



RURAL INDUSTRIES RESEARCH
& DEVELOPMENT CORPORATION

Improving Skin Quality of Emus and Ostriches

A benchmark study of husbandry, transport,
lairage and slaughter methods

**A report for the Rural Industries Research
and Development Corporation**

by Dr Philip C Glatz

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Researcher Contact Details

Dr Phil Glatz
South Australian Research and Development Institute,
PPPI, Roseworthy Campus,
Roseworthy, SA 5371.
Phone: (08) 83037786
Fax: (08) 83037986
e-mail: glatz.phil@saugov.sa.gov.au

RIRDC Contact Details

Rural Industries Research and Development Corporation
Level 1, AMA House
42 Macquarie Street
BARTON ACT 2600

PO Box 4776
KINGSTON ACT 2604

Phone: 02 6272 4539
Fax: 02 6272 5877
e-mail: rirdc@rirdc.gov.au
Internet <http://www.rirdc.gov.au>

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Foreword

In Australia nearly half the farm gate value of ostriches is in the skins. However, 58% of skins being processed are being downgraded by at least one grade because of damage on farm, during transport, in the lairage and during processing and tanning. In the Emu Industry 95% of skins are being downgraded with 35% having no commercial value.

With the current revival in the export market for skins there was a need by Industry to develop Quality Assurance (QA) documentation for all the practices, which influence skin quality.

A Ratite Industry Committee comprising skin marketers, tanners, farmers, transporters, processors and researchers developed the documentation using a HACCP-based approach and have recommended an audit procedure for each segment of the Industry. A CD-ROM was developed to complement the documentation and to provide an introduction to the Industry of the key issues associated with maintaining good skin quality.

Implementation of the skin QA audit process has already commenced in the Ostrich Industry. This will raise the standards in Industry, improve the profitability of ratite farming and give confidence to skin buyers that they are purchasing a quality product.

This project was funded from RIRDC Core Funds which are provided by the Federal Government.

This report, a new addition to RIRDC's diverse range of over 600 research publications, forms part of our New Animal Industries R&D program, which aims to accelerate the development of viable new animal product industries.

Most of our publications are available for viewing, downloading or purchasing online through our website:

- downloads at www.rirdc.gov.au/reports/Index.htm
- purchases at www.rirdc.gov.au/eshop

Peter Core

Managing Director

Rural Industries Research and Development Corporation

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- The New Animal Products Program of the Rural Industry Research and Development Corporation for providing funds to undertake this work.
- The advice and support from Dr Peter McInnes throughout the course of the project.
- Warwick Hack (New Animal Industries Officer, Primary Industry and Resources SA) and Belinda Rodda (Technical Officer, South Australian Research and Development Institute) for assistance with the documentation.
- Mark Bradley and Denise Galloway (IC Media) and Ian Dinning (Lecturer, Media, University of South Australia) for preparing the CD-ROM.
- Support from the Ratite Industry Skin Committee including John Atkins (skin marketing), Trevor Jones (tanning), Wayne Hamood (ostrich farming), Peter Stephens (ostrich farmer) Robert Cavedon (abattoir), Wayne Pilz (emu farming), Bert Rayner (skin marketing), Ross Haebich (emu and ostrich transport) and Kevin Barry (ostrich transport) who worked with the research team to develop the documentation.
- The support from Dr. Doug Black, Chris Tuckwell, Bruce Makin, Geoff Lean, Peter Thompson and Dr. John Snowden for their comments and suggestions.
- The approach used in this skin quality benchmarking was modelled on a current RIRDC project on broiler welfare audits coordinated by Associate Professor John Barnett (VIAS). His ideas and suggestions were very helpful.

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Executive Summary

In October 1999, RIRDC New Animal Products Program provided funds for the project to develop benchmarks to improve skin quality of ratites. The outcome of the project is skin documentation for use in the Ostrich and Emu Industry. The documents will be useful in skin QA programs to assist Industry to produce high quality skins. The benchmark documents cover the farming, transport, lairage, slaughter, curing, tanning and skin marketing sectors of the Industry.

In Australia nearly half the farm gate value of ostriches is in the skins. However, 58% of bird skins being processed are being downgraded by at least one grade because of damage on farm, during transport, in the lairage, during processing and tanning. In the Emu Industry 95% of skins are being downgraded with 35% having no commercial value.

Development by the Ratite Industry of documentation that recommends best practices will raise the standards in Industry and improve the profitability of ratite farming. Documentation to reduce skin damage covers best practice methods in all areas of the production chain. In addition, adoption of QA guidelines in producing ratite skins will give confidence to skin buyers that they are purchasing a quality product.

The project was coordinated by Phil Glatz (Senior Research Scientist, South Australian Research and Development Institute) with support from Warwick Hack (New Animal Industries Officer, Primary Industry and Resources SA), Belinda Rodda (Technical Officer, South Australian Research and Development Institute), Mark Bradley and Denise Galloway (IC Media) and Ian Dinning (Lecturer, Media, University of South Australia).

A Ratite Industry Committee comprising John Atkins (skin marketing), Trevor Jones (tanning), Wayne Hamood (ostrich farming), Robert Cavedon (abattoir), Wayne Pilz (emu farming), Bert Rayner (skin marketing), Ross Haebich (emu and ostrich transport) and Kevin Barry (ostrich transport) worked with the research team to develop the documentation. Other people in Industry were involved in reviewing the audit documentation. These included Dr. Doug Black, Dr. John Dingle, Chris Tuckwell, Bruce Makin, Geoff Lean, Peter Thompson and Dr. John Snowden. The approach used in this skin quality benchmarking was modelled on a current RIRDC project on broiler welfare audits coordinated by Associate Professor John Barnett.

- The project used the seven principles of the 'HACCP-based quality assurance systems approach' to: i) identify potential risks that contribute to poor skin quality, ii) identify the critical risks, iii) establish appropriate targets for the risk area, iv) establish a monitoring system, v) establish contingencies to be used in association with deviations observed during monitoring, vi) establish a verification program and vii) develop documentation that accurately depicts risk, critical limits and corrective action.
- The documentation is supported by a CD-ROM demonstrating events that lead to poor skin condition in emus and ostriches and simple strategies on how to minimise these problems.

General Introduction

In Australia nearly half the farm gate value of ostriches is in the skins. However 58% of bird skins being processed are being downgraded by at least one grade because of damage on farm, during transport, in the lairage and during processing. The cost to the Industry is \$71.78 per bird slaughtered. In the Emu Industry 95% of skins are being downgraded with 35% having no commercial value.

A recent RIRDC study examining locomotor behaviour of declawed yearling emus in a farm environment captured video evidence of events that contribute to poor skin condition in emus, which also apply to ostriches. These included aggressive interactions between birds including kicking, feather pecking and trampling. In addition there were a number of other factors that caused panic in the flock. Birds became tangled in fences or ran into fences, which could also contribute, to skin damage and downgrading of hides. In addition it was well known that were some other practices used in yarding, loading/unloading, transport, lairage, processing, curing and tanning of skins that were also contributing to reductions in skin quality.

One of the concerns in the Ratite Industry was the lack of quality assurance documentation and an auditing process that could be utilised by Industry to improve skin quality. To develop such documentation requires developing questions relating to husbandry, handling, transport, lairage and slaughter of ratites that can be completed by a yes/no answer and appropriate documentation for record keeping. Practices which cause skin and follicle damage to birds can be identified in this process. Use by industry of the documentation would raise the standards in the Ratite Industry, improve quality of skins and identify critical areas for further research.

Objectives

- Reduce skin damage and improve profitability of ratite farming.
- Determine the effect of current farm practices, transport, lairage and slaughter on skin quality.
- Recommend management techniques to improve skin quality of ratites.
- Demonstrate by CD-ROM the effect of some current farm practices on skin quality.
- Practical documentation for Industry to incorporate into quality assurance programs.
- Develop an R&D strategy for improving skin quality.

The Benchmark Documentation

The documentation provided for ratites examines the breeder, hatchery, rearing, growing, transport, lairage, slaughter, curing, tanning and skin marketing sectors. It was recognised that skin damage may be limited to a few key areas of the production chain. However, it was considered that all factors that might effect the numbers of hides produced, area of hide produced/bird and quality of hide be examined. Emphasis has been given to ensuring that there are high levels of bio-security and traceability of birds and their hides throughout the production chain. Each section of the document should be considered as stand-alone. This has resulted in some repetition.

The documentation is set out as follows for each sector using the HACCP-based protocol:

- Questions and implications relating to the breeder, hatchery, rearing, growing, transport, lairage, curing and tanning sectors that can be completed by a yes/no answer.
- Fact sheets that provide more detail on the questions and the implications
- Record keeping checklists.
- List of targets to be achieved
- Score sheets for monitoring, evaluation and verification.

It is considered that the documents will demonstrate the standards required to achieve high quality skins.

Implementing the Audit in the Ratite Industries

Audits can be either official or informal. An informal audit could be conducted by the grower or a skin marketer and can be used to identify and help resolve weaknesses. An external auditor usually conducts an official audit. These could be persons appointed by peak bodies such as the Australian Ostrich Association or the Emu Farmers Federation of Australia. Before an audit, a farmer, transporter, abattoir or tanner would be advised of the date for the audit. The auditor will assess records, diaries and data sheets as well as inspecting birds, facilities and skins.

The official will examine the audit questions and decide their relevance to the enterprise. In filling in the audit score sheets the auditor will score five points for critical issues and one point to non-critical issues if there is compliance. Depending on the approach taken by the auditor non-compliance with some critical issues may result in enterprises failing the audit. In most cases however, a score will be provided to the enterprise and area of the enterprise, which needs to be improved, will be indicated. An improvement is the overall score achieved on each subsequent audit will be an indicator of the improvement in practices.

It is expected that each person working in the production chain will read the documentation understand the questions being asked and its impact on skin quality and the need to keep records and the evidence required to demonstrate compliance. It is recommended that each

sector conduct their own trial audit, keep notes of activities and records, identify problems and solve them.

Obtaining the Benchmark Documentation

The benchmark audit documentation is provided in volumes 1 and 2. These can be made available to Industry on disk or via e-mail. The proceedings of an Industry Workshop, which was held in Adelaide in February, 2000 to develop the documentation is also available on request.

CD-ROM 'FACTORS INFLUENCING RATITE SKIN QUALITY'.

by

Denise Galloway and Mark Bradley,
I.C. Imaging,
Box 227
P.O. HENLEY BEACH. S.A. 5022.
icimaging@senet.com.au
Telephone: (mobile) 0413318158

Background

The CD-ROM has been produced in conjunction with the benchmark documentation. The CD-ROM can be used as a stand-alone resource and for some users; it will work complementarily and assist introduction to the audit documents.

Content

The CD-ROM presents an overview of each of the factors influencing skin quality of ratites and information to assist production of improved quality skins. In addition, users can download pages from the Emu and Ostrich Skin audit documents. Benchmark score sheets are available for users wishing to evaluate their practice in detail and to familiarise themselves more fully with the recommendations for improving skin quality. Direct links to the Rural Industries Research and Development Corporation and Pig and Poultry Institute web-sites are also provided.

Technical

- The CD-ROM is produced for PC and NT formats.
- Will run on Windows 95 or 98.
- The CD-ROM takes approximately 30 minutes to work through, excluding downloading and document printing time.

Creative

The CD-ROM is a modest budget media application, which incorporates the knowledge that exists in the industry.

The information is organised with straightforward navigation and a range of interactive options. This enables users to choose areas of interest and work at their own pace in any order.

Video footage, some drawn from previous research data has been incorporated. Still photographs, slideshows, audio and text are used in the production.

Duplication and Distribution

This title can be reproduced at quite low cost, especially when compared with video duplication. The most economic method is to have this done commercially and the larger the run, the cheaper per item. As an example, a bulk run of 500 copies, including booklet, jewel case, cover, back slick can be done commercially for approximately \$2.50 per copy. In this instance, 500 copies may be excessive and a smaller run more appropriate. Initially, it is likely that a short run for holding in stock may be best even though the duplication cost per item will be higher.

With regard to distribution, there are a number of materials including videos, available via links to the RIRDC web-site. Michael Bourke at NSW Agriculture is handling distribution of videos produced for the Egg industry and he may be of assistance. If RIRDC have no other convenient method of distribution, IC Media may be able to undertake this task. IC media have a structure through which there is distribution of other educational publications.

Possible developments

The material on the CD-ROM master can be economically updated and can also be reversioned for online delivery. Direct links to other relevant web-sites could also be incorporated in the future.

Given the intensifying culture of multimedia, there is likely to be growing demand for CD-ROM and online delivery of content in rural communities and industries. These developments will also contribute strongly to VET initiatives.

Research which investigates audience response, preferred production styles and formats, efficacy in dissemination of research and science communication could assist in determining some formalised guidelines for producing media for rural community and rural education audiences. Cost saving strategies including reversioning existing materials, archiving of data and images for retrieval and future multi-use could be explored as part of such a study.

RATITE SKIN QUALITY RESEARCH AND DEVELOPMENT PLAN 2001 – 2006

(This plan has been developed following a request by RIRDC to a progress report submitted on the project)

The ideas for this plan were developed from the following meetings;

- Workshop in Adelaide, February 2000 and a seminar in Moama, November 1999 attended by representatives of the Ratite Industries with expertise in skin quality.
- One on one discussion with emu and ostrich farmers in N.S.W., Vic. and S.A.
- Meetings with emu and ostrich transporters in S.A., Vic, N.S.W. and Qld.
- Meetings and visits to Myrtleford Abattoir to discuss lairage, slaughter and curing of skins.
- Discussion with skin marketers exporting skins to South Africa and Japan
- Conversations with skin researchers and consultants involved in the ratite industries.
- Discussion with South African and Australian tanners.

REASONS FOR THE PLAN

The aim of this plan is to provide direction for the Ratite Industries in future skin R&D.

The plan has the following purpose:

- To provide justifications for the Ratite Skin Industry R&D Plan.
- To give clear direction regarding the Ratite Skin Industry needs and priorities for the period 2001-2006.
- To encourage and support discussions between the Ratite Industries, RIRDC and the research, development and extension providers to ensure the needs of the Skin Industry are identified and incorporated into annual and longer-term planning.
- The plan was developed with input from key personnel in the Ratite Industry and should be considered to be an ongoing document as priorities and circumstances change in the Ratite Skin Industry.

The achievement of the objectives of the plan will further enhance the development of the Ratite Industries.

VISION

To improve viability, efficiency, product quality and technology transfer in the Ratite Skin Industry.

MISSION

To ensure R&D meets the needs of a profitable and sustainable Ratite Skin Industry.

In order to achieve the mission of the R&D program, the Industries, together with RIRDC, will seek to identify and initiate research, development and extension programs to meet the challenges and constraints to the Skin Industry development. The objective is to direct research funds in such a way so as to maximise both the opportunities and benefits for the Australian Ratite Skin Industries.

Priority 1

Objective 1: Nutritional strategies to improve hide strength and tanning qualities.

Most of the research conducted on ostriches has been done in South African. While the data from South Africa has relevance to Australia, nutritional evaluation of cost effective diets using Australian ingredients is a priority to reduce cost of production. In both the emu and ostrich industries high energy/high protein diets are fed to birds to achieve rapid growth. Apart from some limited nutritional research work conducted in Australia there has been little attempt made to demonstrate and evaluate the use of cost-effective diets under ostrich farming conditions.

In the Ostrich Industry, skin marketers and tanners are reporting a high level of fat in the skins at slaughter, which subsequently effects the consistency of colour of tanned skins.

There is a conclusive view that every attempt should be made to reduce the fat content of birds at slaughter. In South Africa reports indicate that birds are given minimal access to feed in the period prior to slaughter. This would be a welfare concern in Australia.

Under Australian farming conditions, it is likely that including cheap high fibre ingredients in diets during the latter stages of growth could substantially reduce cost of diets. Alternatives to lucerne are required to reduce costs of commercially prepared diets. A number of cheaper alternative fibre and protein sources are available including canola meal. Australia has a vast resource of wheat stubbles that could be utilised in a rotational grazing system with conventional pastures for both emus and ostriches. The use of fibre digesting enzymes could increase the efficiency of fibre digestion in both emus and ostriches. There is a view from South Africa that ostrich diets, which have a high grain content, encourage the development of filopumes, which are implicated in the formation of pinholes. This aspect requires further research. Currently there is innovative research being undertaken with other species attempting to increase skin strength using amino acid supplementation in diets prior to slaughter.

Aims

- To facilitate on farm R&D to reduce feeding costs of ratites.
- To develop a database for nutritional value of various Australian feed ingredients used in Ratite diets.
- To develop crop/pasture/rotations to reduce cost of feeding ratites.

Strategies

- Role of fibre digesting enzymes in chick, grower, finisher and breeder diets.
- Develop least cost high fibre diets for finishers utilising cheap novel feed ingredients (orange peel, turnips, straw etc.).
- Compare medics, sub-clover, lucerne and grass and a mixture of medics/grass, subclover/grass as pasture for ostrich finishers.
- Evaluate the feasibility of including ratites in an innovative crop/pasture/animal rotation system in the sheep/wheat belt of Australia.
- Examine the effect of dietary amino acid supplementation in the finisher stage on skin strength.
- Examine the effect of high grain diets on development of filoplumes in growers.

Targets

- Increase the use of enzymes in diets.
- Database of nutritional value of feed ingredients.
- Crop/pasture /bird rotations established.
- Filoplumes and pinholes eliminated

Performance Indicators

- Reduction in cost of production
- Hide quality improved

Priority 2

Objective 2: Modify abattoir practices to improve skin quality

Background

When both ostriches and emus are first housed in the lairage, it is important that birds quickly adapt to the holding area. Many abattoirs use misting to cool and calm birds. Information on other practices to calm the birds like use of low lux levels of blue light has not been utilised. This lighting also may calm the birds as they are moved to the knocking boxes. There is considerable concern in the Industry regarding practices, which can cause skin damage after the bird is killed. There need to be procedures adopted to minimize damage to the skin follicles especially from inappropriate techniques used to remove feathers. A strong view has been expressed that QA documentation needs be developed to train slaughter abattoir staff to remove feathers and skins correctly and reduce flay cuts. Approaches need to be made to AQIS to allow shackling of the birds by the wings as practiced in South Africa. The skin is easier to remove from the birds when shackled by the wings and also enables the skin to be more easily cut into the correct shape for tanning. Efforts is needed to change the attitudes of abattoir staff so they understand that correct handling of skins is just as important as achieving high standards in handling and processing of meat.

The competitive nature of the skin market has not been conducive to developing an Industry QA approach toward abattoir practices.

Aims

- Facilitate R&D to develop improved abattoir practices.
- Develop QA and training documentation to accreditate abattoir staff on feather removal and skinning.

Strategies

- Effect of lairage conditions (misting, lighting) on bird behaviour and skin quality.
- Video demonstrating the correct method to reduce flay cut damage to skins.
- Develop training documentation and video for accreditation of persons skinning, handling skins and removing feathers from ostriches

Targets

- Reduction of skin damage from lairage, skinning and flay cuts

Performance Indicators

- Reduction in skin damage in the lairage.
- Abattoir QA documentation implemented.

Priority 3

Objective 3: Genetic strategies to improve skin quality

Background

Filoplumes which produce both large and small indentations in hides are present in 25-40% of “Aussie” birds, and have been reported in 3-5% of South African strains. Recently in Australia 1200 out of 4000 hides were rejected because of filoplume damage by tanners who grade skins on the basis of pinhole damage. Pinholes have also been seen in lamb and cattle hides, and in lambskins the prevalence of these defects is thought to be under a moderate level of genetic control. Pinholes in lambskins are thought to be caused by primary+secondary follicles coming out as a plug during the fellmongering process, but the aetiology is not clearly understood. The prevalence of pinholes may be a heritable trait in ostriches. However, the remaining question that needs to be resolved is whether pinholes are solely evidence of a filoplume. Some pinholes in ostriches are classified as bacterial damage, although bacterial damage is usually only superficial, irregular and rough and does not occur as individual regular focal indentations observed with pinholes. A factor also worth considering is whether feather removal methods might influence the development of pinholes. There is also evidence that filoplumes disappear as a bird begins to mature. It is possible that the prevalence of filoplumes and associated pinhole defects in hides are both heritable and strongly associated with each other genetically. This would enable selection programs to be implemented to minimise hide defects and subsequent downgrading. The temperament of Ratites is a characteristic, which may be heritable as in other bird species. Birds with poor temperament and those, which exhibit excess levels of unwanted behaviours, cause skin damage to other birds.

Aims

- Undertake genetic studies to determine heritability of filoplumes and pinholes.
- Implement selection procedures to minimise aggressive behaviours in ostriches.

Strategies

- Influence of plumage characteristics on hide defects.
- The relationship between parent and offspring presence of filoplumes and subsequent hide defects.
- Heritability of temperament and relationship to hide damage

Targets

- Reduction in filoplumes
- Improvement in bird temperament

Performance Indicators

- Improvement in skin quality
- Increase in farm profitability

Priority 4

Objective 4: Best practice husbandry and transport procedures to reduce skin damage

Background

There has been concern expressed that birds are not being conditioned to handling resulting in fractious behaviour of birds and damage to skins. In ratites there is a concern that chicks are not achieving their early growth potential. There is a need to establish methods to stimulate chicks to eat by using more regular handling and by maintaining optimum environmental conditions. There is also a need to socialise the birds to human presence from an early age. This requires the handler to visit the chick area often to stir the feed and train the birds to respond positively to human presence. In particular, as the birds age they should be regularly provided feed and water in portable yards. This encourages birds to pen themselves, which is better than birds being forced into yards and risking skin damage. Studies are required, however, to demonstrate the difference in skin quality from conditioned birds versus those with little contact with humans to encourage farmers to adopt the procedure. Moreover, there is a need to reduce the level of aggression in emus and ostriches by providing an enriched environment. This requires the provision of shaded sandy areas for the birds to dust bathe, the use of novel objects in the environment to reduce boredom and the development of stereotype behaviours and aggressive pecking and kicking. There is a difference in opinion on whether birds should be allowed to sit or stand during transport. Methods to keep the birds calm during transport also need to be investigated. Factors such as using blue light during night transport to keep birds calm and utilisation of trucks with air suspension for smoother transport should be investigated. The influence of these factors on skin quality in relation to stocking density during transport needs to be determined. Monitoring behaviour of birds while being

transported would provide evidence for determining best practice transport methods. To minimise the incidence of scars that may result from claw injuries during the chick stage declawing may need to be introduced. Partial amputation of the two toes of ostriches has welfare implications. It may cause the ostriches chronic pain and to become flatfooted and change their gait. On the other hand the change in gait may reduce their ability to deliver effective kicks to humans and other ostriches during aggressive encounters. In the chick stage, declawing may reduce the incidence of clawing and skin damage to other chicks.

Aims

- Facilitate R&D to improve uptake of bird socialisation practices on farm.
- To develop environmental enrichment procedures to reduce aggressive and stereotype behaviours in birds.
- To implement practices to improve bird transport conditions.
- Develop husbandry practices to improve early chick growth and reduce claw damage in chicks

Strategies

- To develop practices to stimulate growth of chickens via housing conditions and conditioning birds to handling and yarding.
- Video demonstrating conditioning of birds to portable yarding.
- Effect of transport conditions on behaviour of ostriches and subsequent skin and tanning quality.
- Examine methods to stimulate growth (auto stirrer, light, preconditioning) in the chick stage by conditioning birds to feed more often.
- Effect of misting birds at yarding and during transport on bird behaviour.
- Influence of availability of sand pits and enriching the environment on the behaviour of emus and ostriches.
- Role of fire breaks inside the fences to reduce pacing and potential skin damage to growers.
- Effect of declawing on skin quality

Targets

- Increased use of enriched environments
- Increased use of portable yarding
- New practices to stimulate chick growth.
- New husbandry and transport methods.

Performance Indicators

- Improvement in skin quality.
- Improvement in farm profitability.

Priority 5

Objective 5: Improve Water Quality

Water quality has been neglected as an issue impacting on skin quality. Poor water quality indirectly effects skins by reducing water consumption in birds, which reduces growth and causes sickness and death. Under Australian summer conditions, livestock drinking water is saltier via evaporation and drinking water temperatures can be as high as 40°C. On many days during summer, water is unfit to drink. Anecdotal comments from the South African Ostrich Industry indicates that ostriches can die if drinking hot water whilst emus will mainly drink in the morning and evening when water is cooler. Producers need to more concerned with the impacts of hot drinking water and poor quality water on ratite production. Standards for water quality have been established for other bird species and need to be evaluated for ratites. If birds can't drink because the water is too hot they will be stressed and potentially fractious leading to skin damage.

Aims

- Conduct R&D to establish drinking water standards for ratites.
- Develop extension material for farmers to assist in the improvement of water quality.

Strategies

- Identify the influence of water quality and drinking water temperature on ratite performance.
- Determine the effect of on-farm drinking water systems on water quality.
- Recommend techniques to improve on-farm water quality.

Targets

- Water quality improved
- Improvement in skin quality

Communications Strategy

Subject to RIRDC approval the findings from this study will be communicated to Industry as follows:

- Project documents and CCROM will be forwarded to the Australian Ostrich Association and the Australian Emu Farmers Federation.
- There will be a one-page publication concerning the documents in the seminar proceedings at the 2000 SA Pig and Poultry Fair.

It is also proposed to present aspects of the study to the following conferences if possible:

- 2001 Poultry Science Symposium in Sydney
- 2001 European Poultry Welfare Conference

Findings will also be communicated via:

- Refereed applied poultry science journals
- Ratite magazines
- Fact sheets for industry
- Presentations at grower meetings