Good Worksheets.

BULLETIN

OF THE NSW ASSOCIATION
OF AGRICULTURE TEACHERS

B. A. A. T.

Volume II 1990

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NSW ASSOCIATION OF AGRICULTURE TEACHERS

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EDITOR'S NOTE

Here we are, half way through the year and the pace of educational change in NSW continues unabated. Recent reforms have great implications for agricultural education and it is in the best interests of teachers to acquaint themselves with such reports as the "final draft of the Scott Report";

"Key learning Areas in Education"
"The Education Reform Bill"

At this stage the affects of these and other changes are not clear, but it appears that many structures that were set up to assist in the teaching and administration of Agriculture are changed or no longer appear to exist. At time of printing, the future of syllabus committees, the tractor replacement program and overall regional funding of agriculture are not clear. This has not been helped by the loss of subject based inspectors, with many science inspectors having been of great assistance in helping to provide advice and financial direction for teachers of agriculture. The problem with dismantling these structures is that no indication has been given as to what structures will continue, and what will replace them. It is almost certain that the Cluster Directors will play a big part in the administration of Agriculture in the school. However many are still unclear as to their role in this area. If anybody has an inkling of structures that are working well in their region, or of any proposed structural changes for agriculture administration, it would be appreciated if they could be forwarded to BAAT for publication.

Rod Francis assures me that organisation for the Biannual Agriculture Teachers Conference are well in hand. Initial arrangements and

details, with hopefully some indication of funding for participants should be available for the next issue of BAAT.

This issue contains some very worthwhile contributions from a range of teachers of agriculture. These include Arthur Kelly at Camden High School, Rick Kemp at St. Clair High School, Carolyn Nyman at Northholm Grammar, Ian Judd ex of Hoxton Park High School, Charles Cassels and the staff of Shalvey and Dunheved High Schools, and Rod Francis.

This issue contains an up to date list of membership of the Association. There has been some difficulty in keeping this list accurately and as a result some financial members did not receive their first issue of BAAT in April. If you are not receiving your BAAT then contact one of the executive members to have the situation corrected. There are copies of BAAT I, still available for those who missed out.

Peter Crick
Editor

TILLING THE TURF

Syllabus Committee Elections

Elections for NSW Teachers Federation representatives on the newly constituted "Agriculture Studies" Syllabus Committee, were held in April. From a field of eight nominees the following people were elected-

Geoff Creek	-	Murrumbidgee College of Agriculture
Pauline Smith	-	Armidale TAFE
Peter Crick	-	Lisarow High School
Russell Swindon	-	Henry Kendall High School

With the Education Reform Bill being passed in the Upper House recently, the Board of School Studies is now responsible for curriculum in NSW schools. This board is ensconced in the Ministry of Education and Youth Affairs, rather than the Department of Education, and because of this the future of all syllabus committees are under a cloud.

Metropolitan Branch of NSW Association of Agriculture Teachers

The Metropolitan Branch of the Association continues to be very active, with funded courses being conducted by the Association over the year. The Association has undergone a complete change in personnel in 1990. The capable people in control are -

President:	-	Peter Jones - Colo High School
Secretary:	-	David Gagg - Model Farms High School
Treasurer:	-	Julie Nixon - Doonside High School
Inservice	-	Ian Saunders - Dunheved High School
		Warren Groth - Pendle Hill High School

Julie Nixon is able to take subscriptions for both the State and Sydney branches of the Association.

School Certificate Performance Descriptors

Before the end of the year, all schools with "Agriculture" and "Sheep Husbandry and Wool Science" will receive "Course Performance Descriptors" to enable teachers to be able to grade their students for the 1991 School Certificate. The grades rang over A - Excellent Achievement; B - High Achievement; C - Substantial Achievement; D - Satisfactory Achievement; E - Elementary Achievement. The award of the grades is at the discretion of the teacher and won't have to fit any requirements of a normal distribution etc. The award of a grade is on the basis of the student having fulfilled a number of descriptors to the satisfaction of the teachers. The descriptors are extracted from the aims of the junior syllabus, and take into account

the assessment guidelines set out in the syllabus. It is important that teachers make themselves aware of this change, to avoid confusion next year.

The Future of Professional Associations

Printed below is a copy of the "vision" for the role of Professional Associations as seen in the recently released "School Centred Education - Report of the Management Review". The indication is that the status of Professional Associations is to be reviewed and maybe more resources will be made available.

Ch. 11: Professional Associations

167. The contribution of professional associations should be officially encouraged by the Department of School Education in areas of teaching, curriculum, leadership, school development and policy advice.

168. The Government should provide a modest level of funding including accommodation to help professional associations strengthen their structural base and support their on-going operation.

169. A small representative committee should be established by the Secretary of the Ministry of Education and Youth Affairs to review the resource needs of professional associations.

170. At regional level, associations should be encouraged to create regional chapters and regional administrators should be encouraged to consult with association members on major professional development and curriculum issues.

"That's a Joke, Son!" Department

Question to a Year 12 class following a dairy farm visit.

Q: *What sort of records would a dairy farmer keep?*

Student 1: *Elvis Presley records.*

Student 2: *No! Don't be silly - Slim Dusty records.*

NEWHAVEN PARK EDUCATION CENTRE
ATTENTION

To those teachers who may not have received our latest correspondence.

Newhaven Park is situated 12km from Bathurst and caters for the needs of Educational Institutions in the field of Agriculture. Comprehensive Package Tours have been arranged ranging from 1 to 5 day Study Camps and includes educational as well as recreational activities.

The advantages of an agricultural excursion to Newhaven Park are:

* resource packages including question booklets and followup activities designed to complement the syllabus and teacher needs.

* The wide variety of guest speakers and venues available to school groups that will allow you to develop your own itinerary or you can use an already successful itinerary or you can use an already successful itinerary currently used at Newhaven Park.

* The uniqueness of the Bathurst Region is such that all facets of agricultural production is close at hand.

* Students are well fed with wholesome meals and enjoy comfortable homestyle accommodation.

* Activities for students to enjoy during their free time for example, swimming pool, tennis, table tennis, pool and video facilities.

* The close proximity to Sydney, tailored educational packages, and low cost venue make Newhaven Park one of the most attractive options available to teachers.

Below is a list of some of the resources available through Newhaven Park.

Venue or Speaker	Syllabus Areas
# Murray Grey Stud & Commercial Herd.	Case Study, A1, A2, A12, A14, A15, E3, E8.
# Agronmist	Case Study, R1, R2, R4, R6, R8, R13, P2.
# Mixed Farm	Case Study, A1, A2, P1, P2.
# Dairy Farm	Case Study, R2, R7, R8, R9, R14. Case Study, Field Trips.

Veterinarian Case Study, A6, A8. Post Mortems.

Charles Sturt University, Agricultural Research Station, Santa Gertrudas Stud, Sale Yards, Stock & Station Agent, Marketing etc. etc.

Further information may be obtained by contacting:

Gloria or Garry Summers
PO Box 663 Bathurst 2795

Phone: (063) 37 2376
Fax: (063) 37 2693.

N.S.W. AG. TEACHERS' ASSOCIATION

The Beef Cattle Industry: Mac Elliott, District Livestock Officer, Wagga Wagga.

(Paper based on information from NSW Beef Industry Situation Statement - 1989/90 by: Ben Andrews - Principal Livestock Officer, Beef Cattle, Sydney).

Introduction:

The Beef Cattle Industry, currently contributes 15.5 million tonnes of beef per annum for local and export trade. Around 40% or 625,000 tonnes is used on the domestic market whilst the remainder approximately 940,000 tonnes goes worldwide to very specific export markets.

Australian Bureau of Agricultural and Resource Economics (ABARE) forecast a 1-5 year projection that the beef industry has excellent prospects with the possibility of producer returns increasing by as much as 50%.

Export markets are increasing and the domestic market has responded to the health style advertising by increasing consumption of beef.

Influences which could affect the beef outlook:

* Drought
* Exchange rate fluctuations
* Inflation rate
* Interest rates

The Industry:

The cattle population has been increasing slightly over a number of years. The A.M.L.C. is forecasting a herd rebuild to 27 million by 1991. Following are tables from the Beef Industry Situation Statement which gives useful comparative data.

Figure 1.

CATTLE STATISTICS - 1988

	CATTLE NO's	CATTLE SLAUGHTERED	PERCENTAGE OF POPULATION
QLD	9M (41%)	2.5M (34%)	28%
NSW	5M (23%)	1.9M (24%)	38%
AUST	22M (100%)	7M (100%)	32%

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* Meat production has increased significantly as a result of higher slaughtering and carcase weights, resulting in an increased value of total beef production. See figure 2.

Figure 2.

BEEF STATISTICS - 1988

	PRODUCTION (000)	VALUE	AV/CSE WGHT
QLD	610 (39%)	$100M (38%)	242 KG
NSW	412 (26%)	$793M (30%)	213 KG
AUST	1570 (100%)	$2600M (100%)	223 KG

* Statistics relating to beef utilisation indicate a considerable increase in export demand, reflecting an increased percentage of beef exported in the past 5 years. The domestic market remains firm with a increased consumption resulting from very progressive promotion by the AMLC, e.g. "Short Cuts Promotion". See figure 3.

Figure 3.

BEEF UTILISATION - 1988

	EXPORT (TONNES)	DOMESTIC (TONNES)	PERCENTAGE EXPORT/DOMESTIC		PER CAPITA CONSUMPTION
QLD	464,000 (49%)	146,000 (23%)	76%	24%	-
NSW	210,000 (22%)	202,000 (32%)	51%	49%	-
AUST	945,000 (100%)	625,000 (100%)	60%	40%	40 KG (UP)

* Both the volume and value of beef has increased. It is still not to be compared with the volume and value of wool but has surpassed the value of wheat. See figure 4.

Figure 4.

COMMODITY COMPARISONS - 1988

	VALUE/WOOL	VALUE BEEF	VALUE WHEAT	ALL COMMODITIES
NSW	$1,962M (32%)	$793 M (13%)	$659M (11%)	$ 5,986M (100%)
AUST	$5,461M (28%)	$2,800M (14%)	$2,035M (10%)	$19,715M (100%)

* Beef enterprises on-farm have not increased by comparison to sheep because the latter continues to be a more profitable option. This is a reflection of continued competitive prices for wool resulting in far more favourable gross margins. Cattle prices will need to increase significantly or relatively wool prices decrease significantly for comparative gross margins to occur. See figure 5.

Figure 5.

GROSS MARGIN COMPARISON - (1990)

	SHEEP			CATTLE		
	MERINO BREEDING	MERINO WETHERS	PRIME LAMBS	WEANER PRODUCT.	YEARLING BREEDING	X BRED YEARLINGS
DSE'S/HEAD	1.9	1.1	2.1	9	14	14.2
GM/ha	$215.04	$197.52	$108.80	$120.00	$116.40	$127.36

Stocking Rate: 8.00 DSE/ha

How Cattle are Marketed:

- Saleyard Auction: 70% of cattle are marketed through saleyards, most on cents/kg liveweight. Some $/head sales still take place.

- Direct Selling to Abattoirs: Highly perishable lotfed and well muscled cattle are increasingly sold direct to abattoirs on a weight and grade basis. Payment can either be made on a liveweight or carcass weight that fit into the particular market requirement of the works.

  AUS-MEAT is contributing by development of meat language and feed-back in AUS-MEAT accredited works.

- C.A.L.M. (Computer Aided Livestock Marketing)

  Australia's auction by description system is the most technically advanced system in the world.

  Its adoption in the industry is slowly but surely ensuring its place within the marketing system.

The Individual Export Markets:

Beef Exports in 1988 was valued at over $2 Billion.

- U.S. Market: Predominantly manufacturing grade beef to mix with U.S. Lot fed fat to turn out hamburger mince. Absorbs approximately 350,000 tonnes of boneless beef.

- Japan: Grain fed, grass fed and some manufacturing grades. About approximately 140,000 tonnes of beef.

- Canada: Approximately 30,000 tonnes of various grades.

- Europe: Approximately 6,000 tonnes. Specialised outlet for edible offal. Prospects of increased market share.

- Korea: Approximately 15,000 tonnes of grain fed and grass fed beef.

- Pacific Basin: Particularly Taiwan, Hong Kong, Malaysia and Singapore for a range of grades.

Live Cattle Exports

1988 Figures show that 90,000 head of cattle and buffalo were exported to:

Japan:	35,000 head of steers
Pacific:	35,000 head of breeding cattle (Bos Indicus)
Middle East:	10,000 head feeder and breeding cattle
Other:	10,000 head of breeding cattle and buffalo

Future Trends

General Developments: Our low cost pasture fed farming systems enables Australia to retain export competitiveness on the world market.

However, specialised markets willing to pay for value added higher quality meat has enabled lotfeeding to increase production to specialised markets such as Japan, Korea and Europe.

An increase of 400% is projected in this specialised market area by 1991.

Other Developments

Breedplan: The most advanced herd improvement technology is marketed worldwide.

Crossbreeding: 30% increase in adaption in N.S.W. since 1985.

High technology: Some of these developments are:

- Embryo transfer (and embryo exports)
- Embryo splitting
- Embryo and semen sexing
- Synchronisation of Oestrus
- Induced twinning
- D.N.A. fingerprinting

In general the beef industry is operating in an economic situation where supply is lower than demand, therefore in an envious situation compared to other industries.

Therefore a bright (if not cautious) future is expected for the industry for the next five years, weather conditions permitting.

Mac Elliott,
District Livestock Officer
Wagga Wagga

<u>Note:</u> Thanks to Sam Walker (Economist) at Wagga for providing recent Qxgas Margin Comparisons.

PROPAGATING PLANTS ON THE SCHOOL FARM

The operation of a small nursery at your school farm can provide a range of valuable practical experience for students, while supplementing the Agriculture faculty coffers. Many people shy away from such a venture because they feel that they don't have the necessary skills. The reality that many plants are very easy to propagate if some basic principles are followed.

My own work has centred largely on the propagation of native plants. I have several reasons for doing so:

1. Native plants provide opportunities to use a wide range of propagation techniques.

2. Plants grown at the school farm can be used in a number of ways around the school, e.g. establishing bird attracting gardens, to demonstrate the adaptations to various environments or in straight out landscape work. Most schools have room for some more trees!

3. Personal bias - a belief that we should be exposing our young people to the diversity of Australia's native flora.

The Basic Techniques

The following are some of the observations and hints from my own work with native plants. Most of them are applicable to the propagation of introduced species (including vegetables and flowers) too. Reference to the seperate notes on propagation from the Society for Growing Australian Plants (SGAP) will start you off in the right direction.

Some personal observations include:-

1. Hygiene is important. Dirty pots and punnets should be washed and soaked in a disinfectant (e.g. Chlorine bleach) and dried in the sun.

2. Most seeds and cuttings will grow well in a sand/peat medium. Try to use a coarse river sand and mix in the ratio of 3:1. Perlite can be added, particularly if your sand is fine. Many cuttings grow well in a perlite/peat moss mix of 3:1.

3. A hand operated concrete mixer can be used to prepare the propagating and growing media. Small amounts are easily mixed in a bucket or wheelbarrow.

4. Soil mixes for growing seedlings or rooted cuttings can be purchased in bulk from commercial suppliers, e.g. Australian Native Landscapes, or made up at school. Commercial ones cost around $40/tonne.

5. An automatic misting system is very useful but by no means essential for striking cuttings.

6. Hormone powders and liquids improve the percentage of cuttings which strike and also speed up root formation. Several types are readily available. Experiment with them.

7. The seeds of some species are slow to germinate, taking up to 4 weeks. Be patient.

8. Small seeded species (e.g. most Eucalyptus, Callistemons, Melaleucas, many vegetables) are easily grown in communal pots or punnets. Larger seeds do better if planted in their own individual tubes, (e.g. Banksia, Acacia, Waratahs).

9. Plastic soft drink bottles and 100mm-150mm flower pots with plastic bags fitted over them all to make suitable mini glasshouses in which to strike cuttings. To use soft drink bottles, pour hot water in and remove the base (the hot water melts the glue), cut in half and use the lower dome shaped end. One from a 1.5 litre bottle fits neatly in a 100mm pot.

   If using plastic bags over a pot fit a hoop of stiff wire over the cuttings to keep the bags off them. Alternatively, blow the bag up through a drinking straw, fold the top over and tie tightly.

10. Up to 20 cuttings, depending on their size, can be struck in a 150mm pot.

11. Larger seeded species (e.g. Banksias, Acacias) can be pregerminated prior to planting. Refer to attached sheet.

12. Use boiling water to break the dormancy of acacias and other pea flowered species. Pour boiling water onto the seeds in a beaker or other container. After 24 hours, remove seeds which have swollen and plant (or pre-germinate). Repeat boiling water treatment on unswollen seed. Some may need 3 or 4 lots of boiling water.

13. Seedlings need nutrients from the time they emerge. Weekly watering with Thrive or Aquasol (1/2 strength) or Nitrosol or Maxicrop Seaweed Extract is sufficient.

14. Harden off the cuttings before potting, then keep them in a shaded area for 3-4 weeks.

15. Slow release fertilisers, e.g. Osmocote, Nutricote are good for potted plants. Simply sprinkle on the surface of mix in with the medium. These are available in 40kg. bags.

16. Write labels in black pen, e.g. Artline 500. Blue ink fades in the sun.

17. Fungi can ruin your students work. Be vigilant and spray cuttings or seedlings if necessary. I have had most problems when using aquaria to grow cuttings.

18. Pot plants into 150mm plastic pots (18c each on requisition), and grow until saleable size, at which time they will sell for $2-$3 each. Plastic nursery bags of 1.5 litre volume ($6/100 from SGAP), are ideal for potting Eucalypts into. The tree can grow to 30-40cms in them and be at an ideal size to plant out.

19. Most semi-hardwood cuttings are best taken in late summer or early autumn, when new growth has hardened off. Take cutting material from yung plants when possible.

20. If you sow your Eucalypt seeds in winter they will be ready to pot on in early-mid spring and be ready to plant out the following autumn, an ideal time to plant them.

21. Sell plants to staff, students (make sure you give them a free one or two) and parents etc. The word will soon spread if you have good plants at the right price.

22. Plant propagation is an ongoing process - there is always something to be done around the nursery.

23. Begin with well known species, which are suited to your local area.

24. Sharp secateurs are needed for cutting. Those on requisition are suitable if not used for fencing as well!

Some species to try:

1. From seeds

Eucalypts	citriodora, maculata, sideroxylon, nichollii, saligna, leucoxylon rosea, macrandra. Most eucalypts are easy to grow from seed. Choose ones which will grow in your local area.
Melaleuecas (Paperbarks)	armarillaris, incana, lateritia, - all species can be grown from seed.
Callistemon (Bottlebrush)	salignas, uiminalis, speciosis, pinifolius, phonicieous. All species can be grown from seed.
Acacias	baileyana, longifolia, floribunda, fimbriata, spectabilis, pyenantha (our Australia floral emblem).
Banksia	ericifolia, spinulosa, marginata, serrata and integrifolia.
Grevillea	robusta, banksii.
Hakea	salicifolia, laurina.

2. From cuttings

Callistemon	Almost all, especially the cultivars like Hannah Ray, Kings Park Special, Captain Cook.
Melaleucea	armarillaris, hypercifolia, lateritia, fulgens.
Grevillea	Nearly all can be grown from cuttings. Some hybrid ones like Ned Kelly, Robyn Gordon, Sandra Gordon, Misty Pink, Poorinda and Royal Mantle are slow to form roots and may be best if cuttings are taken in summer.
Hakea	salicifolia.

These lists are far from exhaustive but provide a good starting point. There is a huge range of plants which can be grown from cuttings.

Reference Books

There are many books which deal with Native plants and their propagation. Some of them are:-

Australian Native Plants. J.W. Wrigley & M. Fagg.
This book is probably the most comprehensive available. It has excellent chapters on propagation, pests and diseases and has detailed descriptions of thousands of plants suitable for cultivation. Approximately 450 pages and priced at 75 tax deductible dollars. Highly recommended.

Encyclopaedia of Australian Plants. R. Elliot & Jones
This is a very detailed series. Volume 1 deals with propagation, pests, diseases and cultural techniques. Volumes 2, 3 & 4 give detailed botanical descriptions of native plants suitable for cultivation. Each volume is expensive at 75 big bucks. One for the enthusiast.

Fun with Australian Plants. G. Elliot
A good little book which gives children some ideas on how to grow native plants. Many of these are good for use with school children.

A Guide to Australian Native Plants. A. Blomberry
Grow What Basic Australian Plant Study Group
Grow What Where Australian Plant Study Group
Grow What Wet Australian Plant Study Group

All of the above, plus many other interesting books with an environmental theme are available from:

Bower Bird Books
PO Box 104
WINMALEE NSW 2777

Write for a catalogue. Their prices are very competitive.

Society for Growing Australian Plants (SGAP)

Membership ($18 p.a.) entitles you to receive two seperate publications.

1. *Native Plants of NSW* - a small booklet printed 4 times per year. Many useful articles on growing and propagating native plants.

2. *"Australian Plants"* - Slightly bigger (30-40 pages) and produced four times per year. Membership also gives you access to -

   Seeds - These are available free through the SCAP seed bank or at a small cost, through the SCAP seed service. Most of my seed comes from these sources.

   Books - The SGAP runs a discount mail order book service for its members (now Bower Bird Books).

   Propagation Aids - A range of nursery bags, punnets, hormones, plant labels, fertilisers, etc. are available by mail order at discount rates.

To join - Send $15 to - The Membership Officer
SGAP (NSW Ltd)
PO Box 378
MILLER NSW 2118

Sources of seed.
H. G. Kershaw P/L at Terry Hills have a large range of Eucalypts, Acacias, Banksias, Callistemons etc., and will sell small quantities (10-25gms). Send for a catalogue -

H. G. Kershaw P/L
PO Box 84
TERRY HILLS NSW

Happy propagating.

Arthur Kelly
Camden High School

Membership Renewal/Application Form

(PLEASE PRINT CLEARLY)

Name .....

Address .....

..... Postcode .....

I belong to a Distric/Study Group (Yes/No) Group .....

TYPE OF MEMBERSHIP	1989	RENEWAL	NEW MEMBER
ORDINARY (all immediate family)	$18.00		
CONCESSIONAL (student/fixed income)	$12.00		

CHANGE OF ADDRESS: Old address .....

..... Postcode .....

LAPSED MEMBERSHIP: If your membership has lapsed, it may be possible to supply back issues of 'Native Plants'. Please advise if you wish your membership to be back dated.

Last Issue Received .....

Make cheques, etc. payable to: **'SGAP - NSW Limited'**

Please write your name and address on the back of Third Party Cheques (e.g. Bank, Building Society, Credit Union cheques and Postal Orders)

POST TO: **SGAP MEMBERSHIP**
P.O. BOX 378,
MILLER NSW 2168

Receipts are not issued for membership payments. Please do not send cash through the mail.

Book Orders should be sent direct to the Book Service Company.

If ordering other items such as Books, Propagation Aids, send a separate cheque. **DO NOT** include Membership Renewals on the same cheque.

Membership Enquiries

For problems or enquiries about existing membership, that is, change of address, non-delivery of Native Plants or Australian Plants or whether you are still financial, etc., please write to the above address giving details of publication date of the last newsletter and journal you received and include your telephone number of where you can be contacted.



Eucalyptus Propagation

INTRODUCTION

This article is reproduced from a leaflet entitled "Eucalypt Propagation on a Small Scale", by David Kleinig and John Doran, available from the C.S.I.R.O. Permission to republish it is appreciated, and the fine work of the C.S.I.R.O. in the improvement of quality of living in Australia is acknowledged.

The recommendations are based on the experience of officers of the Division of Forest Research, C.S.I.R.O., in producing small numbers of seedlings for research. The techniques described are not the only ones possible, and would be modified for producing large numbers of plants.

SEED AND SEED STORAGE

Most commercial eucalypt seedlots are sold, stored and sown as a mixture of viable seeds and chaff (mainly unfertilised ovules), which are difficult to separate in many species. The main features are the very small seed size of most species, the high proportion of chaff (from 5:1 to 30:1 by weight), and the similarity in size, shape and colour of the chaff and viable seeds of some species. The average number of viable seeds per gram of seed and chaff varies greatly with species and is in the range of seven to 4,000.

Eucalypt seeds are relatively easy to store. The mature seeds of most species remain viable for a decade or more when stored at a moisture content below 10% in sealed containers at room temperature. In dry climates, air drying of the seeds during extraction will give a satisfactory seed moisture content for storage (8-10%). In humid climates, however, air drying of the seed may leave the moisture content undesirably high for storage, although this can be partly offset by storage at lower temperature (1-4°C). Long-term maintenance of viability is better assured if seeds at a moisture content of less than 10% are refrigerated in sealed containers at 1-4°C. This treatment is essential for the successful storage of seed of *Eucalyptus deglupta* and *E. microtheca*.

CONDITIONS FOR GERMINATION

Temperature, Moisture and Light

Most eucalypt seeds germinate over a wide range of temperatures, generally 10-30°C. The optimum temperature for germination of most species is close to a constant 25°C, with some tropical species tending to have a higher optimum temperature and some temperate species a lower optimum. High humidity around the germinating seeds is essential, and they should be exposed to a period of light each day.

Stratification

The seeds of most eucalypt species germinate readily without preliminary stratification treatment when given appropriate conditions of temperature, moisture and light. However, seeds of species from high altitudes commonly require cold, moist stratification to break their dormancy. To stratify, sow the seeds in the moist substrate in the germination container (as described below), cover the container with a lid or a plastic sheet to minimise drying, and place in a refrigerated environment at 1-4°C. Check occasionally to see that the substrate remains moist.

Three (3) weeks of stratification is essential to break the dormancy of seeds of *E. perriniana* and will also ensure more rapid and even germination of seed of *E. amygdalina, E. dives, E. nitens, E. pauciflora* ssp. *pauciflora, E. regnans* and *E. stellulata*. Four (4) weeks of stratification is essential for the germination of seeds of *E. glaucescens* and *E. pauciflora* ssp. *niphophila*; six weeks is required by *E. kybeanensis, E. mitchelliana* and *E. pauciflora* ssp. *debeuzevillei*, while *E. delegatensis* requires 6-10 weeks, depending on seed source. On subsequent transfer to warmer temperatures germination should commence within 3-5 days.

RAISING SEEDLINGS

A two-stage approach is recommended. This involves sowing a quantity of seed in a germination container, and then transplanting individual seedlings from this container into separate pots for growing on to the planting-out stage. Usually eucalypts grown in pots will transplant much more successfully to the field than seedlings taken as bare-rooted plants from a nursery bed.

Sowing

The time for this depends on local conditions, particularly on the optimum time for planting-out. For example, in Canberra sowing in the glasshouse in May allows the production of vigorous stock for planting-out in September-October after the last of the severe frosts and well before the hot, dry summer.

Choose a germination container of convenient size and depth. Plastic pots 7.5 cm in diameter are suitable for germinating 20-30 seedlings, and plastic trays 14 x 8 cm for 50-60 seedlings.

Suitable sowing mixes include 2:1 vermiculite and perlite, or 1:1:1:1 coarse sand, peat moss, vermiculite and perlite. If these materials are not readily available, a 1:1 mix of sand and loamy soil, or even a medium grade sand, will suffice. Heat sterilisation of all mixes is desirable. Nutrients are necessary once the cotyledons of the seedlings have developed, and can be provided by a slow-release fertilizer such as "Osmocote" or "Magamp" in the mix, or by regular weekly application of a liquid fertilizer such as "Aquasol". Suitable rates are given in the section on transplanting.

The sowing mix should be watered before sowing and the seeds sprinkled sparsely and evenly over the surface. Care is necessary to avoid sowing too densely, as this will result in unsatisfactory spindly seedlings. The smaller eucalypt seeds do not need to be covered, but larger seeds should be covered with a layer of the sowing mixture no thicker than the diameter of the seed.

Germination trays should be kept in a warm (20-25°C) shaded area (50-80% shade). A glasshouse is preferable but a sheltered shadehouse or verandah can be used. The trays should be watered at frequent intervals with a fine spray, so that the sowing mix is kept moist but not saturated. If "damping-off", the rotting of seedlings by soil fungi attacking at soil level is suspected (most common soon after germination), spray with an appropriate fungicide such as "Benlate" or "Captan".

Transplanting

The most convenient stage for transplanting is about 5-7 weeks after sowing, when the seedlings have 1-2 pairs of leaves above the cotyledons.

Containers of many types and sizes are suitable for transplanting eucalypts. For example, black polythene bags, 10 cm diameter and 14 cm deep (about 1.5 litres) are adequate for raising plants to 25-30 cm in height and are readily available. Other containers in common use include polythene tubes, plastic pots and peat pots of varying capacities.

A potting mix of adequate water-holding capacity, while still allowing good drainage, is essential for optimum plant development. Two such mixes

that are suitable are:

(a) 1:1:1 coarse sand, sandy loam and peat moss;
(b) 1:1:1:1 coarse sand, peat moss, vermiculite and perlite. Nutrients can be conveniently provided by the inclusion of "Osmocote" or "Magamp" in the mix at the rate of 1.75 kg/m³ (17.5 g/10l), or by the regular application of a liquid fertilizer such as "Aquasol". If fertilizers are not readily available, the inclusion of well-decayed animal manure in a mix with coarse river sand, and sandy loam in the proportions 1:2:3, is recommended.

The technique for transplanting into the separate containers is:

(a) Fill the containers with potting mix and water thoroughly.
(b) Take each container and prepare a hole in the mix with a "dibbler" (a pointed tool like a pencil). This hole should be about 1-2 cm in diameter and 2-3 cm deep.
(c) Using the dibbler, carefully prise a group of seedlings out of the sowing container and detach an individual seedling. Handle the seedling by its leaves only and avoid squeezing the stem. Roots are frequently quite long and should be pruned back to a length of 2-3 cm. Care must be taken to prevent the root system folding upwards as it is placed in the hole. Hold the seedling at the side of the hole so that the topmost roots are a few millimetres below the soil surface and gently firm the soil around the root system with the dibbler.
(d) Water gently after transplanting to ensure complete soil contact with the roots.

TENDING AFTER TRANSPLANTING

Initially plants should be kept in a shaded, weatherproof environment. Damage from heavy rain, wind, hail and frost can be very severe. Frost damage is less likely if the plants are on benches rather than at ground level. A permanent shadehouse is desirable, though temporary, portable covers of "sarlon" shade-cloth, hessian or similar material can be quite adequate. The need for shade after the first 2-3 weeks will depend on climate and season. Too much shade should be avoided, as it promotes the development of weak, spindly seedlings.

The potting mix must be kept moist, but not saturated, and never allowed to dry out. Before planting out, the seedlings should be "hardened off" by reducing the watering slightly and increasing the exposure.

Pathogenic fungi, insects and other injurious agencies can cause problems. The treatment of damping-off has already been described. Leaf diseases, including mildews and moulds, can also spread quickly; treatment with "Benlate" spray or dusting with sulphur powder often provides satisfactory control. Obviously it is better to prevent fungal problems by adequate ventilation, heat sterilisation of the potting mixes and good hygiene rather than to attempt often-too-late control with fungicides. Pyrethrum-derived sprays and dusting powders, which are not toxic to man, have been found most useful in controlling a number of insect pests, particularly aphids.

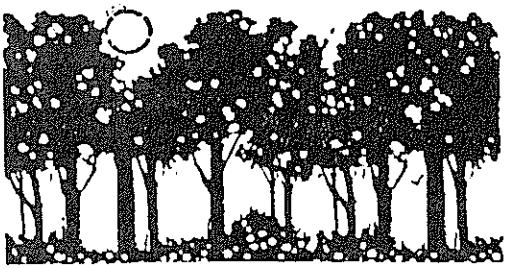
About 2-3 months after transplanting, seedlings should be 25-30 cm tall and ready for planting in the field.

Propagation for the Home Gardener

By THE EDITOR

The propagation of eucalypts from seed is quite easy if the seed is reasonably fresh. It is keeping the seedlings going that is the tricky part. For those who do not want to go to too much trouble, and do not care if they lose a few seedlings (after all, who wants more than a few plants of a species of large gum tree), this method is recommended:—

1. Sow seed only between April and June—send for seed now.
2. Prepare small plastic pots or tubes, crocked at the bottom, with 2 cm of clean, washed, coarse sand over a sandy loam soil in the bottom of the pot.
3. Sprinkle about 10 seeds on the top of each pot and cover lightly with more sand or fine gravel.
4. Water by dunking the tube up to halfway in a container of water. Water will seep up to the top, moistening the seed.
5. Keep the tubes in a bright spot, but with no direct sun. Keep, say, the tubes for one species together in a plastic ice-cream container and keep this on a window-sill—inside, away from the wind.
6. As seedlings shoot up, prick out all except the most vigorous one.
7. Pot on to large pots when the seedling is half as high as the depth of the tube, or pot as described elsewhere in this issue.
8. So you failed—try again. There are hundreds of fine seeds in each packet. After a few trials you will find the method that suits your conditions best, and then you will have plenty of plants.
9. The main cause of failure is fungal attack from the water, or because the sand around the seedling gets too wet. Try watering the pot with boiling water before you sow the seed, boiling the water and allowing to cool before watering, keeping the surface of the sand drier, or give the surface a little direct sun for an hour a day.
10. In the early stages vigorous growth is desirable, so that a little foliage fertilizer may help when the seedlings get a few centimetres high.
11. A deep pot or tube is essential to keep that tap-root straight down and not twisted, so plant out before the height of the plant equals the depth of your large pot.



TREES FOR SURVIVAL

A Rotary Shadehouse Project.

NATIONAL COMMITEE PO BOX 77.
TURRAMURRA N.S.W 2074

PHONE

Rotary in Australia has invited its member Clubs to become involved in a wide-ranging tree planting project.

The Trees for Survival programme involves the matching of Rotary Clubs on the seaboard with those inland. Seeds from native trees are collected by the country Clubs and sent to the coast for germination and potting off in shadehouses erected in the schools.

The young trees are sent back to their place of origin, held in school shadehouses to harden over the summer and then planted out.

At all levels this operation implies much expert advice and supervision. It also seeks to involve many others, young and old, to take part in this national enterprise.

If you or your school would like to be involved seek out your local Rotary Club or contact:

NATIONAL COMMITTEE
P.O. BOX 77
TURRAMURRA NSW 2074

(02) 449 9258

12.

A.S.A.P. is the Australian Society of Animal Production, and the members of the branch in your area invite you to consider nominating for membership.

A.S.A.P. was established to promote the development of animal production in Australia

Membership is open to everyone who is engaged in or interested in animal production. A.S.A.P. has about 2000 members, in various vocations – farmers, graziers, research workers, extension and technical staff, teachers and commercial personnel.

The Society was founded in 1951 and is essentially a Federal association of 13 branches throughout Australia.

Every two years one of the branches hosts a National Biennial Conference which provides an opportunity for all the members to get together to exchange information and ideas. The Conference Proceedings are sent free to all current members. This means that all members, wherever they are, and whatever their interests in animal production, regularly receive the most recent information available.

The branches periodically hold meetings to discuss topics of local or national interest and to profide a forum for members to raise matters of importance to animal production.

A.S.A.P. is a unique organisation. It provides a formal structure in which producers and research workers can meet and learn from each other. It gives opportunities for everyone involved in animal production, with all its aspects, to present their ideas. A.S.A.P. thrives due to the interest and support of people throughout Australia. The annual subscription fee is much lower than for most other organisations ($10 to $20, depending on which branch. Student fees are lower).

If you are involved in animal production and wish to keep informed about developments in this field, you should belong to A.S.A.P. The attached membership application form should be sent to your nearest branch Secretary as soon as possible. If you do not know any members of A.S.A.P., your branch Secretary will arrange for someone to nominate you. Your branch Secretary's name and address are on the back of the application form

AUSTRALIAN SOCIETY OF ANIMAL PRODUCTION

(Branch)

NOMINATION FOR MEMBERSHIP

We, the undersigned, hereby nominate as an ordinary/student member

.....
(full name in block letters)

.....
(full postal address in block letters)

.....

.....

Occupation .....

Main interests in animal production

.....

.....

Signature of Nominators 1 .....

2 .....

If you do not know any members of A.S.A.P., your branch Secretary will arrange for someone to nominate you. Your branch Secretary's name and address are on the back of the application form

Statement by Nominee:
If admitted to membership I shall conform with the rules of the Society and pay the annual fee for membership which has been fixed at

$ for 19

Signature of Nominee

Date

For Committee use only

Branch approval on

Federal registration on

Nominee notified on

BRANCHES OF A.S.A.P.

Hunter Valley
Naracoorte
New England
Northern Territory
Queensland
Richmond – Tweed
Riverina
South Australia
Southern Tablelands
Sydney
Tasmania
Victoria
Western Australia

HON. SECRETARY,

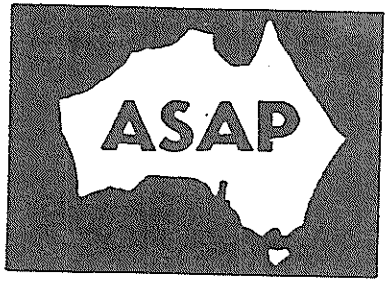
SYDNEY Branch

90 MT. VERNON RD.
KEMPS CREEK
2171

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WHAT IS A.S.A.P.?

IF YOU ARE INVOLVED IN ANIMAL PRODUCTION AND ARE INTERESTED IN WHAT YOU ARE DOING, YOU SHOULD BELONG TO A.S.A.P.

POULTRY MAGAZINES

Many schools have made pure breed poultry raising and showing part of their Agriculture programs. To supplement this interest, schools, teachers or pupils may be interested in a number of magazines in the area.

1. THE FANCIERS GAZETTE

Published by the Bantam Club of N.S.W. and for the $18 p.a. subscription, the subscriber receives a monthly magazine. It is printed on a small budget so the magazine quality is not high but it is still regarded as the "Voice of the Fancy". Each issue contains articles, often reprints from the now defunct "Poultry" newspaper on speicific breeds, show results, forthcoming poultry club shows, club news and letters from readers. If one is prepared to overlook the publication quality and soak up what it offers, it represents a useful adjunct to pure breed poultry interest.

Contact: The Bantam Club of N.S.W.
291 Galston Road,
GALSTON N.S.W. 2159

2. FANCY FOWL

A lavish and high quality production from England. It is relatively expensive at $27 p.a. subscription for six issues. However, the real poultry enthusiast will appreciate the quality articles and pictures, mostly in colour of breeds we do not see in Australia. The reader also gains an insight into the European scene where meticulous care is taken with the exhibition and judging of fowls.

Australian Contact: Ken Bergin
P.O. Box 5
SUMMER HILL N.S.W.

3. New Zealand POULTRY AND GAME BIRDS

A relative newcomer to the poultry scene and is now in its second year of publication. The magazine is published on quality paper with a wide range of topics covered from show poultry, pigeon, waterfowl, caged birds to game birds. There are no coloured pictures in this publication. The annual subscription is expensive at $33 p.a., editions appearing in May, July, September, November, January and March. The articles contained are well written.

Contact: New Zealand Poultry & Game Birds.
P.O. 5070
New Plymouth
NEW ZEALAND

4. AUSTRALASIAN POULTRY

This is the latest magazine to hit the scene and is also a bi-monthly publication. It covers laying and show fowls, bantams, turkeys, game birds, waterfowl and squab. It has a recommended retail price of $4.25 per copy but is available on a $24 annual subscription. It has an average magazine quality of production. There are no coloured photographs contained in the magazine but the articles contained are well written.

Contact: Poultry Information Publishers,
P.O. Box 1187
Hoppers Crossing
Victoria 3030

5. POULTRY PRESS

This is an American newspaper style production and has been in production for over 75 years. It is worth writing for a sample copy to see how only the Americans can do things - it is an education! Annual subscription is $U.S.10 and the subscription must be paid in U.S. dollars.

Contact: Poultry Press
P.O. Box 542
CONNERSVILLE
IN 47331 1-317-827 -0932

Rick Kemp.

AUSTRALIAN PERLITE
A DIVISION OF LAPORTE GROUP AUSTRALIA LIMITED (Incorporated in Australian Capital Territory)
TECHNICAL INFORMATION

SIMPLE STEPS IN SETTING UP "AUSPERL" GROW BAGS

It is assumed that the water quality is suitable for growing hydroponically, and that the nutrient mix has been adjusted to suit.

Most of the Grow Bags in Australia are used under cover, for the added advantage of climate control.

STERILISING THE SOIL.

It is strongly recommended that the soil be sterilised when moving from soil to hydroponic production. If already in hydroponics the greenhouses should be washed and sterilised. All weeds and grasses around the greenhouses must also be removed. This is done to ensure that the production area is rid of pests and diseases.

FLOOR COVERING

The two most popular floor covers used in greenhouses are polythene and concrete. A floor covering of white polythene will reflect light under the leaves. The use of concrete will absorb heat and liberate it during the night. Both materials have the advantage of better hygiene and stopping weed growth. The risk of soil born diseases are eliminated when using these covers. The greenhouses are also easily kept clean, as they can be swept or washed out.

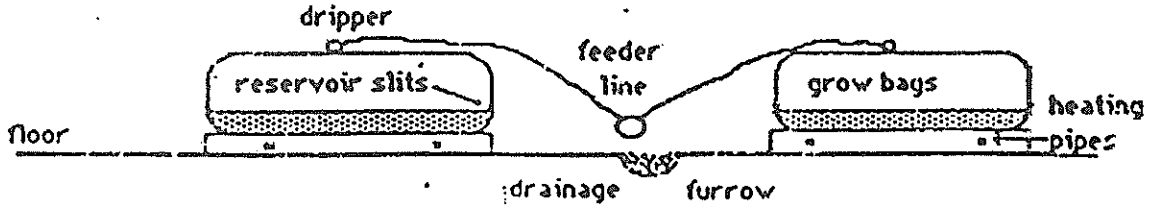
LAYOUT OF BAGS.

Bags are often slightly raised by the use of polystyrene or similar material, this is done to reduce bending when working on crops, as well as to provide some insulation and facilitating the placement of heating pipes.

Idealy double rows should be used, for double rows the bags are placed along side each other. Wider that double rows would make picking difficult, and increase the chance of disease. The spacing between the rows depends on the aisle spacing that the crop requires. The bags are then laid end to end forming a continuous row.

The greenhouse does not have to contain a slope over its length, but if a slope exists, it has to be taken into account when placing drainage slits in the sides of the bags. Ideally Ausperl Grow Bags are suited to a level surface.

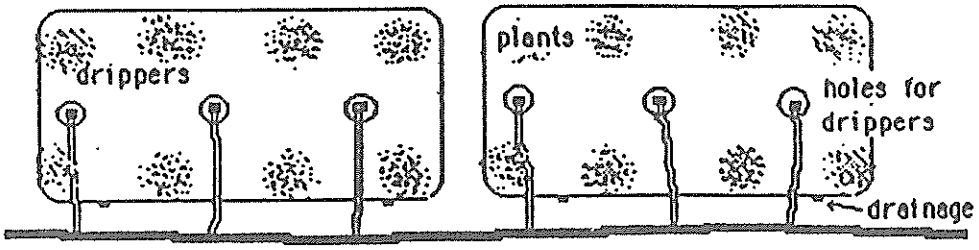
If you are in a area where heating is required, root zone warming is recommended, and heating pipes should be placed under each row.



NOTE:
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Issued by Laporte Group Australia Limited (Incorporated in Australian Capital Territory).

LAYOUT OF DRIPPERS.
The Grow Bags require a minimum of three reliable drippers per bag. Polythene pipes are laid between double rows, with drippers connected to these pipes. The drippers must be regularly checked to ensure that they are all working correctly.

Top view of bags



NUTRIENT SOLUTION.
It is recommended that nutrients be bought in a pre mixed form from manufacturers. These nutrients can be mixed directly into a large holding tank and be pumped in dilute form to the crop.

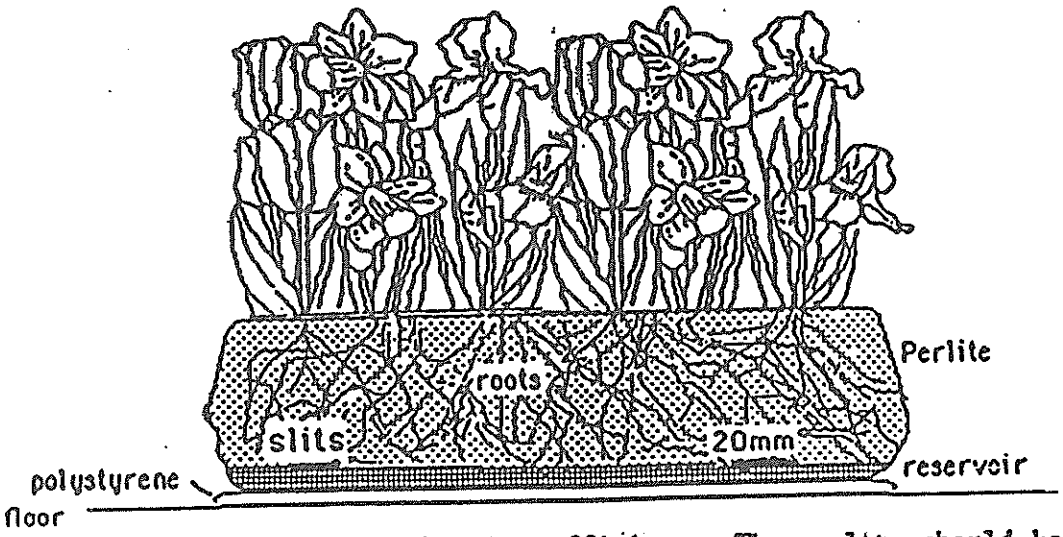
The second system that can be used is where the nutrients are mixed to form a concentrated stock solution and than diluted into a holding tank, or injected into the water supply. The pH is balanced in both the above systems. This is done to ensure that the nutrient solution reaching the plants is not too alkaline or acid.

WETTING UP THE BAGS.
* Holes are cut in top surface of bags and drippers insert.
* Pump nutrients into bag until Perlite is well moistened.
* Ensure reservoir is in bag by feeling the base of the bag.
* Test that the top Perlite is moist by sqeezing a grain between thumb and forefinger, moisture should be present.

SLITTING OF BAGS.
Ausperl Grow Bags are an ideal medium because root moisture stays constant and at an optimum level. This is obtained by means of a solution reservoir at the bottom of each bag. The reservoir is obtained by having slits at a predetermined level (see next paragraph). The slits determine the reservoir volume. Excess nutrients that are applied runs to waste, so the Perlite never becomes too wet. Solution is run to waste at each feed, this will wash out all harmful salts that have accumulated. Perlite has a very strong capillary action, which ensures that nutrients are drawn upwards from the reservoir and distributed evenly throughout the medium. Solution uptake by the plants is then matched by the capillary lift of the Perlite. To ensure that the plant is at optimum moisture never allow the reservoir to dry out.

The height of the first slit from the bottom of the bag is determined by what medium the crop is propagated in. Plants propagated in Perlite, Vermiculite, peat or any blend of these, require slits at 20mm (3/4") from the bottom of the bag.

Plants propagated in Growool blocks and planted onto Ausperl Grow Bags, require the initial slit to be made 75mm (3") from the bottom. This is due to Perlite's strong attraction for water, as it will draw the water out of the Growool block thereby causing the block to rapidly dry out. By having the slit at 75mm the Growool will not dry out so quickly, however care must be taken and the blocks must be checked regularly. The slits should be lowered to the normal 20mm height once the roots have become established (usually within the first two weeks). By propagating in Perlite the need to vary slit heights can be eliminated.



One to two slits 4cm long per bag is sufficient. These slits should be made on the inside of the bags. Allowing excess nutrients to run into drainage furrows. Drainage furrows are placed in the middle of each double row. This allows the excess nutrients to be drained from the greenhouse.

Slits are easily made by having blades set at at the required height in a block of wood. This allows the two slits to be cut at the correct height.

PLANTING.
* Cut holes in Grow Bags, this is best done by scalpel
* Place propagated plants in Perlite
* Plant at normal crop densities, for example 8 to 10 sim carnations or two tomato plants per bag.

FEEDING.
The feeding cycle used (how much how often) will depend on various factors:
*Temperature - the hotter it is the more water the plants use, therefore feed more often at a lower EC (electrical conductivity).
*Crop - some crops use more nutrients than others, also mature crops use more nutrients than the same crop at an un-established stage.
*Water Quality - with good quality water run 10% to waste, with waters that have high Sodium and Cloride levels run up to 30% to waste.
*Reservoir - if the reservoir dries out it means more solution must be applied, ensure that at each feed excess is applied.

MONITORING.
For optimum production EC and pH from the run off solution should be checked daily. Monitor the EC of the solution going into the bags and then the EC of the solution running to waste. This is done to maintain the EC at an optimum level.

If the EC of the solution running to waste increases then:
*run more solution to waste at each feed.
*If the solutions EC still does not decrease it is recommended that the input solution be reduced. This EC should not be reduced by more than 0.5uS/cm. It is not recommended to flush with water as this shocks the roots due to sudden changes in solution, always flush with dilute nutrient solution.

To determine the percentages that is running to waste, measure the amount of solution going onto the slab through the drippers, then measure the amount running out of the bottom of the bag. If a 25% run off is required and 10L per bag is being applied 2.5L should run to waste. During summer months more water should be run into the bags to maintain the same run off, as the plants are using more water.

Ausperl Grow Bags cannot be over watered as the excess solution simply runs to waste. The reservoir of solution and the capillary lift of the Perlite ensures an ideal moisture level is maintained in the bag. Watering to excess prevents salt burn as the salts do not have a chance to build up in the bag.

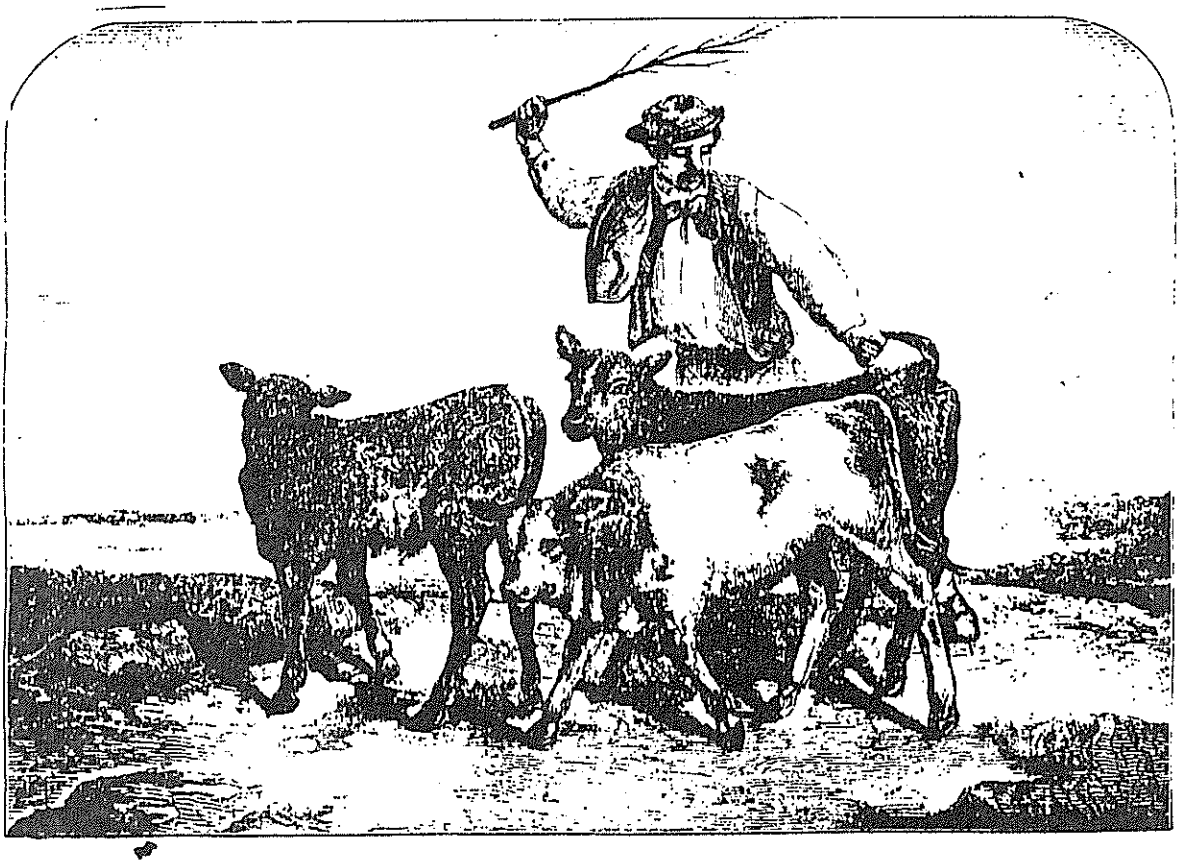
REMEMBER:
*Sterilise the soil.
*Check drippers regularly.
*Wet bag with nutrients.
*Slit bag to maintain a 20mm reservoir.
*Monitor EC and pH daily.
* Always run a minimum of 10% to waste.
* Flush with dilute solution never water.
Happy Growing.
Specialized advice is available from Australian Perlite, please phone (02) 666 8000.

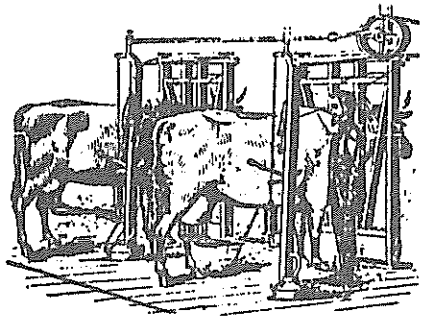
Artificial Insemination

contributed by

IAN JUDD

ex-Hoxton Park High School.





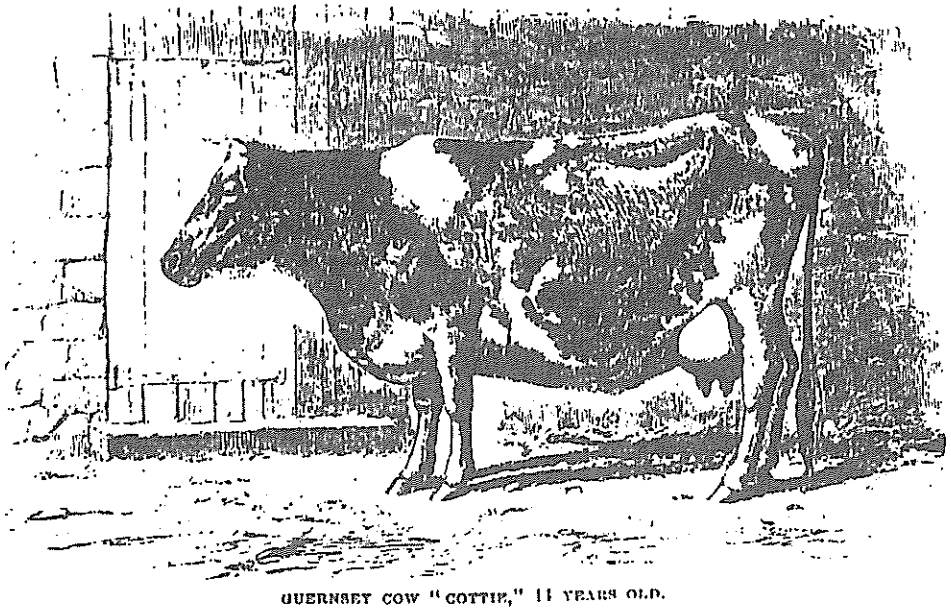
What is the purpose of Artificial Insemination?

In your workbook define what artificial insemination is?

Write the following passage in your workbook and fill in the missing words.

The cow can only be mated at a certain time every 21 days; this is called the ..... cycle. The time of standing heat can vary between 15-18 hours and is the time the cow allows the bull to service her. If the cow is not mated during .... Then she cannot have a calf.

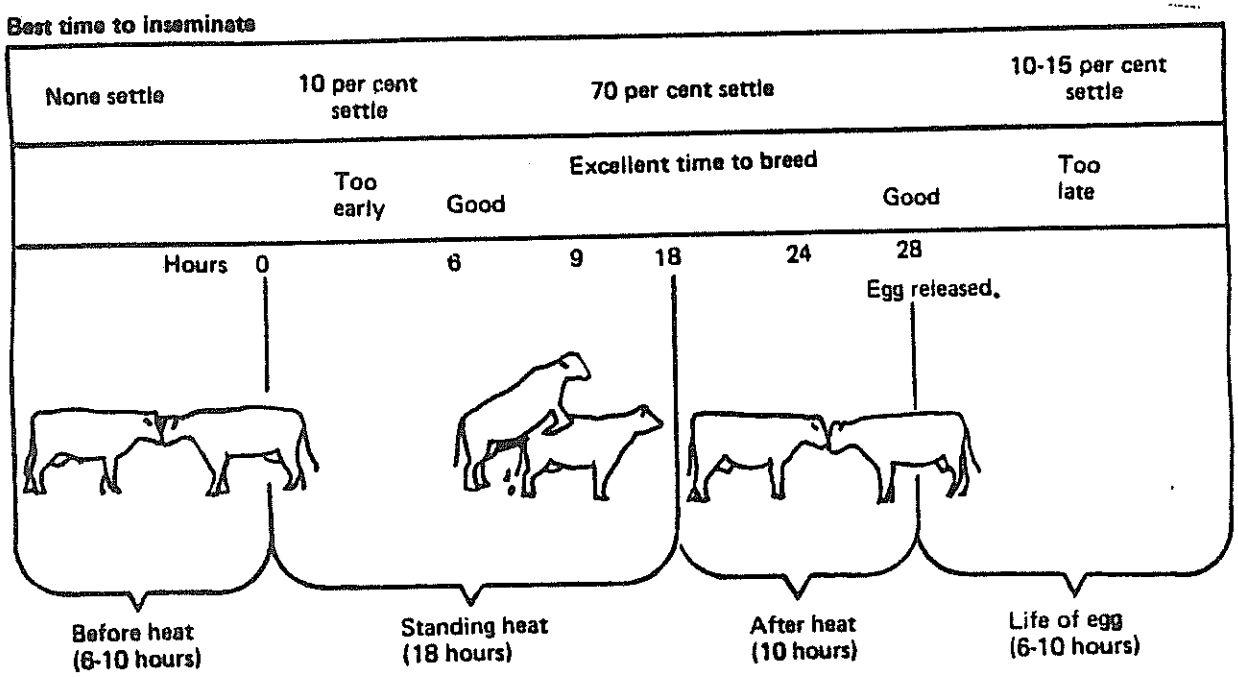
In artificial insemination the farmer must be able to take over the .... roll of detecting standing heat. Another name for the heat period is ..... To do this the farmer uses a teaser bull and observes the cows for visual signs of outrus. A teaser bull can no longer produce ..... and cannot mate. The teaser bull wears a chin ball harness which marks the cows that he mounts.



GUERNSEY COW "COTTIE," 11 YEARS OLD.

Observe the following diagram and answer the questions below.

Diagram 1: When to breed for best results.



Before heat.	Standing heat	After heat
1. smells other cows	1. stands for bull	1. will not stand
2. rides other cows	2. bawls a lot	2. smells other cows
3. vulva moist, red and slightly swollen.	3. nervous and excitable	3. clear mucous discharge from vulva.
	4. rides cows	
	5. off feed & milk	
	6. eye pupil dilated.	

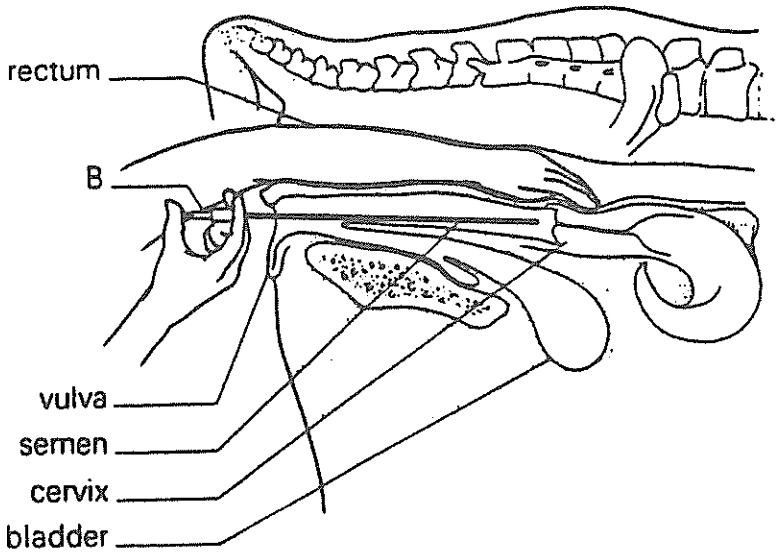
Conception results are best when the female is bred no earlier than 60 days after calving and during the latter part of standing heat.

Questions:

1. When is the best time to inseminate?
2. What signs does the cow show:
   a) before heat b) standing heat c) after heat
3. What is the life of the egg?
4. How soon after calving should the cow be bred?

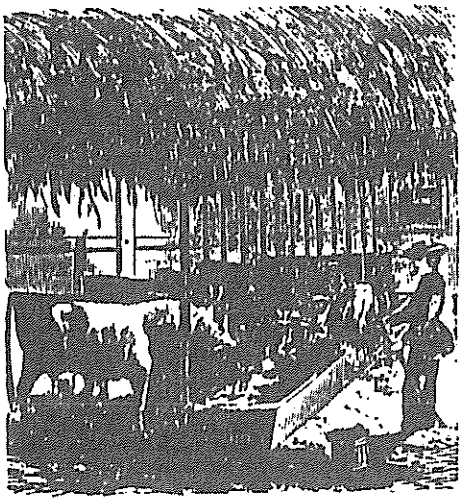
Observe the diagram and answer the questions below.

Diagram 2: Demonstration of Artificial Technique.



Important points to remember:
1. The operators arm is inserted through the anus into the rectum and holds the cervix.
2. The catheter is then placed inside the vagina and guided through the cervix.
3. The sperm is released into the uterus.

Questions:
1. Where does the operators arm go and why?
2. Where is the catheter placed?
3. Where is the semen injected into?



The following is an extract from a book by Roald Dahl called My Uncle Oswald. Read through the passage and answer the questions.

'Good,' he said. Then he began his story.

'Exactly fourteen years ago,' he said, 'in the winter of 1905, I observed a goldfish frozen solid in the ice in my garden pond. Nine days later there was a thaw. The ice melted and the goldfish swam away, apparently none the worse. That set me thinking. A fish is cold-blooded. So what other forms of cold-blooded life could be preserved at low temperatures? Quite a few, I guessed. And from there, I began speculating about preserving *bloodless* life at low temperatures. By bloodless I mean bacteria, etcetera. Then I said to myself, "Who wants to preserve bacteria? Not me." So then I asked myself another question. "What living organism above all others would you like to see kept alive for very long periods?" And the answer came back, spermatozoa!'

'Why spermatozoa?' I asked.

'I'm not quite sure why,' he said, 'especially as I'm a chemist, not a bio man. But I had a feeling that somehow it would be a valuable contribution. So I started my experiments.'

'What with?' I asked.

'With sperm, of course. Living sperm.'

'Whose?'

'My own.'

In the silence that followed, I felt a twinge of embarrassment. Whenever someone tells me he has done something, no matter what it is, I simply cannot help conjuring up a vivid picture of the scene. It's only a flash, but it always happens and I was doing it now. I was looking at scruffy old A. R. Woresley in his lab, as he did what he had to do for the sake of his experiments, and I felt embarrassed.

'In the cause of science everything is permissible,' he said, sensing my discomfort.

'Oh, I agree. I absolutely agree.'

'I worked alone,' he said, 'and mostly late at night. Nobody knew what I was up to.'

His face disappeared again behind the smokescreen, then swam back into view.

'I won't recite the hundreds of failed experiments I did,' he said. 'I shall speak instead of my successes. I think you may find them interesting. For example, the first important thing I discovered was that exceedingly low temperatures were required to keep spermatozoa alive for any length of time. I kept freezing the semen to lower and still lower temperatures, and with each lowering of the temp. I got a longer and longer life span. By using solid carbon dioxide, I was able to freeze my semen down to -97° Centigrade. But even that wasn't enough. At minus ninety-seven the sperm lived for about a month but no more. "I must go lower," I told myself. But how could I do that? Then I hit upon a way to freeze the stuff all the way down to -197° Centigrade.'

'Impossible,' I said.

'What do you think I used?'

'I haven't the foggiest.'

'I used liquid nitrogen. That did it.'

'But liquid nitrogen is tremendously volatile,' I said. 'How could you prevent it from vaporizing? What did you store it in?'

'I devised special containers,' he said. 'Very strong and rather

elaborate vacuum flasks. In these, the nitrogen remained liquid at minus one-nine-seven degrees virtually for ever. A little topping up was required now and again, but that was all.'

'Not for ever, surely.'

'Oh, yes,' he said. 'You are forgetting that nitrogen is a gas. If you liquefy a gas, it will stay liquid for a thousand years if you don't allow it to vaporize. And you do this simply by making sure that the flask is completely sealed and efficiently insulated.'

'I see. And the sperm stayed alive?'

'Yes and no,' he said. 'They stayed alive long enough to tell me I'd got the right temperature. But they did not stay alive indefinitely. There was still something wrong. I pondered this and in the end I decided that what the sperm needed was some sort of buffer, an overcoat if you like, to cushion them from the intense cold. And after experimenting with about eighty different substances, I at last hit on the perfect one.'

'What was it?'

'Glycerol.'

'Just plain glycerol?'

'Yes. But even that didn't work at first. It didn't work properly until I also discovered that the cooling process must be done very gradually. Spermatozoa are delicate little fellows. They don't like shocks. You cause them distress if you subject them straight away to minus one-nine-seven degrees.'

'So you cooled them gradually?'

'Exactly. Here is what you must do. You mix the sperm with the glycerol and put it in a small rubber container. A test tube is no good. It would crack at low temperatures. And by the way, you must do all this as soon as the sperm has been obtained. You must hurry. You cannot hang about or it will die. So first you put your precious package on ordinary ice to reduce the temperature to freezing point. Next, you put it into nitrogen vapour to freeze it deeper. Finally you pop it into the deepest freeze of all, liquid nitrogen. It's a step by step process. You acclimatize the sperm gradually to coldness.'

'And it works?'

'Oh, it works all right. I am quite certain that sperm which has been protected with glycerol and then frozen slowly will stay alive at minus one-nine-seven for as long as you like.'

'For a hundred years?'

'Absolutely, provided you keep it at minus one-nine-seven degrees.'

'And you could thaw it out after that time and it would fertilize a woman?'

'I'm quite sure of it. But having got that far I began to lose interest in the human aspect. I wanted to go a lot further. I had many more experiments to do. But one cannot experiment with men and women, not in the way I wanted to.'

'How did you want to experiment?'

'I wanted to find out how much sperm wastage there was in a single ejaculation.'

'I'm not with you. What d'you mean by sperm wastage?'

'The average ejaculation from a large animal such as a bull or a horse produces five ccs of semen. Each cc contains one thousand million separate spermatozoa. This means five thousand million sperm altogether.'

'Not five thousand *million*! Not in one go!'

'That's what I said.'

'It's unbelievable.'

'It's true.'

'How much does a human produce?'

'About half that. About two ccs and two thousand million.'

'You mean to tell me,' I said, 'that every time I pleasure a young lady, I shoot into her two thousand million spermatozoa?'

'Absolutely.'

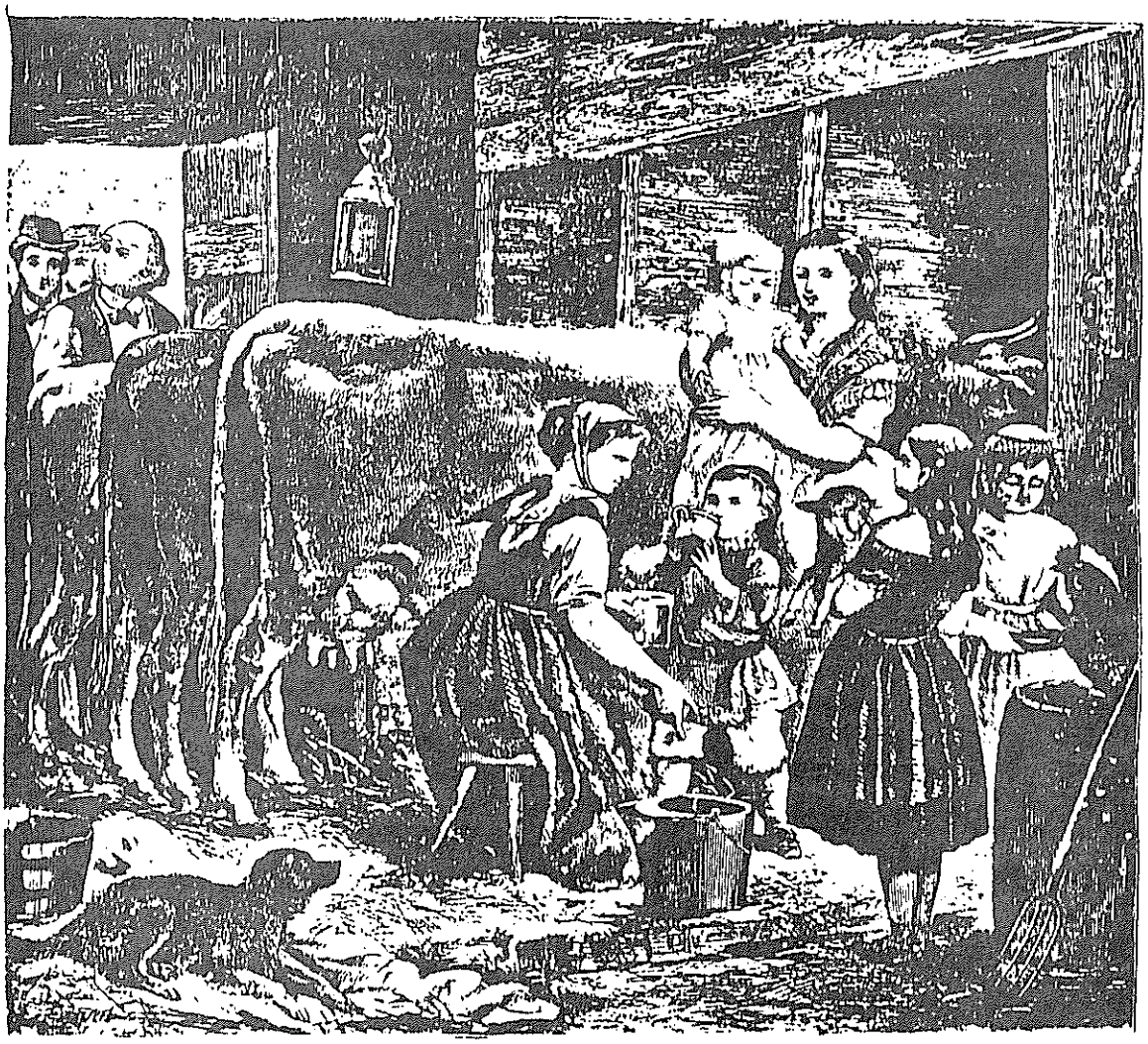
'All squiggling and squirming and thrashing about?'

'Of course.'

'No wonder it gives her a charge,' I said.

A. R. Woresley was not interested in that aspect. 'The point is this,' he said. 'A bull, for example, definitely does *not* need five thousand million spermatozoa in order to achieve fertilization with a cow. Ultimately, he needs only a single sperm. But in order to make sure of hitting the target, he has to use a few million at least. But how many million? That was my next question.'

1. In what year did the story begin?
2. What are the names of the two characters in the passage?
3. What was used to freeze the sperm initially? What happened to the sperm and why?
4. What final technique was used to store the sperm?
5. How much semen and sperm does a bull produce?



Comparison of costs- A.I. vs Traditional.

Cost comparison exercise for a 100 cow commercial herd.

Data: a) Bulls cost = $1000 -traditional: 3% of bulls (3 years service)
-A.I. 1% of bulls (4 years service)

b) 75 % of cows settle or conceive at 1st insemination.

c) Semen costs $5/straw

d) Technician charges $5/insemination.

e) Labour - 5hrs./day at $8/hr

f) The A.I. program runs for 6 weeks.

Artificial Insemination		Traditonal Mating	
Semen:	5x ... = $....	Bulls:	$\frac{3 \times 1000}{3}$ = $1000
Technician:	5x ... = $....		
Bull:	$\frac{1x \ldots}{4}$ = $....		
Labour:	..x6x7 = $....		
Total =	_____		_____

Variation:

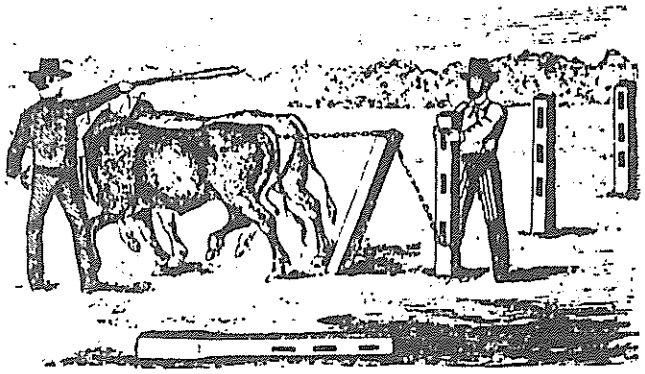
What is the cost if the farmer inseminates the cows?

New cost = $ .....

What is the cost if the bull costs $1500?

New cost = $.....

Which method would you advise the farmer to use? Back up your suggestion with 5 reasons.



Dirty Prac !



C'mon make my day! The following are a series of five (5) experiments designed to explore the different techniques used to analyse the structure, composition and nature of soil profiles.

EXPERIMENT 1:

Classification of Soil Constituents

Objectives: Identify course sand, fine sand, clay and organic matter in a soil sample.

What we need: 50g. of soil, measuring cylinder, water.

What do we do: 1/ Collect a sample of soil and weigh out 50g.
2/ Place the soil in the jar and 2/3 fill with water.
3/ Shake the mixture up well and allow to settle.
4/ Identify the parts of the soil in your sample.
5/ Label figure 2.

FIG. 1

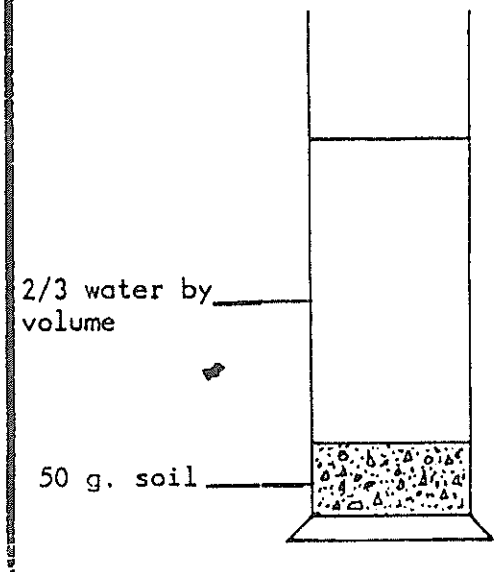
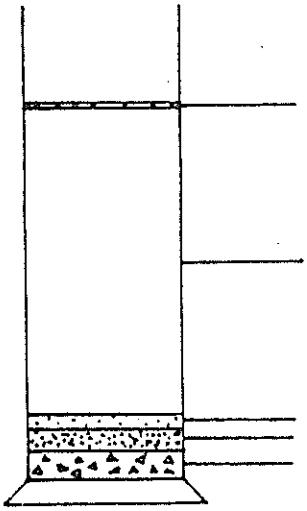


FIG. 2



EXPERIMENT 2:

Determining Soil Moisture Content

Objective: 1. Calculate the moisture content of the soil sample.
2. Use an electronic balance.

What we need: 50g. of soil, metal container, tongs, tripod, bunsen, gauze, electronic balance.

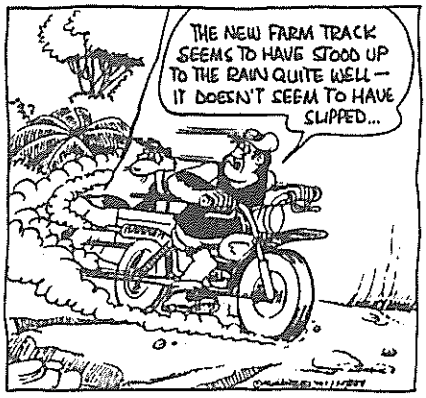
What do we do: 1. Weigh out 50g. of soil using the electronic balance.
2. Heat the soil until steam appears and you can smell wood burning.
3. Weigh soil after heating.
4. Complete the calculation.
5. (a) Weight of metal beaker = _____ g.
(b) Weight of beaker + 50g soil = _____ g.
(c) Weight of beaker + dry soil = _____ g.
(d) Weight of water = _____ g.
(e) % of water in the soil = _____ %

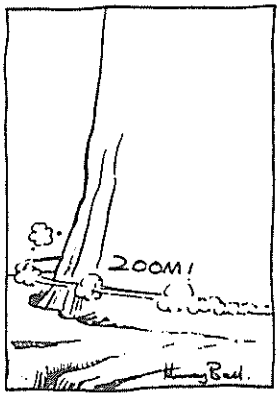
Results: _____

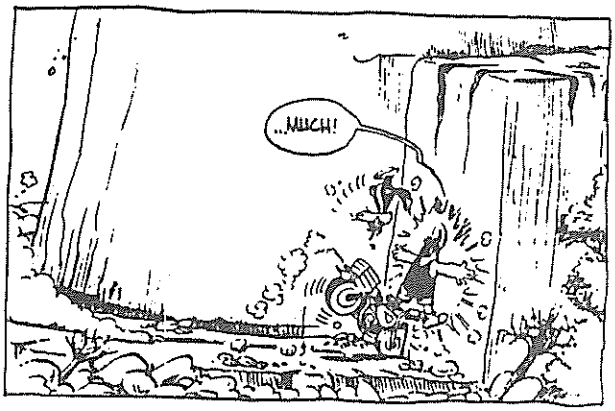
_____

Conclusion: _____

_____







EXPERIMENT 3:

Testing for Soil Nitrogen

Objective: To analyse the soil and determine if sufficient levels of nitrogen are present in the soil.

What we need: 2g of soil, 10ml of water, filter paper and equipment, white tile, 10 drops of N-phenyl-amine (aniline) indicator.

What do we do: 1. Place the 2g of soil in a test tube with the 10ml of water and shake.
2. Filter.
3. Place a few drops of filtered liquid onto the white tile.
4. Add 10 drops of indicator.
5. If the spot turns BLUE a compound of nitrogen is present.

Dark blue (adequate) -------> Light blue (trace)





Results:

_____

_____

_____

_____

Conclusion:

_____

_____

_____

_____





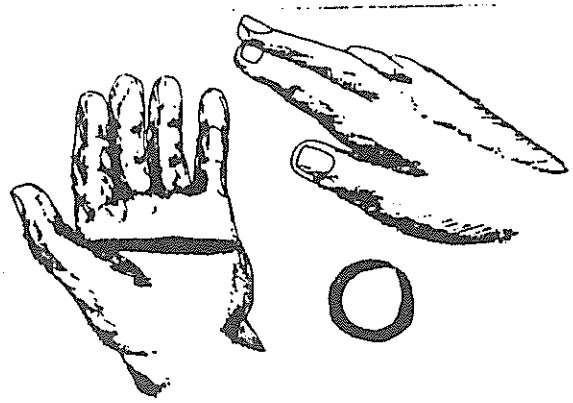
EXPERIMENT 4:

The Categorisation of Soil by Feel

Objective: To sort soil samples into different groups by feel.

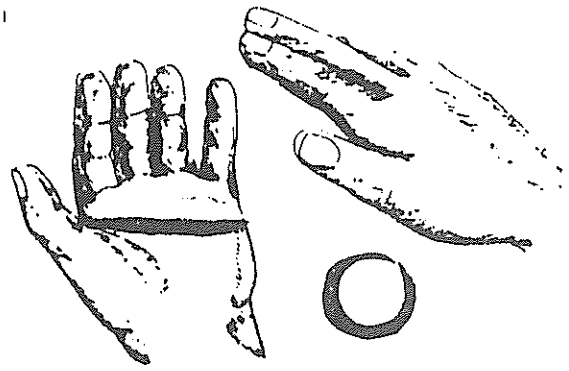
What we need: Soil samples, water.

What do we do:
1. Take a sample of soil (about a 2cm mound) and moisten it until it feels like putty.
2. Squeeze it between the thumb and forefinger.
3. Press your thumb forward and try to form the sample into a ribbon.
4. Refer to the diagrams below to categorise the sample.
5. Repeat the process for a number of samples.

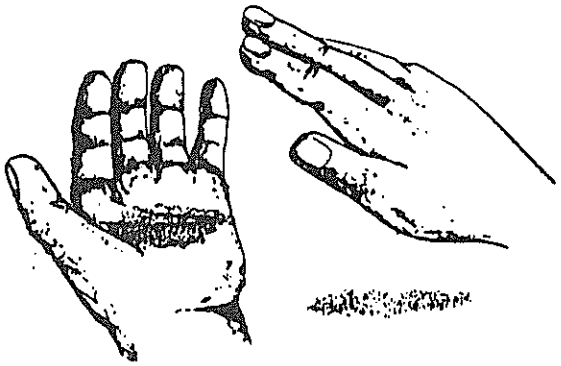


If the ribbon forms easily and can be bent without breaking - clay.



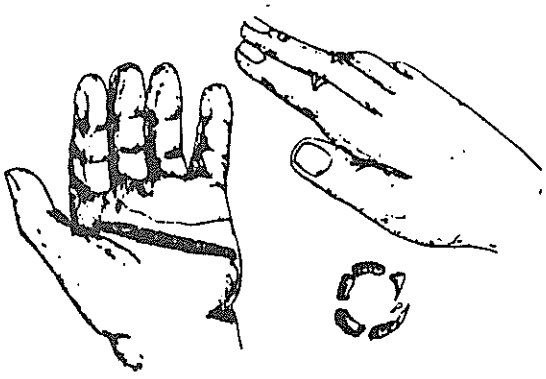


If ribbon forms but is easily broken - clay loam.

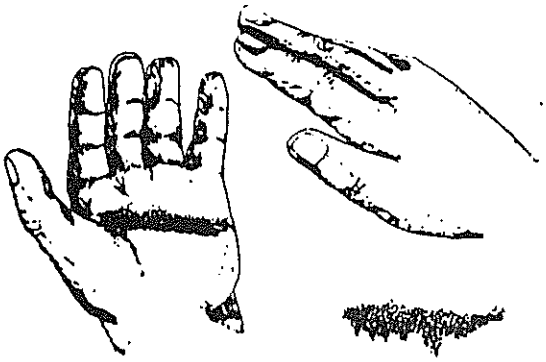


If there is a smooth feeling - silt loam





If there is a gritty feeling - sandy loam



If the ribbon will not form - loam or sand

SOIL A:

Texture type _____

SOIL B:

Texture type _____

Results:

_____

_____

Conclusion:

_____

_____

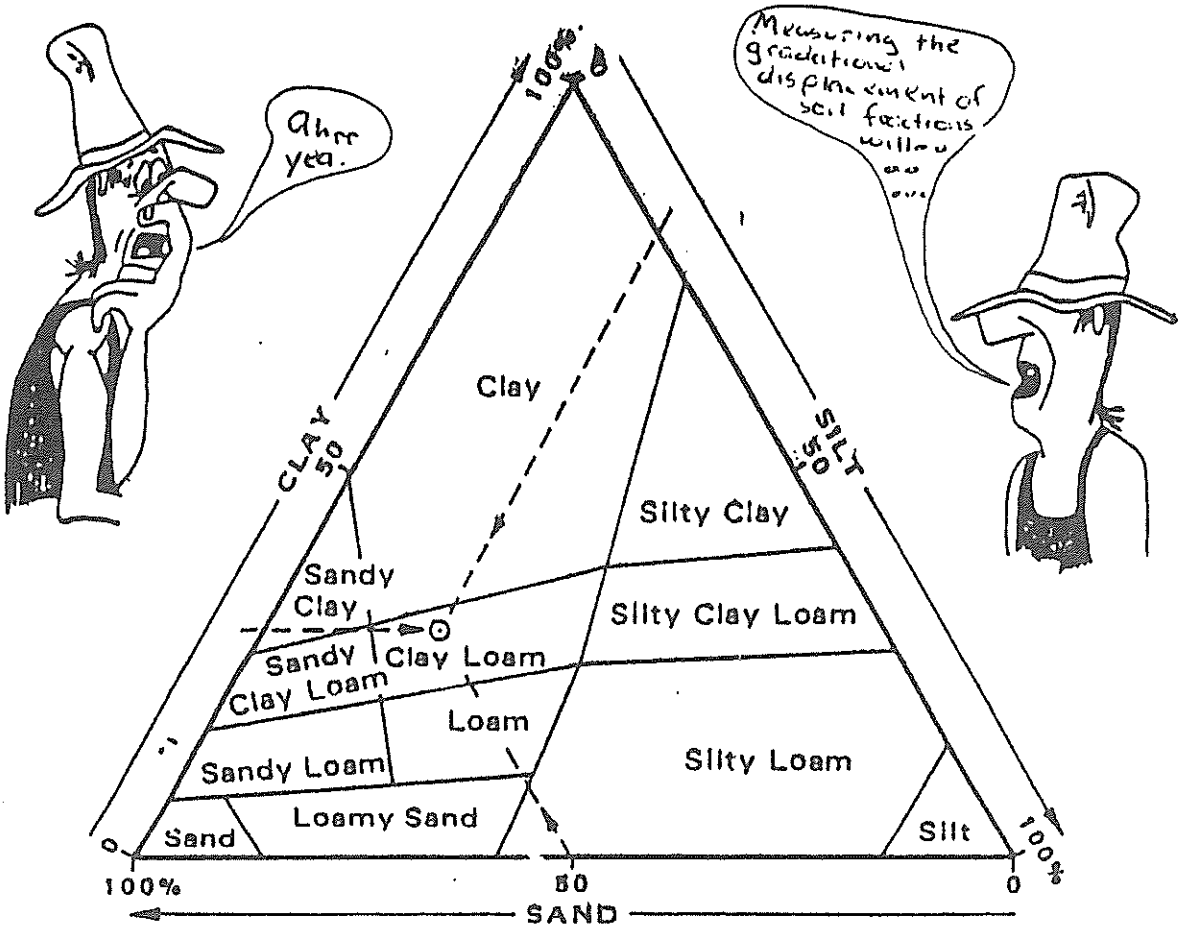
EXPERIMENT 5:

Categorisation of Soil Texture by Mechanical Analysis

Objective: To sort soil samples into groups by mechanical analysis. This involves passing the soil through smaller sized sieves and measuring the soil fractions.

What we need: Soil samples, sieves of varying size.

What do we do:
1. Weigh 100g of a soil sample.
2. Shake through the sieves provided.
3. Collect the separated soil fractions and weigh.
4. Determine the % of each of the soil fractions obtained. ie
   (a) >2mm = _____ g
   (b) 2mm -> 212um = _____ g
   (c) 212um -> 38um = _____ g
   (d) <38um = _____ g
5. Calculate the % of sand, silt and clay of the sample.
6. Determine the soil texture by reading off the "Texture triangle" listed below.



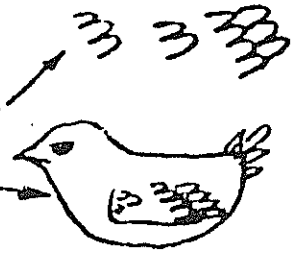
Checking Chickens

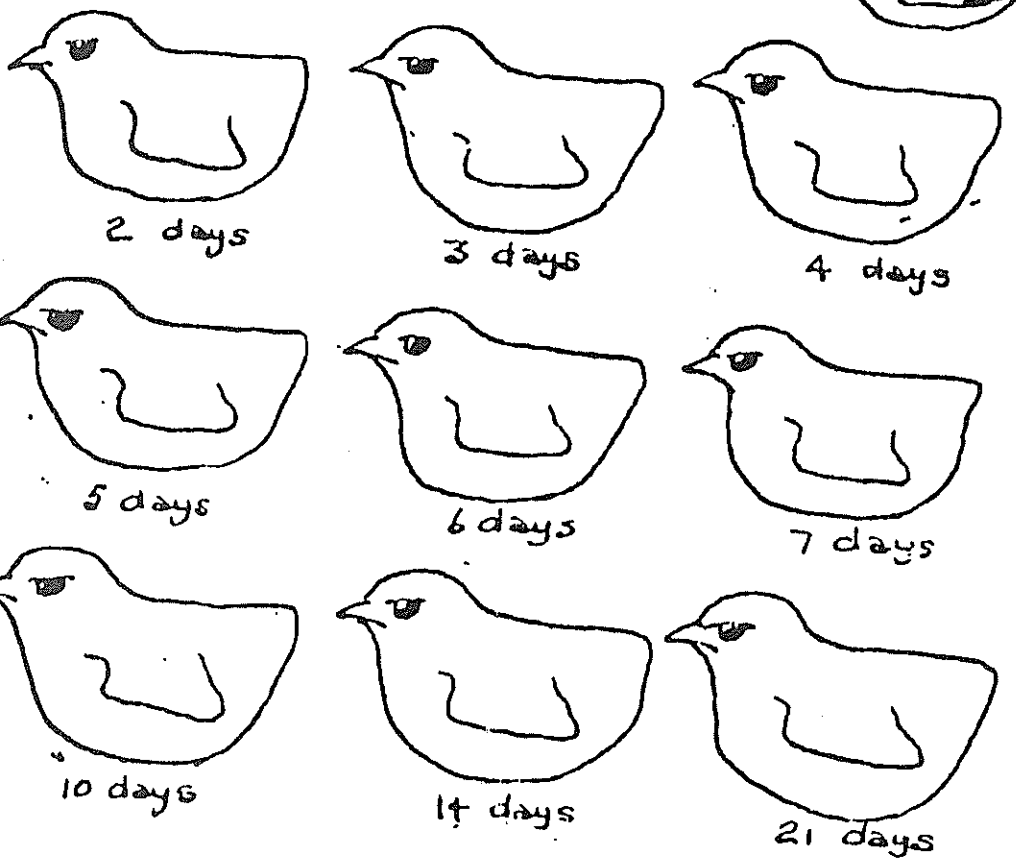


To pick up a chicken put your fingers under chicken and lift it up carefully.

FEATHER DEVELOPMENT

On these drawings you make marks like this to show the number and position of feathers:





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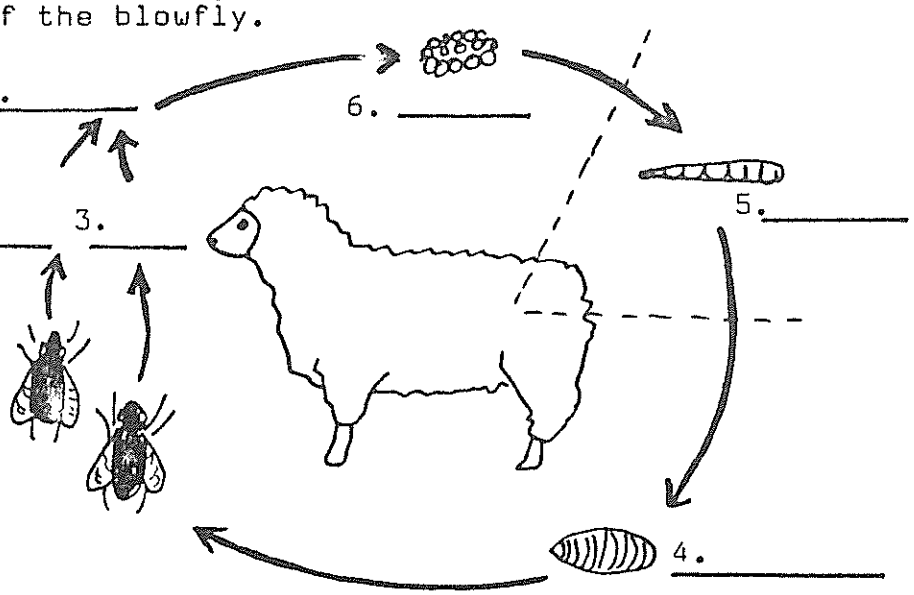
TEACHERS NOTES :

Name _____ Class ___ ___ .

THE SHEEP BLOWFLY

Part 1. Fill in the missing words on the drawing of the life cycle of the blowfly.

larva
eggs
pupa
sperm
zygote
ovum



Part 2. Fill in the missing words in the passage below.

After the mating of the adult blowflies and the formation of zygotes. _____ are laid on a moist patch of wool. A sheep is usually struck on the _____, the wool in this part often being dirtied with droppings and _____. The eggs hatch into larvae (called _____). which live on the flesh until fully grown. Then they fall on the ground and hide in cracks. Here they pupate, after which they emerge as _____.

Sheep become attractive to flies when 1. their wool is wet from rain urine, dung or sweat, 2. the weather is hot - above 20 C 3. they are wounded eg. dog bites.

Why do you think most occur in the crutch area ?

_____

_____

EGGS	MANURE	CRUTCH AREA	MAGGOTS	FLIES

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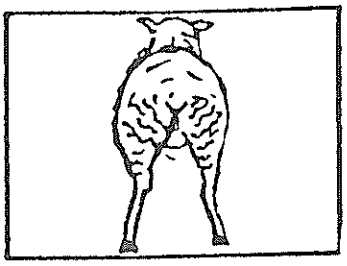
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TEACHERS NOTES:

Name _____ Class _____

BLOWFLY CONTROL

Complete the sentences below , then colour in the drawings.

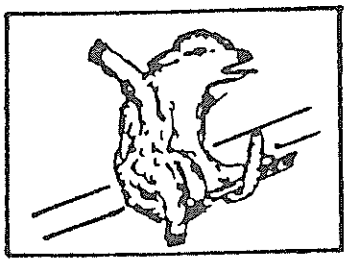


WRINKLES - breed out animals with deep breech wrinkles. This would reduce fly strike because _____

_____

_____

_____

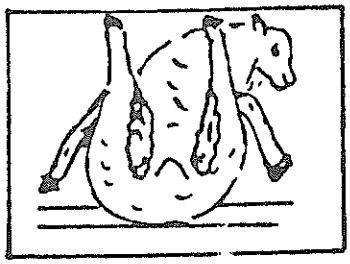


TAILING- This would reduce fly strike because _____

_____

_____

_____



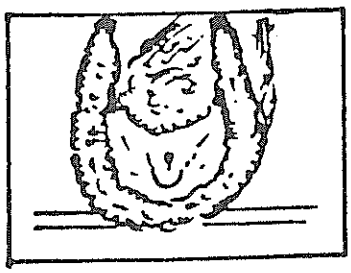
MULESING - This reduces fly strike because

_____

_____

_____

_____

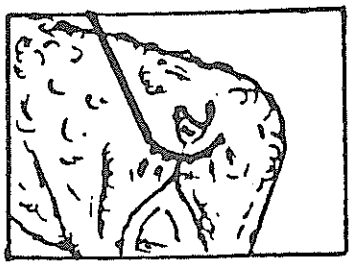


CRUTCHING - This reduced fly strike because _____

_____

_____

_____



JETTING- This reduces fly strike by

_____

_____

_____

_____

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TEACHERS NOTES:

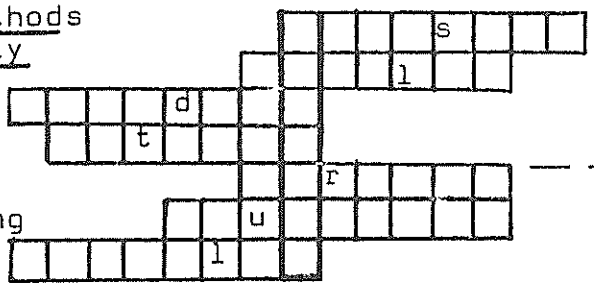
Name _____ Class _____

REDUCING BLOWFLY STRIKE

1. Place the words listed in the correct space then fill in the " hidden word " .

There are five methods of reducing blowfly strike in sheep. They are :-

(a) breeding out wrinkles
(b) correct tailing
(c) mulesing
(d) crutching
(e) jetting



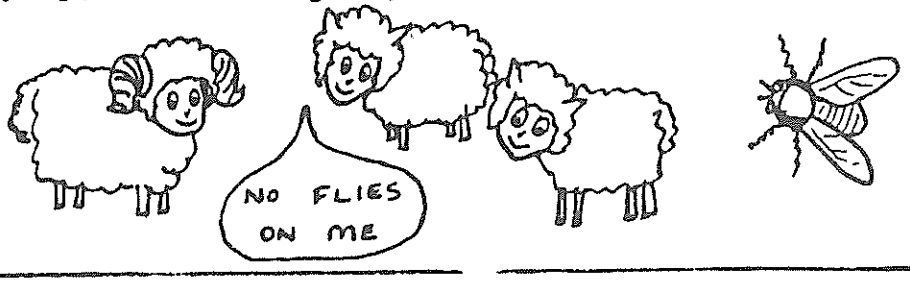
Hidden Word _ _ _ _ _ _ _ _

2. Using the words listed above fill in the spaces in the passage below.

Blowflies are the worst pest of sheep in Australia. Prevention is better than cure. Farmers can carry out three operations on sheep in order to reduce the chance of flystrike. Each operation helps to reduce the amount of dung and urine in the breech area.

_____ is necessary at least once a year to stop the wool around the tail and back legs getting soiled and becoming attractive to blowflies. _____ is the removal of pieces of skin from the breech area of the sheep. The chance of flystrike is reduced by this operation because it removes wrinkles in the crutch and over the tail. Correct _____ means cutting off the tail about 12 centimetres from the base. This is done when the sheep is a lamb, two to eight weeks old. This operation is part of what farmers call lamb marking. Tails are removed so that the crutch may be kept dry and is then less likely to be struck by flies.

Breeding sheep that don't have _____ around their breech is another method of reducing the risk of blowfly strike. _____ consists of forcing an insecticide under pressure into the wool. This repels or kills flies and destroys live maggots. It is an emergency measure giving short term protection.

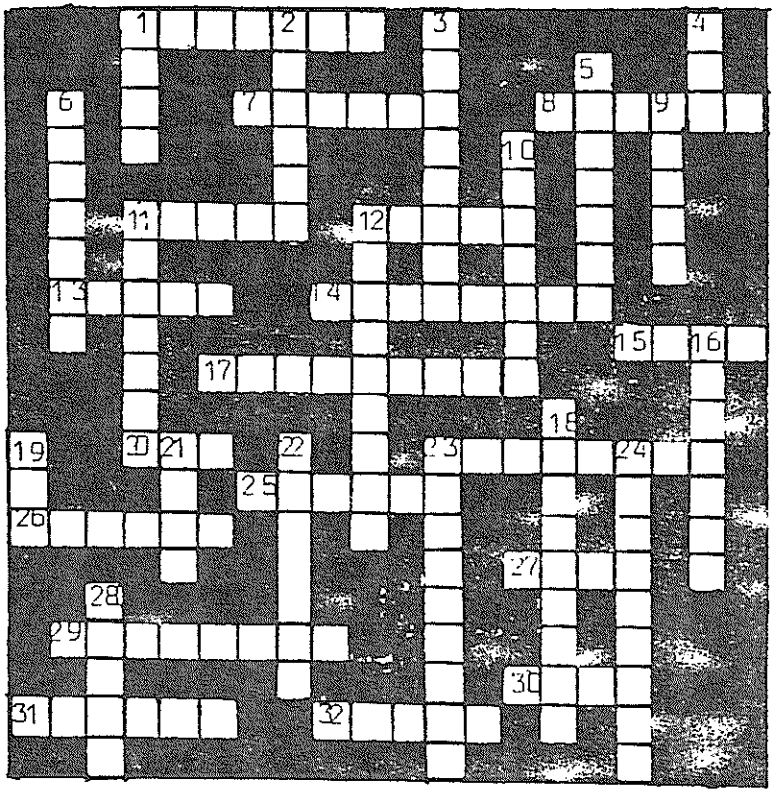


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TEACHERS NOTES:

SHEEP HUSBANDRY



CLUES.

ACROSS

1. A major parasite of sheep.
7. A male sheep that has been castrated as a lamb.
8. A young sheep of either sex from 9 - 10 months until it is a two tooth. It follows from the weaner stage.
11. Disease of the liver caused by flat worms.
12. A natural wave formation visible in wool, in general, the closer the waves the finer the wool.
13. A term applied to a sheep that has had its fleece removed.
14. Removal of a layer of skin from the breech area to prevent blowfly strike.
15. A young sheep still with its mother or up to 5 months of age .
17. Operation carried out to control internal parasites.
20. Age in years of a sheep with four adult teeth.
23. A type of sheep coming back to merino qualities
25. A lamb that has been weaned from its mother, or has stopped sucking its mother. (6-9 mths old)
26. Product of sheep.
27. Staples or locks of wool on the breech area heavily coated with dung.
29. An animal with four stomachs.
30. Number of upper teeth in the sheep.
31. A term applied to a sheep that does not possess horns.
32. Age in years of a sheep with six adult teeth.

Name _____ Class _____

AGRICULTURE WORKSHEET

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SHEEP HUSBANDRY CROSSWORD

CLUES

DOWN

1, A package of wool in a wool pack in good order for shipment.

2. The coat of the sheep.

3. Barber's pole, nodule worm, black scour worm, liverfluke, sheep ked and blowfly are examples of a _____.

4. A female sheep.

5. The placing of rams with ewes for mating.

6. Pregnancy toxaemia or twin lamb disease is due to low _____ in the blood of the ewe.

9. An aged sheep that has lost its incisor teeth.

10. Operation best carried out after shearing (after wounds have healed) to control external parasites.

11. Disease of the hooves caused by the bacteria fusiformis nodosus, the act of shearing wool from the bre

12. The act of shearing wool from the breech area and hind legs.

16. Operations such as vaccination, tail docking, castration etc. are carried out at this time.

18. Period of pregnancy, average in sheep is 150 days (5 months).

19. An entire male sheep.

21. The fibre from the fleece of the sheep.

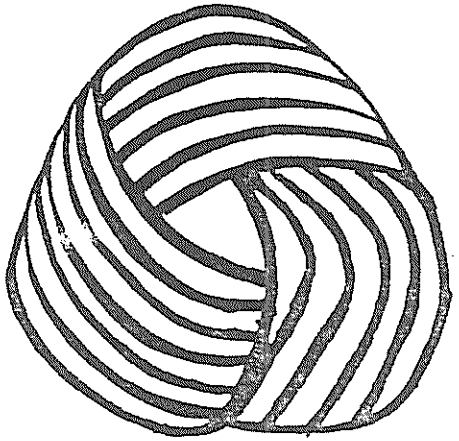
22. Emergency measure against blowfly insecticide is applied using a hand held spray.

23. An animal possessing the blood of two or more breeds.

24. The leasing of the grazing rights of a paddock.

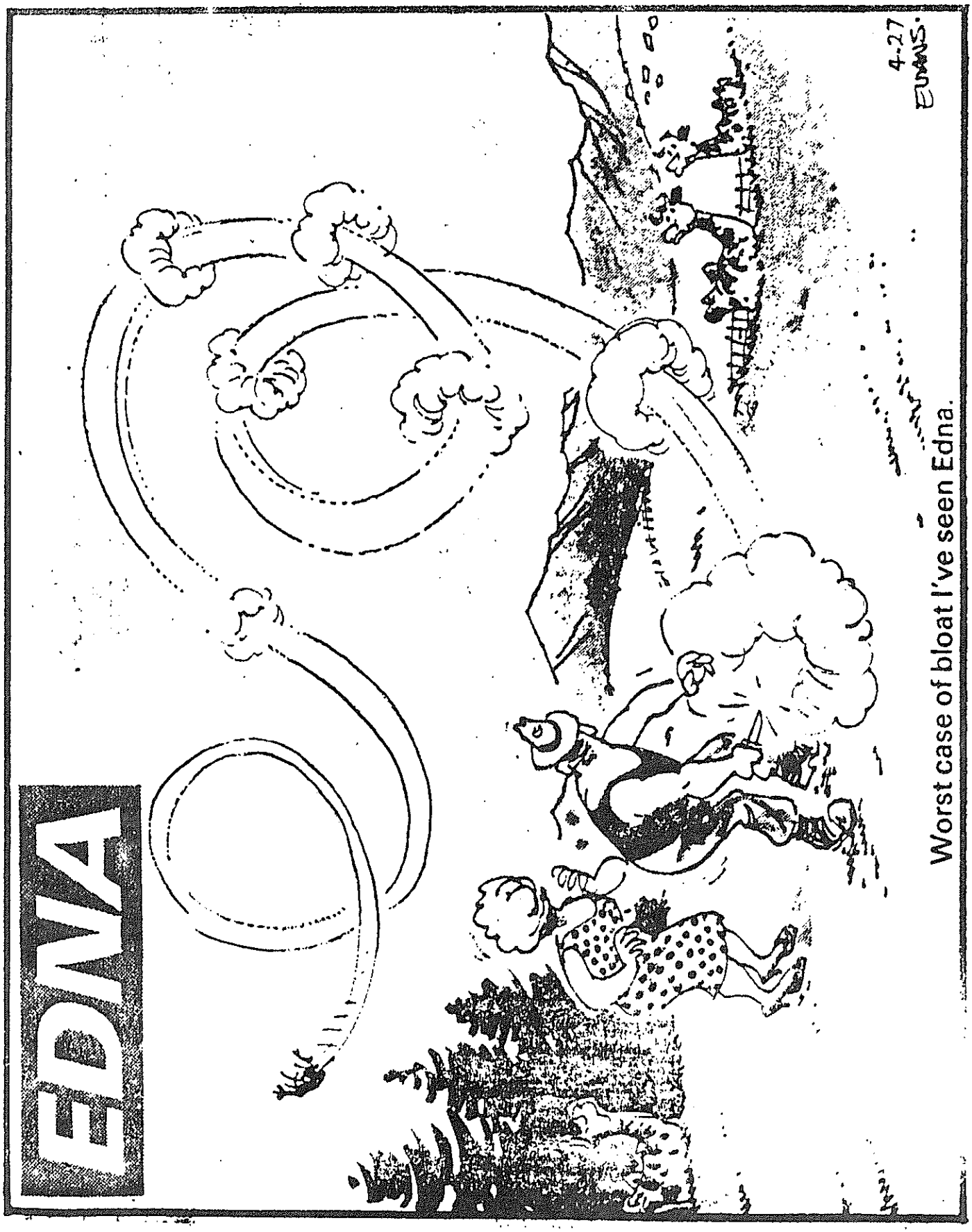
28. The rejected sheep from a flock.

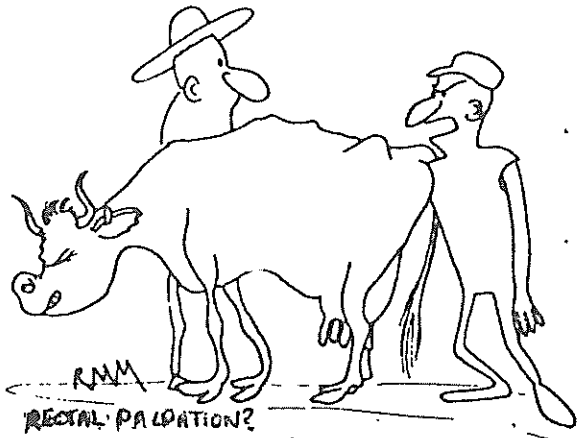
WOOLMARK



PURE NEW WOOL

BAAT
THE COMICS





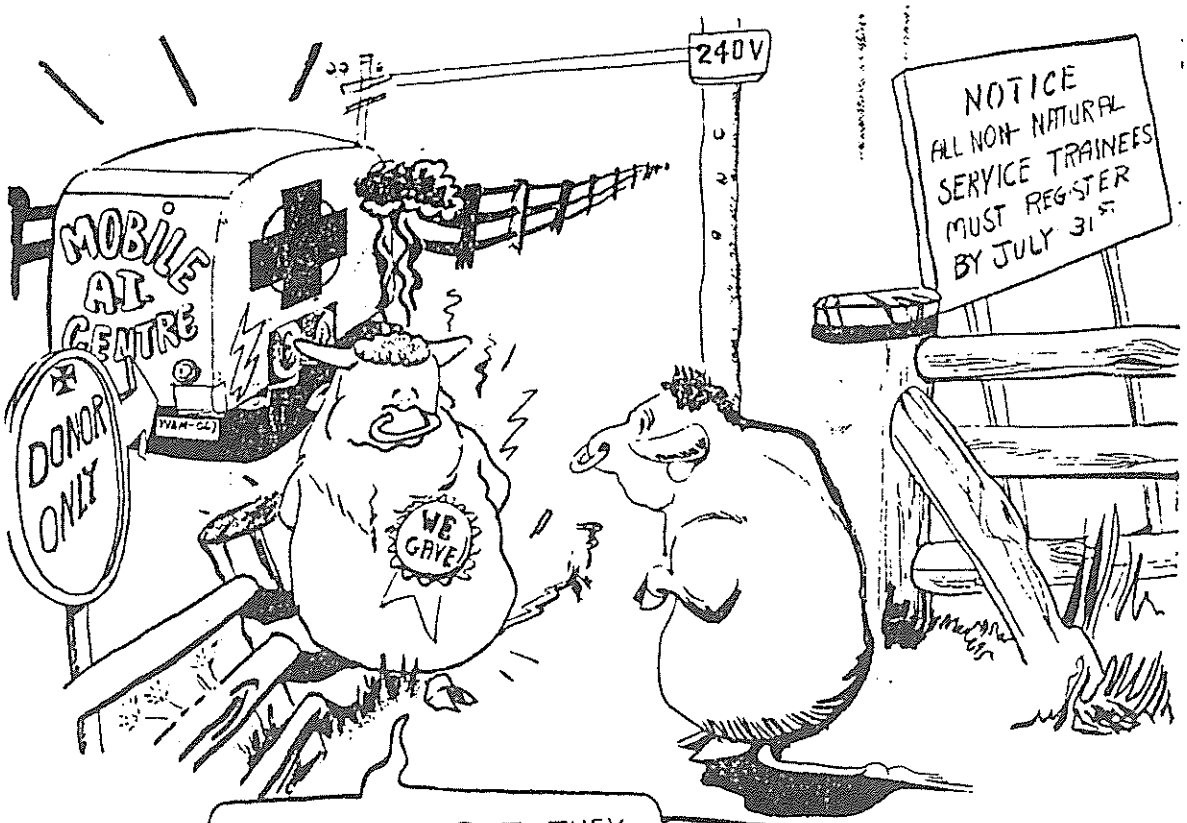
It may be hard to get heifers cycling after their first time



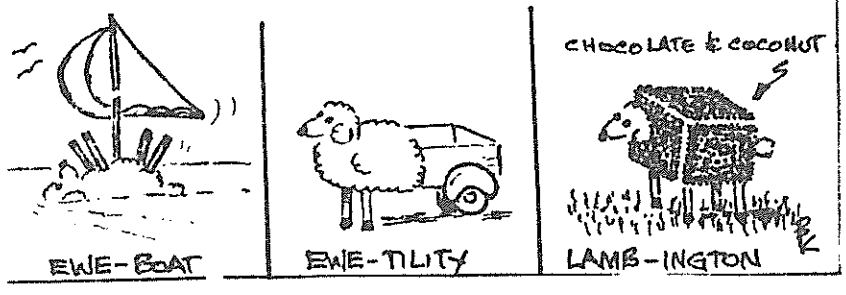
try removing their calves for 48hrs

Semen are placed in glass ampules. (horned sailor)





SOME USES FOR OUR SURPLUS SHEEP



Title	Initials	Surname Given	Address Line 1	Address Line 2	Post Code	Type of Member	Date Subs.Financial?
						M	31 DEC 90 YES
		###CASH SALES				M	31 DEC 90 YES
	C	ANDERSON	185 WAKADEN ST	GRIFFITH NSW	2660	M	31 DEC 90 YES
MR	A	ANNISON	ST IGNATIUS COLLEGE	TAMBOURINE BAY RD LANE COVE	2066	M	31 DEC 90 YES
MR	R	ANSON	WADE HIGH SCHOOL	POOLE ST GRIFFITH	2680	M	31 DEC 90 YES
	R	ARAYA	P.O.BOX 94	RICHMOND NSW	2753	M	31 DEC 90 YES
MR	I	BAIRD	PO BOX 27	HARDEN NSW	2587	M	31 DEC 90 YES
MRS	S	BANNERMAN	PENNANT HILLS HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
		BARKER COLLEGE	AG CO-ORDINATOR 91 PACIFIC HIGHWAY	HORNSBY NSW	2077	I	31 DEC 90 YES
MR	T	BARNETT	'URUKAWA ABERBALDIE ROAD	WALCHA NSW	2354	M	31 DEC 90 YES
		BASS HIGH SCHOOL	ATTN:J RICHARDSON	#### COURIER ####	8888	M	31 DEC 90 YES
	N	BASTOCK	C/- 3 DE MESTRE PLACE	NOWRA NSW	2541	M	31 DEC 90 YES
	S	BEHAN	PO BOX 671	LEETON NSW	2705	M	31 DEC 90 YES
	C	BOURNE	22 BENJAMIN CIRCUIT	SINGLETON HEIGHTS	2330	M	31 DEC 90 YES
	G	BRAY	ALBURY HIGH SCH KIEWA STREET	ALBURY NSW	2640	M	31 DEC 89 NO
MS	M J	BRAY	MACQUARIES BHS JAMES RUSE DRIVE	NORTH PARRAMATTA NSW	2151	M	31 DEC 90 YES
	R	BROADFOOT	41 BALMORAL ST	BALGOWNIE NSW	2519	M	31 DEC 89 NO
	L	BROWN	JAMES RUSE AGRICULTURAL HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
MS	F	BUCHAN	RIVERSTONE HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MR	D	BUCKLEY	ST PATRICKS	GOULBURN NSW	2580	M	31 DEC 89 NO
	M	BURGESS	GLEN INNES HIGH SCHOOL	GLEN INNES NSW	2370	M	31 DEC 89 NO
	D	BURNS	HENRY LAWSON HIGH SCHOOL SOUTH STRE	GRENFELL NSW	2810	M	31 DEC 90 YES
	A J	BUTLER	TUMUT HIGH SCHOOL	TUMUT NSW	2720	M	31 DEC 89 NO
MISS	L	BUTTSWORTH	JAMISON HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MR	M	CADDEY	69 WARRIGAL STREET	BLACKHEATH NSW	2785	M	31 DEC 89 NO
		CANBERRA GRAMMAR SCHOOL	R CLARK MONARO CRESCENT	RED HILL ACT	2603	I	31 DEC 90 YES
	J	CARLON	ARMIDALE HIGH SCHOOL BUTLER ST	ARMIDALE	2350	M	31 DEC 90 YES
MISS	S	CARRIER	BERKELEY VALE COMMUNITY HIGH	BERKELEY RD BERKELEY VALE	2259	M	31 DEC 90 YES
MR	L D	CARTWRIGHT	MORRISET HIGH BRIDGE STREET	MORRISET NSW	2264	M	31 DEC 90 YES
	C	CASSELS	176 FRANCIS STREET	RICHMOND NSW	2753	M	31 DEC 90 YES
	M	CAUSLEY	SINGLETON HIGH SCHOOL	YORK ST SINGLETON NSW	2330	M	31 DEC 90 YES
MR	R D	CHANDLER	'ROSEBUD'	URALLA NSW	2358	M	31 DEC 90 YES
MR	T	COLLINS	WERRINGTON TAFE	#### COURIER ####	8888	M	31 DEC 90 YES
MR	S J	CONGDON	SCONE HIGH SCHOOL GUNDY STREET	SCONE NSW	2337	M	31 DEC 90 YES
	A	COOKE	ULADULLAH HIGH 34 THE ENTRANCE RD	LAKE CONJOLA	2539	M	31 DEC 90 YES
		COURALLIE HIGH SCHOOL	AG TEACHER CAROL AVENUE	MOREE NSW	2400	M	31 DEC 90 YES
MISS	R	COWELL	FINLEY HIGH SCHOOL PO BOX 228	FINLEY NSW	2713	M	31 DEC 90 YES
MR	N A	COX	SINGLETON HIGH SCHOOL YORK ST	SINGLETON	2330	M	31 DEC 90 YES
	G	CRAIN	MOUNT AUSTIN HIGH SCH	LEAVENWORTH DRIVE WAGGA WAGGA NSW	2650	M	31 DEC 90 YES
		CRANEBROOK HIGH SCHOOL	ATTN:G THOMPSON HOSKING ST	MT PLEASANT	2750	C	31 DEC 90 YES
	G	CREEK	MURRUMBIDGEE COLLEGE OF AGRICULTURE	YANCO NSW	2703	M	31 DEC 90 YES
MR	P	CRICK	LISAROW HIGH SCHOOL	###COURIER###		M	31 DEC 90 YES
	D	CROFTS	THE SCOTS SCHOOL	BATHURST NSW	2795	M	31 DEC 90 YES
MRS	M L	CUMMINGS	RMB 6388 OLD WINTON ROAD	TAMWORTH NSW	2340	M	31 DEC 90 YES
	D	CUTTS	PENNANT HILLS HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
	M	DENHAM	JAMES RUSE AGRICULTURAL HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
MR	T	DICKESON	ELDERSLIE HIGH SCHOOL HILDER STREET	NARELLAN NSW	2563	M	31 DEC 90 YES
		DOONSIDE HIGH SCHOOL	AG TEACHER	#### COURIER ####	8888	M	31 DEC 90 YES
MS	H	DOUGLAS	29 RAYMOND STREET	WELLINGTON NSW	2820	M	31 DEC 90 YES

Title	Initials	Surname Given	Address Line 1	Address Line 2	Post Code	Type of Member	Date Subs.Financial?
	P	DUFFERIN	KANDOS HIGH SCHOOL	FLEMING ST KANDOS	2848	M	31 DEC 89 NO
	A	EDDY	JAMISON HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
		EDEN HIGH SCHOOL	R YEOMAN BARCLAY STREET	EDEN NSW	2551	C	31 DEC 89 NO
MS	J	ELDRIDGE	GREYSTANES HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MR	B	ELVERY	42 RIVER ST	MACLEAN NSW	2463	M	31 DEC 90 YES
		ERINA HIGH SCHOOL	G SPENCE THE ENTRANCE ROAD	ERINA NSW	2250	C	31 DEC 89 NO
MR	C	EVANS	EMERTON ED OFFICE HINDEMITH AVENUE	MT DRUITT NSW	2770	M	31 DEC 89 NO
MS	J	FINN	NORTHMEAD HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MS	B L	FISHER	ROBERT TOWNSON HIGH THUNDERBOLT DR	RABY	2570	M	31 DEC 90 YES
MR	J	FITZHENRY	GUANDIALLA CENTRAL SCHOOL	GUANDIALLA NSW	2721	M	31 DEC 89 NO
MRS	L	FLETCHER	BASS HILL HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
		FORBES HIGH SCHOOL	WYNDHAM AVENUE	FORBES NSW	2871	C	31 DEC 90 YES
MR	G	FULLJAMES	MOSS VALE HIGH SCHOOL	MOSS VALE NSW	2577	M	31 DEC 90 YES
	I	GANT	MERRIWA CENTRAL SCHOOL MCKENZIE STR	MERRIWA NSW	2329	M	31 DEC 89 NO
	P	GIBLIN	BYRON BAY HIGH PO BOX 360	BYRON BAY NSW	2481	M	31 DEC 90 YES
Mr	J	GIFFORD	TERRIGAL HIGH CHARLES KAY DFRIVE	TERRIGAL NSW	2260	M	31 DEC 90 YES
	D	GILLARD	FINLEY HIGH SCHOOL	TOCUMWAL STREET FINLEY	2713	M	31 DEC 90 YES
		GIRRAWEEN HIGH SCHOOL	AS TEACHER	#### COURIER ####	8888	I	31 DEC 90 YES
MR	V	GOBRAN	65A WOLLWICH ROAD	WOOLWICH NSW	2110	M	31 DEC 90 YES
		GOSFORD HIGH SCHOOL	AGRICULTURAL DEPT RACECOURSE ROAD	GOSFORD NSW	2250	I	31 DEC 90 YES
	M	GOWER	MACARTHUR ANGL COLLEGE RICHARDSON RD	NARALLEN NSW	2567	M	31 DEC 90 YES
MR	P	GRAHAM	IRRAWANG HIGH MOUNT HALL RD	RAYMOND TERRACE	2324	M	31 DEC 90 YES
	F	GREEN	JUNEE HIGH SCHOOL LORNE STREET	JUNEE NSW	2663	M	31 DEC 90 YES
	N	GRIFFITH	IRRAWANG HIGH MOUNT HALL ROAD	RAYMOND TERRACE NSW	2324	M	31 DEC 90 YES
	S	GRIMMETT	WOODENBONG CENTRAL UNUMGAR STREET	WOODENBONG NSW	2476	M	31 DEC 90 YES
MS	M J	HANLON	DUNEDOO CENTRAL SCH PO BOX 42	DUNEDOO NSW	2844	M	31 DEC 90 YES
MR	A	HARRISON	ST GREGORYS COLLEGE	CAMPBELLTOWN NSW	2560	M	31 DEC 90 YES
MR	W	HAZZARD	MT VIEW HIGH MT VIEW ROAD	CESSNOCK WEST NSW	2325	M	31 DEC 90 YES
	I	HEFFERNAN	DAPTO HIGH SCHOOL CLEVELAND RD	DAPTO NSW	2530	M	31 DEC 90 YES
		HEINEMANN EDUCATIONAL	COMMISSIONING EDITOR NSW	261 PACIFIC HIGHWA/ NORTH SYDNEY NSW	2060	M	31 DEC 89 NO
MS	K	HERTEL	HENRY KENDALL HIGH FRANCIS STREET	GOSFORD NSW	2250	M	31 DEC 90 YES
	D	HICKS	INSPECTOR BOX 280	COONABARABRAN NSW	2357	M	31 DEC 88 NO
MRS	J K	HOFFMAN	6 CAMELOT RD	GOONELLABAH	2480	M	31 DEC 90 YES
MR	G	HOLMKVIST	ST JOHNS COLLEGE WOODLAWN C	PO BOX 6 LISMORE	2480	M	31 DEC 90 YES
MS	P	HOOD	NARRABRI HIGH GIBBONS STREET	NARRABRI NSW	2390	M	31 DEC 90 YES
	J	HOPKINS	BROKEN HILL HIGH SCHOOL	GARNET ST BROKEN HILL	2880	I	31 DEC 90 YES
PPP	J	HUME	BINGARA CENTRAL SCHOOL	FINCH STREET BINGARA	2404	M	31 DEC 90 YES
MR	P	HUMPHRIES	DENILIQUIN HIGH SCHOOL HARFLEUR ST	DENILIQUIN NSW	2710	M	31 DEC 90 YES
	N	HUNTER	NORTHLAKES HIGH 15 CLIFF AVENUE	AVOCA BEACH NSW	2260	M	31 DEC 89 NO
MR	P	HURST	HAWKSBURY HIGH HIBBERTS LANE	FREEMANS REACH	2756	M	31 DEC 90 YES
	S	IRWIN	MACINTYRE HIGH SCHOOL	PO BOX 16 INVERELL	2360	M	31 DEC 89 NO
MR	N	IWANUSCHA	CASINO HIGH SCHOOL	CASINO NSW	2470	M	31 DEC 90 YES
MISS	J	JACKSON	HURLSTONE AGRICULTURAL HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
Mr	B	JELKS	7 QUEENSBURY RD	PADSTOW HEIGHTS NSW	2211	M	31 DEC 88 NO
MR	A	KELLY	CAMDEN HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
MR	R	KEMP	ST CLAIR HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
	C T	KENDALL	"KARINGAL"	MANGOPLAH NSW	2652	M	31 DEC 88 NO
		KENDALL CENTRAL SCHOOL	GRAHAM STREET	KENDALL NSW	2439	I	31 DEC 89 NO
MR	I	KERR	PORT MACQUARIE HIGH	OWEN STREET PORT MACQUARIE NSW	2444	M	31 DEC 90 YES
		KINGSCLIFF HIGH SCHOOL	OXFORD ST	KINGSCLIFF NSW	2487	M	31 DEC 89 NO

Title	Initials	Surname Given	Address Line 1	Address Line 2	Post Code	Type of Member	Date Subs.	Financial?
		KINGSWOOD HIGH SCHOOL	MR ROSS-NEW	#### COURIER ####	8888	M	31 DEC 90	YES
	T	KIRBY	AG TEACHER BEGA HIGH PO BOX 682	BEGA NSW	2550	M	31 DEC 90	YES
	H	KLEINBERGS	MOLONG CENTRAL SCHOOL	PHILLIP ST MOLONG NSW	2866	M	31 DEC 90	YES
		KNOX GRAMMAR SCHOOL	THE PRINCIPAL	PACIFIC HIGHWAY WAHROONGA NSW	2076	M	31 DEC 88	NO
MR	D	LANDON	GLOUCESTER HIGH SCHOOL	GLOUCESTER NSW	2422	M	31 DEC 89	NO
	P	LAWLER	3 HIGH STREET	ARMIDALE NSW	2350	M	31 DEC 89	NO
	J	LEE	GLEN INNES HIGH SCHOOL	EDWARDS ST GLEN INNES	2370	M	31 DEC 90	YES
	I	LEES	GALSTON HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90	YES
	G	LIDDELL	TWEED RIVER HIGH SCHOOL HEFFRON STR	TWEED HEADS SOUTH NSW	2413	M	31 DEC 90	YES
MR	D	LONDON	GLOUCESTER HIGH RAVENSHAW STREET	GLOUCESTER NSW	2422	M	31 DEC 90	YES
MS	E	LOUEY	BOSSLEY PARK HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90	YES
	P	LYNE	CONDOBOLIN HIGH SCH INNES STREET	CONDOBOLIN NSW	2877	M	31 DEC 90	YES
	B	MALLYON	BEGA HIGH SCHOOL	UPPER EDEN ST BEGA	2550	M	31 DEC 89	NO
	B	MANKTELOW	WARREN CENTRAL SCHOOL	WARREN NSW	2824	M	31 DEC 90	YES
MR	P J	MARJASON	BALMAIN HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90	YES
	I	MARRIOTT	CASINO HIGH SCHOOL PO BOX 583	CASINO NSW	2470	M	31 DEC 89	NO
MR	G	MARSHALL	GUNNEDAH HIGH	MARQUIS ST GUNNEDAH	2380	M	31 DEC 90	YES
MS	S	MARTIN	JP II SENIOR HIGH SCHOOL	MARAYONG ###COURIER###	8888	M	31 DEC 90	YES
	K	MARTYR	NORTH LAKES HIGH BRAVA AVENUE	SAN REMO NSW	2262	M	31 DEC 89	NO
	P	MATUS	DELROY HIGH SCHOOL	EAST ST DUBBO SOUTH	2830	M	31 DEC 89	NO
MR	R	MC GREGOR	JAMES RUSE AGRICULTURAL HIGH	#### COURIER ####	8888	M	31 DEC 90	YES
MR	C	MC QUEEN	PICTON HIGH SCHOOL HUME HIGHWAY	PICTON	2571	M	31 DEC 90	YES
MS	P	MCCANN	ST GREGORYS COLLEGE	CAMPBELLTOWN NSW	2560	M	31 DEC 89	NO
MR	L	MCCLYMONT	GRAFTON HIGH SCHOOL PO BOX 458	GRAFTON NSW	2460	M	31 DEC 90	YES
	R	MCFARLANE	### Mail returned ###	BOURKE HIGH SCHOOL P O BOX 564 BOURKE NSW	2840	M	31 DEC 88	NO
MR	C L	MCGILCHRIST	QUIRINDI HIGH SCH HILL STREET	QUIRINDI NSW	2343	M	31 DEC 90	YES
MR	I	MCLENNAN	GRAFTON HIGH SCHOOL MARY STREET	GRAFTON NSW	2460	M	31 DEC 89	NO
MS	A	MCMILLAN	WAGGA WAGGA HIGH COLEMAN STREET	WAGGA WAGGA NSW	2650	M	31 DEC 90	YES
	M	MELINO	HOLY SPIRIT COLL PO BOX 633	GRAFTON NSW	2460	M	31 DEC 89	NO
MR	J C	MIDDLETON	ST MARYS SENIOR HIGH	KALANG AVE ST MARYS	2760	M	31 DEC 90	YES
	B	MIKULSKI	MACKSVILLE HIGH SCHOOL	BOUNDARY ST MACKSVILLE	2447	M	31 DEC 90	YES
	P	MILLER	COOMEALLA HIGH SCHOOL SILVER CITY H	DARETON NSW	2717	M	31 DEC 89	NO
MS	A G	MITCHELL	"DANDALOO"	WARIALDA NSW	2402	M	31 DEC 90	YES
MRS	J	MOORE	THE KINGS SCHOOL PENNANT HILLS RD	PARRAMATTA	2150	M	31 DEC 90	YES
MS	P	MOORE	ST CLAIR HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90	YES
	C	MORRIS	ST IGNATIUS COLLEGE	RIVERVIEW NSW	2066	M	31 DEC 89	NO
	J M	MORSE	ASCHAM SCHOOL	NEW SOUTH HEAD RD EDGCLIFF NSW	2027	M	31 DEC 90	YES
MR	B D	MULCAHY	TENTERFIELD HIGH	1 HIGH ST TENTERFIELD	2372	M	31 DEC 90	YES
	P	MURDOCH	BRAIDWOOD CENTRAL SCHOOL	3/32 WILSON ST BRAIDWOOD NSW	2622	M	31 DEC 88	NO
		MURWILLUMBAH HIGH SCHOOL	AG ASSISTANT PO BOX 829	MURWILLUMBAH NSW	2484	I	31 DEC 90	YES
	P	NAPIER	16 WATSON ST	YOUNG NSW	2594	M	31 DEC 89	NO
		NARROMINE HIGH SCGHOOL	13 MERILBA STREET	NARROMINE NSW	2821	M	31 DEC 90	YES
MRS	K	NASH	"GUNTIABAH"	BUGALDIE NSW	2357	M	31 DEC 90	YES
	V	NORTHWOOD	WHITEBRIDGE HIGH LONUS AVE	WHITEBRIDGE	2290	M	31 DEC 90	YES
MRS	C	NYMAN	NORTHOLM GRAMMAR COBAH RD	ARCADIA	2159	M	31 DEC 90	YES

Title	Initials	Surname Given	Address Line 1	Address Line 2	Post Code	Type of Member	Date Subs. Financial?
	G	O'CONNOR	CHEVALIER COLLEGE MOSS VALE ROAD	BOWRAL NSW	2576	M	31 DEC 90 YES
MR	P N	OLIVER	BLUE MOUNTAINS GRAMMAR	PO BOX 110 WENTWORTH FALLS	2782	M	31 DEC 90 YES
MR	P	OSTERLOH	BOMADEERY HIGH CAMBERWARRA RD	BOMADERRY	2541	M	31 DEC 90 YES
	L J	OUWENDUK	COURALLIE HIGH SCHOOL	CAROL AVENUE MOREE NSW	2400	M	31 DEC 89 NO
MRS	J	PEARCE	COLO HIGH SCHOOL	#### COURIER ####	5888	M	31 DEC 90 YES
MR	R	PIPER	RICHMOND HIGH SCHOOL	#### COURIER ####	6688	M	31 DEC 90 YES
MR	T	PLOWMAN	ST COLUMBUS HIGH	SPRINGWOOD NSW	2777	M	31 DEC 89 NO
	S	POLOSAK	GOULBURN HIGH SCHOOL	GOLDSMITH ST GOULBURN	2580	M	31 DEC 90 YES
	W	PRYCE	NOWRA HIGH SCHOOL MOSS STREET	NOWRA NSW	2540	M	31 DEC 89 NO
	N	PUDDEY	WOOLGOOLGA HIGH SCHOOL	WOOLGOOLGA NSW	2456	M	31 DEC 90 YES
	C	PURSS (LIFE MEMBER)	37 WESTBOURNE ST	DRUMMOYNE NSW	2047	M	31 DEC 89 NO
	G	QUINTAL	MUDGEE HIGH SCHOOL	41 BOURD ST MUDGEE	2850	M	31 DEC 90 YES
MR	C	RALPH	ST CLAIR HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MR	B	RANSAY	ELIZABETH MACARTHUR WATERWORTH RD	NARELLAN NSW	2567	M	31 DEC 90 YES
MR	S	RAWLINSON	PITTWATER HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MRS	S	RIGG	"IANDRA" MS 769	THALLON QLD	4497	M	31 DEC 90 YES
	R	ROBERTS	DUVAL HIGH SCHOOL CREST ROAD	ARMIDALE NSW	2350	M	31 DEC 89 NO
	C J	ROBERTS	ST PAULS GRAMMAR SCHOOL	P O BOX 1118 PENRITH NSW	2750	M	31 DEC 90 YES
	H S	ROSSON	29 RAYMOND ST	WELLINGTON NSW	2820	M	31 DEC 89 NO
	J	RUSSELL	THE DON COLLEGE WATKINSON STREET	DEVONPORT TAS	7310	M	31 DEC 90 YES
MR	R	RUSSELL	HURLSTONE AGRICULTURAL HIGH	#### COURIER ####	8888	M	31 DEC 90 YES
	P	RUTHERFORD	PLC: AVON ROAD	PYMBLE NSW	2073	M	31 DEC 90 YES
MR	S	RYDER	ENVIRON ED PO BOX 135	CAMDEN NSW	2570	I	31 DEC 90 YES
MR	J A	SCOTT	DEP PRINCIPAL DORRIGO HIGH	FERNBROOK ST DORRIGO NSW	2453	M	31 DEC 90 YES
	G	SIMPSON	CANOBOLOS HIGH SCHOOL ICELY ROAD	ORANGE NSW	2800	M	31 DEC 90 YES
MRS	D A	SLINGER	93 WOMBAT STREET	YOUNG NSW	2594	M	31 DEC 89 NO
MR	P K	SMITH	COWRA HIGH SCHOOL DOWELL STREET	COWRA NSW	2794	M	31 DEC 90 YES
MS	L	SORRELL	7/50 GREAT NORTH RD	FIVE DOCK	2046	C	31 DEC 90 YES
		ST CATHERINE'S COLLEGE	ATTN E SMITH	ST CATHERINE'S SCHOOL SINGLETON NSW	2330	C	31 DEC 88 NO
MS	M L	STATHAM	NAROOMA HIGH PO BOX 332	NAROOMA NSW	2546	M	31 DEC 90 YES
MRS	K	STEVENSON-WORTHY	MENAI HIGH SCHOOL	#### COURIER ####	8886	M	31 DEC 90 YES
	K K	STEWART	ROYAL BOTANIC GARDENS	EDUCATION OFFICER MRS MACQUARIES ROAD SYDNEY NSW	2000	P	31 DEC 88 NO
	K	SWANN	TUMUT HIGH SCHOOL	PO BOX 70 TUMUT	2720	M	31 DEC 89 NO
MR	R	SWINDEN	HENRY KENDALL HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
MR	C	TAYLOR	KNOX GRAMMAR SCHOOL PACIFIC HIGHWAY	WAHROONGA NSW	2076	M	31 DEC 90 YES
MR	G D	TAYLOR	BOMADERRY HIGH SCH CAMBEWARRA RD	BOMADERRY	2541	M	31 DEC 90 YES
	A	THOMAS	"ALEENA" ROCKVALE RD	ARMIDALE	2350	M	31 DEC 90 YES
PPP	N	THOMAS (RETIRED)	'MINIBAH' ROCKVALE ROAD	ARMIDALE NSW	2350	M	31 DEC 89 NO
MS	N	TRUE	CRESTWOOD HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
MRS	S	TWEED	PRAIRIEWOOD HIGH SCHOOL	#### COURIER ####	6888	M	31 DEC 90 YES
MRS	E J	WAGNER	NEW ENGLAND GIRLS SCHOOL	BLAXLAND RD DUMARESQ	2350	M	31 DEC 90 YES
MS	J	WALKER	JAMES RUSE AG HIGH SCHOOL	#### COURIER ####	8888	M	31 DEC 90 YES
MR	N R	WATSON	LITHGOW HIGH SCHOOL PO BOX 296	LITHGOW	2790	M	31 DEC 90 YES
MR	G	WEBB	UMINA HIGH SCHOOL	###COURIER###	8888	M	31 DEC 90 YES
	G	WHAN	MACKSVILLE HIGH SCHOOL	BOUNDARY ST MACKSVILLE	2447	M	31 DEC 89 NO
MS	R A	WHEATON	OXLEY HIGH SCHOOL PIPER STREET	TAMWORTH NSW	2340	M	31 DEC 90 YES

Title	Initials	Surname Given	Address Line 1	Address Line 2	Post Code	Type of Member	Date Subs.Financial?
MR	R	WHITE	ST GREGORYS CAMPBELLTOWN	BADGALLY RD CAMPBELLTOWN	2560	M	31 DEC 90 YES
MS	J P	WILKINS	MURIFIELD HIGH SCHOOL	**** COURIER ****	8888	M	31 DEC 90 YES
MR	D G	WILLIAMS	TEMORA HIGH SCHOOL ANZAC ST	TEMORA	2666	M	31 DEC 90 YES
		WINDSOR HIGH SCHOOL	AS DEPT MULGRAVE ROAD	MCGRATHS HILL NSW	2756	C	31 DEC 89 NO
MR	M	WOODMAN	HAY MEMORIAL HIGH	HAY NSW	2711	M	31 DEC 89 NO
MRS	E.	WOODSIDE	WADE HIGH SCHOOL PO BOX 1095	GRIFFITH NSW	2680	M	31 DEC 90 YES
		YANCO AGRICULTURAL HIGH	MAIN AVENUE	YANCO NSW	2703	I	31 DEC 90 YES
		YOUNG HIGH SCHOOL	T MORGAN PO BOX 713	YOUNG NSW	2594	C	31 DEC 89 NO

NUMBER OF MEMBERS PRINTED: 198 for Agricultural Teachers Assoc'n as at 2 JUL 90
of which 148 are financial and 50 are unfinancial