOURTH GRADE

- At least one quarter of the skin must be free from defects.
- Extensive visible defects outside the crown area are allowed and will not affect grading.

TRIMMING

Neck will be trimmed 20 cm above featherline.
Leg will be trimmed in the middle of “knee”.

GENERAL

1. Colour variations cannot be considered as an element to change the grading of leather but it is the prerogative of both buyer and seller to discuss a price adjustment.

2. Tanning cannot be considered as an element to change the grading of leather, but it is the prerogative of both buyer and seller to discuss a price adjustment.

3. Filoplumes resulting in “pin holes” are believed to be genetically caused defects and an extensive occurrence of it in at least two quarters will allow for a downgrading by at least one grade.

4. Defects or scarring caused by bacterial damage and an extensive occurrence of it in at least two quarters will allow for a downgrading by at least one grade.

5. A skin is a “torn” skin when a tear extends into the crown.

6. A “natural scar” is a healed scar and would remain a defect.

7. “Rough surface” is damaged grain.

8. ”Loose grain” is where the grain is separated from the “base” of the leather.

9. Vein marks” are defects of predominantly older birds and, if very obvious and covering a substantial area of the skin will lead to a downgrading of the hide.

10.

Size	**dm2**	**sq. ft.**		
A	120 +	13.0 +		
B	100-119	10.75-12.75	Price 10% less than	A
C	80-99	8.5 - 10.5	‘’	B
D	50-79	5.5 - 8.25	‘’	C
E	30-49	3.25 - 5.25	‘’	D

All hides less than 13 square feet in size should be lowered in value using the above guidelines.