RURAL INDUSTRIES RESEARCH
& DEVELOPMENT CORPORATION

Sustainable Land Use for Depastured Horses

Guidelines for small properties

A report for the Rural Industries Research and Development Corporation

by A K Stubbs

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Researcher Contact Details
Mr Arthur Stubbs
Primary Tasks Pty Ltd
Unit 58, Second Floor
Carlton Clocktower Complex
247 Drummond Street
CARLTON VIC 3053

Phone: 03 9844 1135
Fax: 03 9844 4554
Email: akstubbs@compuserve.com

RIRDC Contact Details
Rural Industries Research and Development Corporation
Level 1, AMA House
42 Macquarie Street
BARTON ACT 2600
PO Box 4776
KINGSTON ACT 2604

Phone: 02 6272 4539
Fax: 02 6272 5877
Email: rirdc@rirdc.gov.au.
Website: http://www.rirdc.gov.au

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Foreword

Particular difficulties exist with grazing horses on small and agistment properties around urban areas. In most of these situations, the land area available is insufficient to provide enough pasture feed, even under optimum management conditions, for the number of horses accommodated.

Land care issues, such as weeds, erosion and dust, often become major considerations on these properties due to lack of awareness of suitable pasture and grazing management practices.

This publication describes current land use and horse management practices on typical, small, peri-urban properties and identifies the problems and concerns of horseowners in these situations. It establishes guidelines for optimum, pasture based, land management strategies to ensure sustainable land use and more economical feeding.

The information contained in this report will be of value to those involved with a range of horse activities. A more widespread understanding and implementation of sustainable, pasture based, grazing regimes for horses will have long term benefits in more effective and sustainable land use, economy of horse management and improved appearance of horse properties.

The project, an addition to RIRDC's diverse range of over 600 research publications, is part of the Horses Sub-Program of the Corporation. It addresses a Program Strategy identified in the 1996-97 RIRDC Program Plans:

- develop improved pasture mixes and pasture and management regimes for horses on Australian farms and also to develop sustainable land use practices for horses depastured around urban areas.

This project was funded from industry revenue which is matched by funds provided by the Federal Government.

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- downloads at www.rirdc.gov.au/reports/Index.htm
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Peter Core
Managing Director
Rural Industries Research and Development Corporation

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Selection of survey respondents was greatly facilitated through the offices and staff of the New South Wales, South Australian and Victorian branches of the Equestrian Federation, the New South Wales and South Australian branches of the Pony Club Association, and the Barwon, Central, Northern Metropolitan and Southern Metropolitan Zones of the Pony Club Association of Victoria. Special thanks are due to these organisations.

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Author

Arthur Stubbs (B.Agr.Sc.) is currently Director of Primary Tasks Pty Ltd, Agricultural Consultants, and formerly held positions with the Victorian Department of Agriculture, ICI Australia, and the Herd Improvement Organisation. He has had many years experience with pasture establishment and management under a wide variety of grazing regimes with different classes of livestock.

Executive Summary

Introduction

Horse paddocks, particularly in and near urban areas, are often seen, conceptually and visually, as "exercise yards" with varying attempts made to use the designated land for feed production. The general lack of attention to pasture composition and vigour in these situations results in greater reliance on purchased feed (and cost). It is also reflected in haphazard grazing systems, overfeeding, or excessive grazing pressures due to underfeeding. These circumstances can lead to weeds (some noxious), soil erosion, horse health problems, and an unfavourable environmental impact from dust, flies, weed transfer and aesthetic effects.

The problems are particularly noticeable on agistment properties around urban areas. Many of these properties are leased, some have absentee land-owners and some agistment is unsupervised. Good pasture management on small properties presents a particular challenge but is quite feasible as is shown on many dairyfarms. Horse nutritional requirements are not dissimilar to those of other grazing animals on Australian farms whose feed needs are most economically met by improved and well managed pastures.

A more widespread understanding and implementation of sustainable, pasture based, grazing regimes for horses will have long term benefits in more effective and sustainable land use, economy of horse management and improved appearance of horse properties.

Objective

To establish guidelines for horse owners and agisters on optimum,pasture based grazing and nutritional strategies for horses on small and agistment properties around urban areas to ensure sustainability of land use and economy of feeding.

Methodology

The study was limited to the relatively uniform climatic zone of temperate, south- eastern Australia to avoid too many variable factors and have greater application with respect to improved pasture management. It was expected that this would reveal principles useful in other geographical situations.

A mail survey of a structured, random sample of horse owners,agisters and agistees associated with small properties was conducted. The sample was structured to include properties in New South Wales,South Australia and Victoria, properties adjacent to metropolitan and provincial urban areas and was anticipated to include a range of horse owners, agisters and agistees.

Information was collected on methods of pasture and grazing management, feeding practices, approach to land care, problems encountered, priorities needing attention and general level of knowledge on these matters (see Appendix).

The mail survey was supplemented by telephone contact with a selection of respondents to gain more qualitative information.

Visits were made to a selected sample of horse and agistment properties in the three States involved in the survey. The sample was selected to cover a representative range based on size of holding, number of horses and management practices to examine current horse keeping systems.

The opportunity was taken to examine particular features of management such as paddock size, grazing system, stocking rates, spelling of paddocks, manure disposal, treatment of rank feed and weeds, and feeding regimes.

Results

Of the 660 questionnaires despatched, 196 completed questionnaires were returned by early December,1996, and 5 "returned to sender", a response rate of *30%.*

Inspections of 21 horse properties, around Sydney in New South Wales, Adelaide in South Australia, and Melbourne in Victoria, were made to examine current practices and discuss particular issues. Most of these properties were selected from amongst survey respondents and were chosen to investigate different systems of land tenure, stocking rates, feeding strategies and land care problems. In addition, six properties in the South Australian Central Hills Soil Conservation Board area were inspected to view specific land management matters and approaches.

Respondents

The respondent profile indicates that the targeted range of horse owners, including land owners, agistees and agistors, mostly on small (less than 10 hectares) properties around urban areas, was achieved. The distribution was relatively even across States and approximately proportional to memberships of the Pony Club Association and the Equestrian Federation.

It is probable that there was a respondent bias towards those with a greater than average interest in land use issues and the potential of pasture feeding, however it is considered that this would be advantageous to the project rather than the opposite.

Land Use

Nearly all respondents were intent on using their available land for provision of pasture feed for their horses through grazing. Topography and nature of the land, fencing, and paddock accessibility for farm machinery (for fertilising and general pasture management activities) were usually conducive to this purpose.

The major obstacle to increasing pasture feeding was the prevalence of horse stocking rates in excess of those considered capable of providing horses with pasture feed all year round (eg., Avery,1996, suggests at least 1-1.5 hectares per horse on good pasture). This situation was exacerbated where horses in more than one ownership shared the grazing area, most commonly found under agistment. Poor quality and quantity of pastures in most cases, as discussed in the next section, were also an important inhibiting factor. Despite these limitations, nearly half the respondents thought that the land area available was "about right", perhaps due to reliance on hand feeding for the bulk of horse feed needs.

Pasture

Respondents' answers to this part of the survey and subsequent field investigations reveal the basis of the problem confronting sustainable land use and increased pasture feeding. In the majority of situations, pastures are mainly comprised of poorer grasses, a little clover, native plants and weeds, and plant nutrition is inadequate. Knowledge of management techniques for growing vigorous, dense pastures is fairly limited, not surprisingly because this is an area of horse husbandry and education that receives little attention. However, there was a general desire amongst respondents to provide more pasture feed for horses, particularly during the colder and drier months.

Although most land does contain a smattering of the better grasses and clovers, lack of optimum fertilising inhibits their profusion and growth such that less nutritious plants and weeds become prevalent. Where fertiliser or soil conditioner was used, and that was in less than half of cases, it was generally applied in insufficient quantities, too infrequently, and often appeared unsuitable in type with regard to supply of required plant nutrients. This state of affairs was underlined by the lack of soil or pasture sampling undertaken.

The main pasture management activity was cited as manure removal, however the worm control aspect of this practice appears to be perceived at least equally as important to respondents. Regular harrowing

of paddocks, which is a significant but not standard practice, is probably a more beneficial manure treatment, less arduous, and can have a positive effect on pasture management through spread of nutrients. Slashing was the next most common pasture management activity, to control rank pasture growth on manure and urine patches, and weeds in most cases.

Weed species were well recognised by most respondents, and are a fairly constant norm in horse paddocks although, surprisingly, a slight majority did not consider them a specific problem for horse health or pasture management. Nevertheless, weeds were rated as the main land care matter needing attention and one of the most important general problems and a priority for research. Spraying and hand hoeing are widely practised to control weeds, but these are short term (usually annual) measures and do not provide a permanent solution.

Grazing

The high level of satisfaction with the grazing system practised, which in most cases was rotational, was usually justified for reasons of resting paddocks for worm control and pasture regeneration. Whilst these reasons are by themselves logical, the usual range of paddock sizes and numbers, despite fairly common use of electric fencing, make systematic, even rotations very difficult to achieve.

It is suspected that most rotational grazing is not that rigorously controlled and probably achieves more from the point of view of worm control than increasing pasture supply. Reliance on hand feeding also obviates the need for stricter grazing control. Strip and block grazing are the more effective forms of rotation for pasture rationing but are rarely practised.

Land Care

The major land care issues reported were connected with weeds, pasture quantity and quality, which are themselves interrelated. Pasture cover, quality and damage, overgrazing, drainage, erosion and dust, in most cases are all symptoms of inadequate or unhealthy pastures which, in turn, allow weeds to intrude and flourish. Fencing was a relatively significant issue and is perhaps related to grazing control and pasture supply, as well as being important for horse security and safety.

Feeding

The prevalence of supplementary feeding amongst respondents was to be expected, however the range of feeds provided in many cases, which included hay, chaff, grains, minerals and mixes, was surprising. Such combinations of feeds raises the question of whether convention or fashion takes the place of necessity. Many respondents sought advice on feeds and feeding requirements from a range of sources. Feeding requirements of most horses, particularly ponies, can be adequately catered for with pasture, hay and some grain according to researchers (Bryden, McMeniman and Trevor-Jones,1997).

The predominance of frequent (usually daily) hand feeding of horses may also be partly due to reasons other than nutritional needs, eg., catching horses, “reward”. Perhaps hand feeding is the easiest approach, albeit costly (on average $880 per year), and is certainly justified in some situations according to work and pasture supply, however the potential of pastures to provide a greater proportion of the dietary needs, even on these smaller properties, is considerable.

Agistment

Agistment services, where provided, appear to be primarily involved just with frequent supervision and feeding of horses, and to a lesser extent, rugging and stabling, however a significant proportion of agistees attend to these tasks themselves. Written agistment agreements are the exception rather than the rule and, in view of the demand for agistment, are probably not often requested.

Horse Health

Attention to horse health is obviously a high priority with respondents with good vaccination and parasite control programs, and paddock treatments for worm control, widely practised. In agistment situations however, where health standards should be a major concern, there appears to be some laxity.

Health and disease problems and incidence, as reported, do not appear abnormal. Most common problems were physical injuries and the usual feed related problems of colic and founder. Attention to horse health, apart from dental treatment, costs $259 per year on average.

Costs

Costs of keeping a horse varied a little between States but the separate cost categories were reasonably consistent in proportion to the total. In the survey sample, the annual average cost was $1,875 per horse, of which 47% was feed ($880), 20% saddlery ($384), and 17% farriery ($316). Any measures that can be taken to reduce the amount and cost of supplementary feeding will be of significant economic benefit to horse owners.

Problems and Research Priorities

The main emphasis given by respondents in all States concerned growing better pastures and reducing weeds. Lack of pasture quantity and quality, pasture improvement and management methods, and weed control were the major issues raised. These are all closely inter-related although respondents may not have been fully aware of the degree of the connection. Drainage and erosion, also cited as prominent problems, in turn are often a side effect of poor pastures and weed infestations. This reflected answers to questions on pastures, weeds and land care issues and indicates the major thrust of future work to assist small property owners.

Fences were rated as an important issue, mainly for security and safety. This was contrary to the general survey response that indicated a very high level of satisfaction with fencing, except where barbed wire was used. Worm control, despite the apparent careful and effective attention to this aspect of horse husbandry, was also listed as a significant problem. This may be a reflection of the ongoing vigilance needed for this practice. Other matters of understandable concern were the decreasing availability of land for horse keeping around urban areas, and aspects of horse and rider safety, particularly on roads and in public areas.

Guidelines

The major emphasis of the project is on *sustainable land use*, which is to be achieved under pasture based, horse grazing regimes, with economy of feeding and improved appearance of horse properties as important objectives.

It is apparent from the study that prime attention is needed to promotion of vigorous pastures, composed of the better pasture species, to provide ground cover. The aim at all times is to provide even ground cover with good, healthy pasture ranging in height from about 5-15 cm. This is the first line of defence against weeds, surface moisture and erosion, and in turn will provide increased pasture supply and quality.

This primary aim necessitates strict control of horse access to pasture areas on the typical smaller property to avoid uneven and over grazing. On some small properties, where grazing pressures are relatively high, this may involve yarding of horses and exclusion from pasture for considerable periods of time.

1. Fertilisers/Plant Nutrition

The first essential is to ensure that pasture growth is not limited by lack of plant nutrients, which can be readily supplied by commonly available fertilisers. Soil samples should be taken to determine nutrients, fertilisers and soil conditioners required.

The main limitation in Australian soils, and in most respondents' situations, is phosphorus, which is supplied in a readily accessible form by superphosphate fertiliser. Annual rates of application on most small horse properties in South Eastern Australia should be up to 200 kilograms per hectare. Such rates have been shown to produce very productive pastures in other grazing enterprises.

The next possible requirement will be potassium, although the need for this more expensive fertiliser should always be determined by soil sampling. Lime may be needed to correct excessive soil acidity, which affects availability of plant nutrients, and in some situations, nitrogen fertiliser can be used to assist winter pasture production.

The main priority is to grow a dense, vigorous "pasture crop" on the grazing area, allowing grazing when ground conditions are suitable and sufficient feed is available.

2. Pasture Species

Much of the land used for grazing horses already contains some quantity of the better pasture species (ryegrass, phalaris, fescue, kikuyu, white and sub clover). These are nutritious, productive and resilient plants that respond quickly to liberal fertilising in a year or so. The perennial grasses are also better suited for sustainability.

It is often not necessary to sodseed or sow pasture seed but, if in doubt, the simplest method of introducing new plants should be chosen. Ploughing and resowing can be resorted to if required, subject to expert advice.

3. Rationed Grazing

Grazing opportunities should be "rationed" to ensure that even grazing occurs and pasture height is maintained above the desirable minimum level (about 5 cm). This strategy will usually require feeding yards, and necessitate the use of electric fencing as an economical means of dividing the available paddock area(s) into uniform "grazing blocks" commensurate with grazing pressures. Shifts of grazing blocks weekly or fortnightly would be a desirable aim, however this will be dependent on paddock area available, number of horses and season. Such an approach can overcome selective grazing ("lawns and roughs") by minimising pasture availability at any one time.

The objective at all times is to sustain maximum ground cover with the "pasture crop", but increasing the consumption of pasture feed by horses as far as possible. Calculation of feed requirement for horses and balancing this with pasture feed available and amount of hand feeding needed is the recommended goal to assist with economy of feeding. On some highly stocked properties this may result in horses spending much of their time in yards or stables, however this may be necessary to sustain pasture cover. In more lightly stocked situations, control of pasture growth, particularly in spring, may require some slashing on occasions to avoid excessive pasture height (above about 15 cm).

4. Yards

Feeding yards, in association with stables or by themselves, are invaluable for small property management. They enable the confinement of horses from the grazing area, as required, and are beneficial in concentrating hand feeding, with any introduced weed seeds, and manuring, in a small area.

Yards should be about 100 square metres in area and have a well drained, non-erodable surface, composed of fine rubble and sand, similar to the material used for menages.

5. Manure Management

If manure removal is impractical or infrequent, spreading manure by harrowing should be practised where possible to distribute plant nutrients and organic matter, and to avoid "clumpiness" in pasture growth. Rotational grazing around the grazing blocks greatly assists the application and effectiveness of this practice by resting areas for a period after harrowing. This allows pasture to freshen and aids in worm control.

"Harrowing" can be achieved with a piece of weldmesh or logs tied together, dragged by a vehicle or

by hand.

6. Drainage

Surface drainage with shallow spoon drains, dug by implement or by hand, is a simple and effective means of reducing excess water on paddocks, Drains can be placed along permanent fencelines, at appropriate locations, to prevent in-flow of water from neighbouring areas, or across contours within a paddock. Care needs to be taken to avoid any risk of causing erosion and consideration should be given to harmless disposal of surplus water.

Drainage is also improved by maintenance of a dense, vigorous pasture, and by planting tree belts in suitable situations, which also contribute to provision of shelter and shade.

7. Advice

Advice on the application of guidelines in specific situations should be sought from local, professional sources to provide up to date, relevant knowledge. State Departments of Agriculture or Natural Resources, Private Agricultural Consultants, and Fertiliser Companies will assist determination of requirements for optimum plant nutrition, suitable pasture species and methods of introduction, stock carrying capacity of various types of land, and general pasture management strategies.

Recommendations

- The findings of this study should be disseminated to Pony Club Associations, Equestrian Federation Branches, and similar Horse Organisations associated with small property owners, for their members' information and implementation. In addition, and where possible, Agistment Centres should be circularised and the guidelines recommenede for application. The availability of the manual, "Pastures for Horses", should be publicised at the same time.

- Demonstration paddocks should be established at strategic locations by these Horse Organisations, with assistance from the relevant State Agricultural and Natural Resources Departments or Soil Conservation Boards, to illustrate what can be achieved by application of the recommended guidelines.

- Education programs for young horse enthusiasts, eg., in Pony Clubs, should include specific attention to pasture and grazing management practices aimed at achieving sustainable land use as outlined in this project.

- The approach taken in South Australia by the Mt Lofty Ranges Soil Conservation Boards to provision of land management advice by short courses, field days and information leaflets specifically for horse owners on small holdings be used as a model and publicised in other States as an example worth following.

- State Departments of Local Government should be advised of the project results and requested to inform their constituent municipalities regarding the availability of guidelines for land management practices for small horse properties around urban areas.

Introduction

Horse paddocks, particularly in and near urban areas, are often seen, conceptually and visually, as "exercise yards" with varying attempts made to use the designated land for feed production. The general lack of attention to pasture composition and vigour in these situations results in greater reliance on purchased feed (and cost). It is also reflected in haphazard grazing systems, overfeeding, or excessive grazing pressures due to underfeeding. These circumstances can lead to weeds (some noxious), soil erosion, horse health problems, and an unfavourable environmental impact from dust, flies, weed transfer and aesthetic effects.

The problems are particularly noticeable on agistment properties around urban areas. Many of these properties are leased, some have absentee land-owners and some agistment is unsupervised. Good pasture management on small properties presents a particular challenge but is quite feasible as is shown on many dairyfarms. Horse nutritional requirements are not dissimilar to those of other grazing animals on Australian farms whose feed needs are most economically met by improved and well managed pastures.

Some horse property owners have applied knowledge of good grazing management, appropriate stocking rates, fertiliser use, species selection and weed control. There is little general application of these practices but great potential as evidenced by the interest in this project.

Findings from the project will have relevance to other sections of the horse industry where the particular problems associated with horse feeding and management on small properties apply.

A more widespread understanding and implementation of sustainable, pasture based, grazing regimes for horses will have long term benefits in more effective and sustainable land use, economy of horse management and improved appearance of horse properties.

Objective

To establish guidelines for horse owners and agisters on optimum,pasture based grazing and nutritional strategies for horses on small and agistment properties around urban areas to ensure sustainability of land use and economy of feeding.

Methodology

The study was limited to the relatively uniform climatic zone of temperate, south- eastern Australia to avoid too many variable factors and have greater application with respect to improved pasture management. It was expected that this would reveal principles useful in other geographical situations.

The project was designed to draw together current knowledge and experience in the grazing management and nutrition of horses and point to optimum practices by:

1. Mail and Telephone Survey

A mail survey of a structured, random sample of horse owners,agisters and agistees associated with small properties was conducted. The sample was structured to include properties in New South Wales,South Australia and Victoria, properties adjacent to metropolitan and provincial urban areas and was anticipated to include a range of horse owners, agisters and agistees.

The mail survey questionnaire was drawn up in consultation with fellow researchers, a small number of Victorian Pony Club and Equestrian Federation members and other persons with experience in this area. It

was also tested with a sample of Pony Club and Equestrian Federation members.

Information was collected on methods of pasture and grazing management, feeding practices, approach to land care, problems encountered, priorities needing attention and general level of knowledge on these matters (see Appendix).

660 questionnaires were despatched in late September and early October,1996, to Pony Club and Equestrian Federation members in New South Wales, Victoria and South Australia. The distribution was based on total membership numbers between the States and associations, as follows:

	NSW	Vic	SA Total
Pony Club	200	160	60 420
Equestrian Federation	100	100	40 240

Respondents were randomly selected in postcode areas adjacent to major urban areas in the three States.

The mail survey was supplemented by telephone contact with a selection of respondents to gain more qualitative information.

2. Field Visits

Visits were made to a selected sample of horse and agistment properties in the three States involved in the survey. The sample was selected to cover a representative range based on size of holding, number of horses and management practices to examine current horse keeping systems.

The opportunity was taken to examine particular features of management such as paddock size, grazing system, stocking rates, spelling of paddocks, manure disposal, treatment of rank feed and weeds, and feeding regimes.

Several group discussions were also held and gave the chance to interview a cross-section of horse and property owners on aspects of small property management.

Results

1. Survey

Respondent Identification (Questions 1 - 6 & 8)

Of the 660 questionnaires despatched, 196 completed questionnaires were returned by early December,1996, and 5 "returned to sender", a response rate of *30%*. Returns were distributed as follows:

	NSW	**VIC**	**SA**	**Total**
PCA Member	38	36	10	84
EFA Member	22	27	8	57
Members of PCA & EFA	17	24	9	50
Membership not given	1	2	2	5
Totals	78	89	29	196
Response Rate	*26%*	*34%*	*29%*	*30%*

The general standard of the completed questionnaires was high with most questions being answered fully. Names and addresses of respondents (optional) were supplied by 171 or *87%*.
91% of identified respondents were female, *8%* male, and the balance families.

Nature of land tenure was described as in the following table, with no apparent difference between PCA and EFA members:

	NSW	VIC	SA	Total	
Owner	28	45	23	96	*49%*
Lessee	13	11	2	26	13%
Agistee	31	29	2	62	32%
Combination	6	4	2	12	6%

Responses to Question 6, "Please give details (breed and age) of your horse(s) to indicate size and number", are summarised as follows:

	Horse Numbers (ave.)		
	NSW	**VIC**	**SA**
PCA Member	1.8	2.6	2.8
EFA Member	4.4	3.2	6.0
Members of PCA & EFA	4.1	4.4	5.1

Average number of horses for all respondents was 3.3, and for agistees 1.7.

Average age of horses was 11.5 years with a range from less than 1 to 34 years.

There was a great range of breeds listed as given in the next table, and also crossbreds, however Thoroughbreds accounted for *36%* of all horses and the various Pony breeds *20%*.

Andalusian	Clydesdale	New Forest Pony	Saddle Pony
Anglo-Arab	Connemara	Palomino	Shetland
Appaloosa	Fell	Palouse	Standardbred
Arab	Galloway	Percheron	Stockhorse
Australian Pony	Grey	Pinto	Thoroughbred
Buckskin	Holsteiner	Quarterhorse	Warmblood
Cleveland Bay	Irish Sport	Riding Pony	Welsh Cob
			Welsh Mountain

Land Use (Questions 7 - 20)

81% of respondents reported that the land area available was mainly used for Grazing, *4%* said mainly Exercise, and *15%* said both. (Question 9)

Stocking Rate was calculated from answers to Questions 6 (number of horses) and 7 (land area used for grazing). Although there was considerable variation in horse breed, age and land area, relatively high stocking rates (in excess of a horse per hectare) were:

	Stocking Rates above 1 horse/hectare		
	NSW	**VIC**	**SA**
PCA Member	*45%*	*36%*	*20%*
EFA Member	*41%*	*44%*	*50%*
Members of PCA & EFA	*88%*	*38%*	*50%*
Total	*53%*	*39%*	*41%*

Topography and land type (Question 10) was described as follows:

Topography/Land Type	NSW	VIC	SA
Flat to Undulating	*96%*	*89%*	*83%*
Steep	*4%*	*11%*	*17%*
Rocky	*6%*	*8%*	*3%*
Open	*60%*	*67%*	*69%*
Treed	*40%*	*33%*	*31%*

The majority of respondents reported having a number of paddocks in the total area (Question 11) with only *17%* in NSW, *3%* in VIC, and *10%* in SA having just one paddock. There was a considerable variation in range of paddock sizes (Question 12).

Farm machinery can be operated in *89%* of all paddocks (Question 13).

Fence type (Question 14) ranged from timber post and rail to timber or steel post and wire with "sighter" wires quite common. Electric wire or tape was used in *45%* of cases. *98%* of respondents considered the fences were secure and *93%* reported them safe for horses, except where barbed wire was used.

Number of horses usually kept in each paddock (Question 15) was 1 in *34%* of cases, 1-2 or 2 in *31%* of cases, and ranged up to 20. Horses were stabled at night and grazed on pasture during the day (Question 16) by *45%* of respondents in NSW, *27%* in VIC, and *59%* in SA. Stabling at night was more common amongst EFA members.

Sheep or cattle in varying numbers, and in isolated cases goats and kangaroos, were grazed with horses (Question 17) in *9%* of situations in NSW, *21%* in VIC, and *38%* in SA.

Shared grazing in the same paddock(s), with horses owned by others (Question 18) occurred in *33%* of situations in NSW, *29%* in VIC, and *24%* in SA. Stocking rate was more than 1 horse per hectare in *78%* of these situations.

Land area available for horses (Question 19) was considered to be:

Too Small	Too Big	About Right	Varies with Season	Combinations
19%	*3%*	*48%*	*21%*	*9%*

27% of respondents reported that Local Government Regulations applied to horse grazing in their district (Question 20), *51%* reported no regulations, and *22%* did not know.

Pasture (Questions 21-32)

Description and quantification of the main grasses and clovers in the area grazed by horses (Question 21) was provided by just *52%* of respondents. *50%* of respondents in NSW, *52%* in VIC, and *34%* in SA did not know. Agistees were generally unaware of pasture species.
Main grasses reported were Kikuyu in NSW and Ryegrass and Phalaris in VIC and SA. Most reported clovers were white and sub. Some of these answers may have been influenced by the wording of the question.

57% of respondents, *60%* in NSW, *55%* in VIC, and *55%* in SA, reported that no fertiliser or soil conditioner was applied to the grazing area (Question 22). *5%* did not know.
32% of respondents described the type of fertiliser/soil conditioner used. Superphosphate was the most common type in each State, followed by Lime. Other frequently mentioned types included Poultry Manure

in NSW, Fish Emulsion, Gypsum, Dolomite, Super-Potash and Compost.
Only *12%* of respondents gave the amount of fertiliser used and *33%* reported on frequency of use. Amounts varied greatly and frequency was usually yearly, however a significant proportion reported applications every second or third year.

77% of respondents reported that soil or pasture samples were not taken to determine fertiliser needs (Question 23). *10%* did not know.

Irrigation of the grazing area (Question 24) was reported in just *15%* of situations in NSW, *2%* in VIC, and *3%* in SA.

Pasture management activities reported practised (Question 25) were:

	NSW	**VIC**	**SA**
Harrowing	*17%*	*47%*	*38%*
Slashing	*51%*	*49%*	*62%*
Sodseeding	*4%*	*6%*	*14%*
Manure Removal	*74%*	*65%*	*62%*
Pasture Renovation	*12%*	*21%*	*24%*
Cross Grazing (sheep/cattle)	*12%*	*22%*	*38%*
None	*8%*	*4%*	*3%*

Use of dung beetles was reported on two occasions.

Manure removal frequency (Question 26), where reported, was:

	NSW	**VIC**	**SA**
Daily	*28%*	*19%*	*39%*
Few days to Weekly	*43%*	*33%*	*11%*
Other Frequency	*29%*	*48%*	*50%*

The usual methods of manure disposal reported were for gardens, compost or wormgrowers. Some respondents spread manure over the paddocks.

Very uneven pasture (Question 27) was reported by *31%* of respondents, similar in each State.

Weeds in the pasture (Question 28) were reported by *91%* of respondents, also similar in each State. Weed species were described by nearly all of these respondents and covered a wide range. The most common species listed were Fireweed in NSW; Docks, Thistles and Capeweed in VIC; and Salvation Jane(Paterson's Curse) in SA.

Proportion of the grazing area weed infested (Question 29) varied greatly. Change in proportion over the last five years was reported as:

	NSW	**VIC**	**SA**
Increased	*17%*	*18%*	*22%*
Decreased	*28%*	*47%*	*52%*
Not Changed	*30%*	*20%*	*15%*
Don't Know	*25%*	*15%*	*11%*

Rating of weeds as a problem for horse health or pasture management (Question 30) was answered:

	NSW	VIC	SA
Problem	*35%*	*46%*	*48%*
Not a Problem	*59%*	*53%*	*48%*
Don't Know	*6%*	*1%*	*4%*

Methods of weed control practised by respondents (Question 31) were reported as:

	NSW	VIC	SA
Spraying	*22%*	*59%*	*81%*
Hand Hoeing	*65%*	*52%*	*33%*
Slashing	*54%*	*46%*	*56%*

Ploughing, burning, cross grazing and the use of goats were other methods mentioned.

Preference for pasture to provide more feed for horses (Question 32) was answered:

	NSW	VIC	SA
Yes	*51%*	*49%*	*55%*
Sometimes	*41%*	*31%*	*17%*
No	*8%*	*17%*	*28%*
Don't Know	-	*3%*	-

Winter was the main time of the year in all States when more pasture feed is required although some respondents said "all year". Summer and Autumn were also preferred times in VIC and SA.

Grazing (Questions 33-37)

Grazing systems used for horses (Question 33) were reported as:

	NSW	VIC	SA
Set Stocked	*28%*	*13%*	*45%*
Rotational Grazing	*50%*	*69%*	*48%*
Strip Grazing	*9%*	*16%*	*3%*
Other/Don't Know	*13%*	*2%*	*3%*

84% of respondents thought their grazing system was satisfactory, usually giving reasons associated with resting paddocks or grazing areas for pasture regeneration and worm control. Some said that they were not overstocked or the system "suited the horses".
Those who were not satisfied, generally with set stocking, cited lack of rest of paddocks for pasture supply and worm control, or overgrazing.

Resting of paddocks (Question 34) for varying periods was reported by the majority of respondents in each State, ranging from *60%* in NSW, to *89%* in VIC, and *83%* in SA. Some set stocked paddocks are rested for short periods while horses are stabled or away.

61% of respondents had access to a feeding yard (Question 35), *73%* had access to a stable and *68%* access to a horse shelter (Question 36), and *93%* reported the presence of natural shelter or shade (Question 37), with responses similar between States.

Land Care (Question 38)

Land care matters needing attention where respondents' horses are grazed were considered to be:

	NSW	VIC	SA
Weeds	*60%*	*61%*	*69%*
Erosion	*14%*	*18%*	*28%*
Drainage	*26%*	*46%*	*28%*
Dust	*17%*	*10%*	*28%*
Fencing	*17%*	*20%*	*24%*
Pasture Cover	*28%*	*27%*	*52%*
Tree Damage	*8%*	*9%*	*7%*
Overgrazing	*33%*	*25%*	*24%*
Undergrazing	*1%*	*8%*	-
Pasture Damage	*24%*	*52%*	*31%*
Salinity	*1%*	-	*3%*
Acid Soils	*5%*	*4%*	*3%*
Pasture Quality	*37%*	*33%*	*45%*
Manure Collection	*31%*	*22%*	*10%*
Horse-sick Pasture	-	*2%*	*7%*

Other matters mentioned included rabbits, sullage and worm infestation.

Feeding (Questions 39-43)

Supplementary feeds were given to horses by all respondents (Question 39), most of whom gave several different types, and included:

	NSW	VIC	SA
Lucerne Hay	*88%*	*58%*	*86%*
Grass Hay	*13%*	*84%*	*59%*
Lucerne Chaff	*86%*	*82%*	*55%*
Oaten Chaff	*54%*	*83%*	*72%*
Bran	*51%*	*46%*	*52%*
Grain	*55%*	*66%*	*59%*
Mineral Supplements	*64%*	*66%*	*62%*
Vitamins	*31%*	*46%*	*41%*
Other (pellets, mixes)	*71%*	*75%*	*76%*

Most common feeds given in the "Other" category included Pellets, Coprice, Pollard, Sunflower Seeds, Molasses, Wheaten Chaff, and a great range of proprietary mixes and meals.

Usual frequency of feeding (Question 40) was reported as:

	NSW	VIC	SA
Twice Daily	*33%*	*8%*	*24%*
Daily	*59%*	*56%*	*45%*
As Required	*8%*	*36%*	*31%*

Frequency of feeding was not altered during the year by *73%* of Respondents in NSW, *30%* in VIC, and

45% in SA.

Amount and frequency of feeding was determined (Question 41) by *87%* of the respondents in NSW, *96%* in VIC, and *97%* in SA. Others influencing this practice included Owners and Agistors.

Most common reasons given for determination of the amount and frequency of feeding (Question 42) were: Work *32%*; Condition *25%*; Pasture Supply *17%*; Season *11%*; and Weight 9%.

Sources of advice on feeds and feeding requirements (Question 43) were reported as:

	NSW	**VIC**	**SA**
Stock Feed Company	*22%*	*19%*	*28%*
Local Produce Merchant	*35%*	*44%*	*38%*
Books	*54%*	*58%*	*52%*
Veterinarian	*44%*	*47%*	*31%*
Self	*10%*	*15%*	*17%*
Others	*37%*	*40%*	*31%*

Others, where defined, mainly included Pony Club, Friends, Instructor, Agistor, Course, and Other Riders.

Agistment (Questions 44-47)

A total of 99 respondents reported that they were involved in agistment, including 62 agistees and 37 agistors. Distribution between States was similar to the sample.

Services provided by the agistor (Question 45) were reported as:

	NSW	**VIC**	**SA**
Supervision	*52%*	*70%*	*75%*
Feeding	*64%*	*51%*	*58%*
Stabling	*32%*	*28%*	*67%*
Rugging	*52%*	*35%*	*42%*
Groomimg	*9%*	*7%*	*17%*
Exercise	*11%*	*9%*	*17%*
Training	*9%*	*14%*	*8%*
Manure Removal	*32%*	*19%*	*33%*
Other	*9%*	*14%*	-
None	*32%*	*23%*	*17%*

Other services included Veterinary attention, Foaling and Farrier.

90% of these respondents reported that frequency of attention to horses (Question 46) was daily.

Only *30%* , similar between States, reported the existence of a written agistment agreement (Question 47).

Horse Health (Questions 48-54)

62% of respondents reported health or disease problems with their horses in the past year (Question 48), *55%* in NSW, *73%* in VIC, and *48%* in SA.

The most frequent problems in order, and reported on more than one occasion in each State, were:

NSW	VIC	SA
Colic	Cuts	Foot Abscess
Cuts	Mud Fever	Cuts
Colds	Colic	Colic
Founder	Foot Abscess	Bruised Hoof
Foot Abscess	Founder	Back Problems
Injury	Colds	Sour Sob Poisoning
Lameness	Muscle Strains	
Fly Bites	Seedy Toe	
Back Problems	Rain Scald	
Strangles	Skin Infections	

Vaccination programs for horses (Question 49) were reported by most respondents with some variation in the type of vaccination:

	NSW	VIC	SA
Tetanus & Strangles	*34%*	*64%*	*63%*
Tetanus only	*40%*	*14%*	*30%*
No vaccination	*26%*	*22%*	*7%*

Agistors' requirement of vaccination prior to agistment (Question 50) was reported by a minority of respondents in this category, *7%* in NSW, *44%* in VIC, and *33%* in SA.

Parasite control programs (Question 51) were reported by *98%* of respondents, predominantly for worm control, with frequency of treatment varying between paste applications every 6-16 weeks and stomach drenches every 6-12 months, and sometimes a combination of both.

Paddock treatments used for worm control (Question 52) were reported by *62%* of respondents, *53%* in NSW, *67%* in VIC, and *72%* in SA. The most common treatments mentioned, apart from Manure Removal, were Harrowing, Spelling, Grazing, Liming, Slashing, and Cropping.

69% of respondents, similar between States, reported a requirement that all horses in the same paddocks are drenched at the same time (Question 53). Respondents who answered in the negative were mainly agistees.

71% of respondents, also similar between States, reported a requirement that all new horses entering paddocks be drenched (Question 54). Respondents who answered in the negative were again mainly agistees.

Costs (Questions 55-58)

The range in costs reported by respondents for some items was considerable, dependent on such factors as stocking rate, agistment services provided, incidence of health problems, and nature of equestrian activity. Median costs were:

		NSW	VIC	SA
Feed	**(per horse/month)**	$ 88	$ 60	$ 73
Agistment	**(per horse/month)**	$ 130	$ 69	$ 50
Medicines/Drenches	**(per horse/past year)**	$ 113	$ 112	$ 91
Veterinary	**(per horse/past year)**	$ 153	$ 154	$ 129
Dental	**(per horse/past year)**	$ 41	$ 34	$ 35
Saddlery	**(per horse/past year)**	$ 376	$ 422	$ 293
Farrier	**(per horse/past year)**	$ 314	$ 319	$ 308

General Issues (Questions 59-60)

The main problems or concerns with agistment or depasturing horses (Question 59) reported by 152 respondents, ranked in order of importance (with State rankings bracketed in order, NSW, VIC, SA), were:

1. Pasture Feed Suppply - lack of quantity and quality, overgrazing. (1,1,2)
2. Weed Control - eradication methods, poisoning effects. (2,3,1)
3. Pasture Management - grazing methods, improvement techniques. (4,2,3)
4. Fences - safety, security, maintenance. (5,4,4)
5. Drainage - mud, waterlogging and pasture damage. (11,5,8)
6. Loss of Land - less agistment and horse paddocks due to subdivision, urbanisation. (3,9,-)
7. Horse Safety - in paddocks, stables and on roads, need for riding areas. (6,10,6)
8. Shelter & Shade - need for trees, adequate protection. (8,6,9)
9. Worm Control - need for uniform worming, manure removal. (10,6,7)
10. Erosion - at gateways, along fences, holes in paddocks. (13,11,4)
11. Water Supply - maintenance of adequate quantity and quality. (12,8,11)
12. Supervision - to ensure horse care, reduce theft. (7,12,-)

Priorities needing research attention in connection with agistment or depasturing horses (Question 60) as reported by 111 respondents, ranked in order of importance (with State rankings bracketed in order, NSW, VIC, SA), were:

1. Weed Control - including natural weed suppression, with minimal spraying. (1,2,1)
2. Pasture Supply - best pasture species for quantity, quality and maintenance. (3,1,4)
3. Pasture Improvement - soil testing, fertiliser use, renovation techniques. (2,3,5)
4. Grazing Management - rotational grazing, cross grazing, small area grazing. (6,4,2)
5. Worm Control - best control programs, paddock treatments. (4,5,9)
6. Riding Safety - rider and driver education, securing safe riding areas. (6,8,5)
7. Drainage - reduction of mud and pasture damage. (-,6,8)
8. Land Availability - maintenance of horse facilities and land around urban areas. (5,10,-)
9. Fencing - more effective, cheaper and safer fence types. (6,9,10)
10. Erosion - prevention of bare areas, dust and land degradation. (10,11,3)
11. Shelter & Shade - minimum requirements, suitable tree species. (-,7,-)
12. Feeding - optimum regimes, dietary needs. (9,12,-)

2. Field Visits

Inspections of 21 horse properties, around Sydney in New South Wales, Adelaide in South Australia, and Melbourne in Victoria, were made to examine current practices and discuss particular issues. Most of these properties were selected from amongst survey respondents and were chosen to investigate different systems of land tenure, stocking rates, feeding strategies and land care problems. In addition, six properties in the South Australian Central Hills Soil Conservation Board area were inspected to view specific land management matters and approaches.

Properties ranged from those in single ownership with 2-3 horses, to agistment situations, and Pony Club or Equestrian complexes housing many horses. A considerable variety of land types and regional conditions was encountered which served to illustrate the extremes under which horse keeping is practised.

The major issues concerning horse owners visited were identical to those raised in the survey and there was a common desire, and thirst for knowledge, to improve land use and pasture feeding. Some properties showed what could be achieved in pasture production and weed control by adequate fertilising and grazing management.

Discussion

Respondents

The respondent profile indicates that the targeted range of horse owners, including land owners, agistees and agistors, mostly on small (less than 10 hectares) properties around urban areas, was achieved. The distribution was relatively even across States and approximately proportional to memberships of the Pony Club Association and the Equestrian Federation.

It is probable that there was a respondent bias towards those with a greater than average interest in land use issues and the potential of pasture feeding, however it is considered that this would be advantageous to the project rather than the opposite.

The predominance of female respondents is not unexpected and matches the general perception of a typical member of the horse organisations involved, particularly the Pony Clubs.

Average number of horses per respondent (3.3) was higher than anticipated, particularly for Pony Club members. There was a considerable range of horse ages and breeds, even amongst individual respondents. For this reason, it was not possible to be too precise about calculating grazing pressures based on horse size and breed.

Land Use

Nearly all respondents were intent on using their available land for provision of pasture feed for their horses through grazing. Topography and nature of the land, fencing, and paddock accessibility for farm machinery (for fertilising and general pasture management activities) were usually conducive to this purpose.

The major obstacle to increasing pasture feeding was the prevalence of horse stocking rates in excess of those considered capable of providing horses with pasture feed all year round (eg., Avery,1996, suggests at least 1-1.5 hectares per horse on good pasture). This situation was exacerbated where horses in more than one ownership shared the grazing area, most commonly found under agistment. Poor quality and quantity of pastures in most cases, as discussed in the next section, was also an important inhibiting factor. Despite these limitations, nearly half the respondents thought that the land area available was “about right”, perhaps due to reliance on hand feeding for the bulk of horse feed needs.

Cross grazing paddocks with other animals, recommended for pasture and manure management (Foyel,1994 & Avery,1996), was not widely used but, in the small property situation, this option is not often available.

Government Regulations covering horse grazing appear to be sparse, and in some cases are minimal (Manningham City Council, pers. comm., allows one horse per 0.3 hectares), or relate to horse riding on roads or reserves. The main exception appears to be in South Australia where the Development Act 1983 states that horsekeeping occurs when horses are kept at a stocking rate of more than 1 horse per 3 hectares. Special permission is required in these cases with conditions prescribing aspects such as ground cover, weed control, subdivision and stabling requirements (Mt Lofty Ranges Soil Conservation Boards leaflet).

Pasture

Respondents’ answers to this part of the survey and subsequent field investigations reveal the basis of the

problem confronting sustainable land use and increased pasture feeding. In the majority of situations, pastures are mainly comprised of poorer grasses, a little clover, native plants and weeds, and plant nutrition is inadequate. Knowledge of management techniques for growing vigorous, dense pastures is fairly limited, not surprisingly because this is an area of horse husbandry and education that receives little attention (Kelleher,1997). However, there was a general desire amongst respondents to provide more pasture feed for horses, particularly during the colder and drier months.

Although most land does contain a smattering of the better grasses and clovers, lack of optimum fertilising inhibits their profusion and growth such that less nutritious plants and weeds become prevalent. Where fertiliser or soil conditioner was used, and that was in less than half of cases, it was generally applied in insufficient quantities, too infrequently, and often appeared unsuitable in type with regard to supply of required plant nutrients. This state of affairs was underlined by the lack of soil or pasture sampling undertaken.

The main pasture management activity was cited as manure removal, however the worm control aspect of this practice appears to be perceived at least equally as important to respondents. Unless manure is removed within 24 hours there is little advantage to pasture management (Avery,1996). Regular harrowing of paddocks, which is a significant but not standard practice, is probably a more beneficial manure treatment, less arduous, and can have a positive effect on pasture management through spread of nutrients. Slashing was the next most common pasture management activity, to control rank pasture growth on manure and urine patches, and weeds in most cases.

Weed species were well recognised by most respondents, and are a fairly constant norm in horse paddocks although, surprisingly, a slight majority did not consider them a specific problem for horse health or pasture management. Nevertheless, weeds were rated as the main land care matter needing attention and one of the most important general problems and a priority for research. Spraying and hand hoeing are widely practised to control weeds, but these are short term (usually annual) measures and do not provide a permanent solution.

Grazing

The high level of satisfaction with the grazing system practised, which in most cases was rotational, was usually justified for reasons of resting paddocks for worm control and pasture regeneration. Whilst these reasons are by themselves logical, the usual range of paddock sizes and numbers, despite fairly common use of electric fencing, make systematic, even rotations very difficult to achieve.

It is suspected that most rotational grazing is not that rigorously controlled and probably achieves more from the point of view of worm control than increasing pasture supply. Reliance on hand feeding also obviates the need for stricter grazing control. Strip and block grazing are the more effective forms of rotation for pasture rationing but are rarely practised.

In the majority of situations, horse owners have access to feeding yards or stables which indicates potential for better grazing control.

Land Care

The major land care issues reported were connected with weeds, pasture quantity and quality, which are themselves interrelated. Pasture cover, quality and damage, overgrazing, drainage, erosion and dust, in most cases are all symptoms of inadequate or unhealthy pastures which, in turn, allow weeds to intrude and flourish. Fencing was a relatively significant issue and is perhaps related to grazing control and pasture supply, as well as being important for horse security and safety.

Despite the usual grazing pressures on these smaller properties, there is sufficient evidence to support promotion of vigorous pastures and controlled grazing as the answers to current land care concerns.

Feeding

The prevalence of supplementary feeding amongst respondents was to be expected, however the range of feeds provided in many cases, which included hay, chaff, grains, minerals and mixes, was surprising. Such combinations of feeds raises the question of whether convention or fashion takes the place of necessity. Many respondents sought advice on feeds and feeding requirements from a range of sources. Feeding requirements of most horses, particularly ponies, can be adequately catered for with pasture, hay and some grain according to researchers (Bryden, McMeniman and Trevor-Jones,1997).

The predominance of frequent (usually daily) hand feeding of horses may also be partly due to reasons other than nutritional needs, eg., catching horses, "reward". Perhaps hand feeding is the easiest approach, albeit costly (on average $880 per year), and is certainly justified in some situations according to work and pasture supply, however the potential of pastures to provide a greater proportion of the dietary needs, even on these smaller properties, is considerable.

Agistment

Agistment services, where provided, appear to be primarily involved just with frequent supervision and feeding of horses, and to a lesser extent, rugging and stabling, however a significant proportion of agistees attend to these tasks themselves. Written agistment agreements are the exception rather than the rule and, in view of the demand for agistment, are probably not often requested.

Horse Health

Attention to horse health is obviously a high priority with respondents with good vaccination and parasite control programs, and paddock treatments for worm control, widely practised. In agistment situations however, where health standards should be a major concern, there appears to be some laxity.

Health and disease problems and incidence, as reported, do not appear abnormal. Most common problems were physical injuries and the usual feed related problems of colic and founder. Attention to horse health, apart from dental treatment, costs $259 per year on average.

Costs

Costs of keeping a horse varied a little between States but the separate cost categories were reasonably consistent in proportion to the total. In the survey sample, the annual average cost was $1,875 per horse, of which 47% was feed ($880), 20% saddlery ($384), and 17% farriery ($316). Any measures that can be taken to reduce the amount and cost of supplementary feeding will be of significant economic benefit to horse owners.

Problems and Research Priorities

The main emphasis given by respondents in all States concerned growing better pastures and reducing weeds. Lack of pasture quantity and quality, pasture improvement and management methods, and weed control were the major issues raised. These are all closely inter-related although respondents may not have been fully aware of the degree of the connection. Drainage and erosion, also cited as prominent problems, in turn are often a side effect of poor pastures and weed infestations. This reflected answers to questions on pastures, weeds and land care issues and indicates the major thrust of future work to assist small property owners.

Fences were rated as an important issue, mainly for security and safety. This was contrary to the general survey response that indicated a very high level of satisfaction with fencing, except where barbed wire was used. Worm control, despite the apparent careful and effective attention to this aspect of horse husbandry, was also listed as a significant problem. This may be a reflection of the ongoing vigilance needed for this

practice. Other matters of understandable concern were the decreasing availability of land for horse keeping around urban areas, and aspects of horse and rider safety, particularly on roads and in public areas.

Guidelines

The major emphasis of the project is on *sustainable land use*, which is to be achieved under pasture based, horse grazing regimes, with economy of feeding and improved appearance of horse properties as important objectives.

It is apparent from the study that prime attention is needed to promotion of vigorous pastures, composed of the better pasture species, to provide ground cover. The aim at all times is to provide even ground cover with good, healthy pasture ranging in height from about 5-15 cm.
This is the first line of defence against weeds, surface moisture and erosion, and in turn will provide increased pasture supply and quality.

This primary aim necessitates strict control of horse access to pasture areas on the typical smaller property to avoid uneven and over grazing. On some small properties, where grazing pressures are relatively high, this may involve yarding of horses and exclusion from pasture for considerable periods of time.

1. Fertilisers/Plant Nutrition
The first essential is to ensure that pasture growth is not limited by lack of plant nutrients, which can be readily supplied by commonly available fertilisers. Soil samples should be taken to determine nutrients, fertilisers and soil conditioners required.

The main limitation in Australian soils, and in most respondents' situations, is phosphorus, which is supplied in a readily accessible form by superphosphate fertiliser. Annual rates of application on most small horse properties in South Eastern Australia should be up to 200 kilograms per hectare (subject to soil phosphorus levels). Such rates have been shown to produce very productive pastures in other grazing enterprises.

The next possible requirement will be potassium, although the need for this more expensive fertiliser should always be determined by soil sampling. Lime may be needed to correct excessive soil acidity, which affects availability of plant nutrients, and in some situations, nitrogen fertiliser can be used to assist winter pasture production.

The main priority is to grow a dense, vigorous "pasture crop" on the grazing area, allowing grazing when ground conditions are suitable and sufficient feed is available.

2. Pasture Species
Much of the land used for grazing horses already contains some quantity of the better pasture species (ryegrass, phalaris, fescue, kikuyu, white and sub clover). These are nutritious, productive and resilient plants that respond quickly to liberal fertilising in a year or so. The perennial grasses are also better suited for sustainability.

It is often not necessary to sodseed or sow pasture seed but, if in doubt, the simplest method of introducing new plants should be chosen. Ploughing and resowing can be resorted to if required, subject to expert advice.
3. Rationed Grazing

Grazing opportunities should be "rationed" to ensure that even grazing occurs and pasture height is maintained above the desirable minimum level (about 5 cm). This strategy will usually require feeding yards, and necessitate the use of electric fencing as an economical means of dividing the available paddock area(s) into uniform "grazing blocks" commensurate with grazing pressures. Shifts of grazing blocks weekly or fortnightly would be a desirable aim, however this will be dependent on paddock area available, number of horses and season. Such an approach can overcome selective grazing ("lawns and roughs") by minimising pasture availability at any one time.

The objective at all times is to sustain maximum ground cover with the "pasture crop", but increasing the consumption of pasture feed by horses as far as possible. Calculation of feed requirement for horses and balancing this with pasture feed available and amount of hand feeding needed is the recommended goal to assist with economy of feeding. On some highly stocked properties this may result in horses spending much of their time in yards or stables, however this may be necessary to sustain pasture cover. In more lightly stocked situations, control of pasture growth, particularly in spring, may require some slashing on occasions to avoid excessive pasture height (above about 15 cm).

4. Yards

Feeding yards, in association with stables or by themselves, are invaluable for small property management. They enable the confinement of horses from the grazing area, as required, and are beneficial in concentrating hand feeding, with any introduced weed seeds, and manuring, in a small area.

Yards should be about 100 square metres in area and have a well drained, non-erodable surface, composed of fine rubble and sand, similar to the material used for menages.

5. Manure Management

If manure removal is impractical or infrequent, spreading manure by harrowing should be practised where possible to distribute plant nutrients and organic matter, and to avoid "clumpiness" in pasture growth. Rotational grazing around the grazing blocks greatly assists the application and effectiveness of this practice by resting areas for a period after harrowing. This allows pasture to freshen and aids in worm control.

"Harrowing" can be achieved with a piece of weldmesh or logs tied together, dragged by a vehicle or by hand.

6. Drainage

Surface drainage with shallow spoon drains, dug by implement or by hand, is a simple and effective means of reducing excess water on paddocks. Drains can be placed along permanent fencelines, at appropriate locations, to prevent in-flow of water from neighbouring areas, or across contours within a paddock. Care needs to be taken to avoid any risk of causing erosion and consideration should be given to harmless disposal of surplus water.

Drainage is also improved by maintenance of a dense, vigorous pasture, and by planting tree belts in suitable situations, which also contribute to provision of shelter and shade.

7. Advice

Advice on the application of guidelines in specific situations should be sought from local, professional sources to provide up to date, relevant knowledge. State Departments of Agriculture or Natural Resources, Private Agricultural Consultants, and Fertiliser Companies will assist determination of requirements for optimum plant nutrition, suitable pasture species and methods of introduction, stock carrying capacity of various types of land, and general pasture management strategies.

Recommendations

- The findings of this study should be disseminated to Pony Club Associations, Equestrian Federation Branches, and similar Horse Organisations associated with small property owners, for their members' information and implementation. In addition, and where possible, Agistment Centres should be circularised and the guidelines recommended for application. The availability of the manual, "Pastures for Horses", should be publicised at the same time.

- Demonstration paddocks should be established at strategic locations by these Horse Organisations, with assistance from the relevant State Agricultural and Natural Resources Departments or Soil Conservation Boards, to illustrate what can be achieved by application of the recommended guidelines.

- Education programs for young horse enthusiasts, eg., in Pony Clubs, should include specific attention to pasture and grazing management practices aimed at achieving sustainable land use as outlined in this project.

- The approach taken in South Australia by the Mt Lofty Ranges Soil Conservation Boards, to provision of land management advice by short courses, field days and information leaflets, specifically for horse owners on small holdings, be used as a model and publicised in other States as an example worth following.

- State Departments of Local Government should be advised of the project results and requested to inform their constituent municipalities regarding the availability of guidelines for land management practices for small horse properties around urban areas.

Appendix

Mail Survey Questionnaire

"SUSTAINABLE LAND USE FOR DEPASTURED HORSES"

Research Project for the Rural Industries Research and Development Corporation

CONFIDENTIAL MAIL QUESTIONNAIRE

Introduction

Please complete the following questionnaire and return it in the reply paid envelope by November 15th,1996. All responses will be treated in strictest confidence.

Please provide answers by writing where lines are shown _____ , giving numbers or amounts in rectangular boxes ☐ , and ticks in square boxes ☐

If you agist your horse(s) you may not readily know the answers to some of the questions on pasture and grazing. Tick the "don't know" box if you cannot obtain the information from your agistor.

Respondent Details (OPTIONAL. Please complete if you wish to receive a summary of the survey)

1. Name _____ 2. Telephone _____

3. Address_____

QUESTIONNAIRE IDENTIFICATION (Please complete)

4. Where is the grazing/agistment property for your horse(s)? Location _____ or P/code Area _____

5. Are you a member of the Equestrian Federation? ☐ or Pony Club Association? ☐

6. Please give details of your horse(s) to indicate size and number:

	Horse 1	Horse 2	Horse 3	Horse 4	Horse 5
Breed	_____	_____	_____	_____	_____
Age	☐	☐	☐	☐	☐

(if you have more than five horses please provide details on a separate sheet)

A. LAND USE

Land

7. What is the total land area used for grazing/agisting your horse(s)? ☐ hectares or ☐ acres

8. Is this area, owned by you? ☐ leased by you? ☐ or do you agist your horse(s)? ☐

9. What is the area mainly used for? Grazing ☐ or Exercise ☐

10. Is the land? Flat ☐ Undulating ☐ Steep ☐ Rocky ☐ Open ☐ Treed ☐
(tick more than one box if appropriate)

11. How many paddocks are there in the total area? ☐

12. If there are a number of paddocks,what is the range of paddock sizes? ☐ to ☐ hectares

or ☐ to ☐ acres

13. Can farm machinery (tractors, mowers) be operated in the paddock(s)? Yes ☐ No ☐

14. What type of fence is used around the paddock(s)? _____

Is it secure for the horse(s)? Yes ☐ No ☐ Is it safe for the horse(s)? Yes ☐ No ☐

15. How many horses are usually kept in each paddock? ☐

16. Is the horse(s) stabled at night and grazed on pasture during the day? Yes ☐ No ☐

17. If sheep or cattle are usually grazed with the horse(s) please give the number of sheep ☐
and/or cattle ☐

18. If your horse(s) is grazed/agisted with horses owned by others in the same paddock(s),

what is the total number of horses? ☐ and the total paddock(s)area used? ☐ hectares

or ☐ acres

19. Do you consider that the land area available for your horse(s) is?

Too small ☐ Too big ☐ About right ☐ Varies with season ☐ Don't know ☐

20. Are there Local Government Regulations concerning horse grazing in your district? Yes ☐ No ☐

Pasture

21. What are the main grasses(eg., ryegrass, phalaris) and clovers(eg., sub, white) in the pasture area grazed? (please give % if possible)

Grasses_____ Don't know ☐

Clovers_____

22. Is fertiliser or a soil conditioner(eg,lime) applied to the pasture? Yes ☐ No ☐ Don't know ☐

If so, what is the main type? _____ Don't know ☐

and the usual amount per application? _____ Don't know ☐

How often is this fertiliser/conditioner applied? _____ Don't know ☐

23. Are soil or pasture samples taken to determine fertiliser needs? Yes ☐ No ☐ Don't know ☐

24. Is the area irrigated? Yes ☐ No ☐ Don't know ☐

Amount and frequency of irrigation? _____

25. What pasture management activities are practised? Harrowing ☐ Slashing ☐ Sodseeding ☐

Manure removal ☐ Pasture renovation ☐ Cross grazing with sheep/cattle ☐ None ☐

Other? (please specify) _____ Don't know ☐

26. If manure is removed, how often does this occur ? _____
and how is the manure disposed of ? _____

27. Is the pasture very uneven,eg., large patches that are not grazed (tall, rank growth) and large patches that are heavily grazed (lawns)? Yes ☐ No ☐

28. Are there any weeds in the pasture? Yes ☐ No ☐ Don't know ☐

If yes, what species are they (eg., docks, thistles, bracken, Paterson's Curse)?

_____

_____

29. What proportion of the area would be weed infested? ☐ %

In the last five years has this? Increased ☐ Decreased ☐ Not Changed ☐ Don't know ☐

30. Are the weeds a problem for horse health or pasture mangement? Yes ☐ No ☐ Don't know ☐

31. Is any method of weed control practised? Spraying ☐ Hand hoeing ☐ Slashing ☐

Other? (please specify)_____ _____Don't know ☐

32. Would you prefer the pasture to provide more feed for your horse(s)?

Yes ☐ Sometimes ☐ No ☐ Don't know ☐

If yes or sometimes, at what time of the year? _____

Grazing

33. What grazing system is used for the horse(s)? Set stocked in the paddock(s) ☐

Rotational grazing (moved from paddock to paddock) ☐ Strip grazing (eg., by electric fence) ☐

Other? (please specify)_____ Don't know ☐

Do you think this system is satisfactory? Yes ☐ No ☐ Don't know ☐

If yes, or no, please explain why _____

34. Is the paddock(s) ever rested? Yes ☐ No ☐

If so, for how long? _____

35. Is there a feeding yard? Yes ☐ No ☐

36. Is there a stable? Yes ☐ No ☐ Is there a horse shelter? Yes ☐ No ☐

37. Are there shelter/shade trees or any natural shelter or shade? Yes ☐ No ☐

Land Care

38. What land care matters do you consider need attention where your horse(s) is grazed?

Weeds ☐ Erosion ☐ Drainage ☐ Dust ☐ Fencing ☐ Pasture cover ☐ Tree damage ☐

Overgrazing ☐ Undergrazing ☐ Pasture damage (divots, pugging, muddying) ☐

Salinity ☐ Acid soils ☐ Pasture quality ☐ Manure collection ☐

"Horse sick pasture" ☐ (please define) _____

Other? (please specify) _____

B. FEEDING

39. Which, if any, of the following feeds are given to the horse(s)?

Lucerne Hay ☐ Grass Hay ☐ Lucerne Chaff ☐ Oaten Chaff ☐ Bran ☐

Grain (oats,barley) ☐ Mineral supplements ☐ Vitamins ☐

Other (pellets, mixes)? _____

40. What is the usual frequency of feeding?

Daily ☐ Weekly ☐ As required ☐ (please specify) _____

Does this alter during the year? Yes ☐ No ☐

41. Do you determine the amount and frequency of feeding? Yes ☐ No ☐

If not you, who does? _____

42. How is the amount and frequency of feeding determined?

_____

43. Where do you obtain advice on feeds and feeding requirements?

Stock feed company ☐ Local produce merchant ☐ Books ☐ Veterinarian ☐

Other? (please specify) _____

C. AGISTMENT

[Note: If you do not agist your horse(s), or provide agistment, please go to Question 48]

44. Do you agist horses for other horse owners? Yes ☐ No ☐

45. What services are provided by the agistor?

Supervision ☐ Feeding ☐ Stabling ☐ Rugging ☐ Grooming ☐ None ☐

Exercise ☐ Training ☐ Manure removal ☐

Other? (please specify)_____

46. What is the frequency of attention to the horse(s)? Daily ☐ Weekly ☐ Other_____

47. Is there a written agistment agreement? Yes ☐ No ☐

D. HORSE HEALTH

48. What health or disease problems have you had with your horse(s) in the past year?

Health or Disease Problem	Frequency (once, twice, etc.)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

49. Is there a vaccination program(eg, tetanus, strangles) for your horse(s)? Yes ☐ No ☐

If so, what type of vaccination? _____

50. If you agist the horse(s), is vaccination required by the agistor prior to agistment? Yes ☐ No ☐

If so, what type of vaccination? _____

51. Is there a parasite control program(eg, worms, bots, lice) for your horse(s)? Yes ☐ No ☐

What is the frequency of your drenching for parasite control? _____

52. What paddock treatments, if any(eg.,harrowing mixed grazing, liming), are used for worm control?

_____

53. Is there a requirement that all horses in your paddock(s) are drenched at the same time? Yes ☐ No ☐

54. Is there a requirement that all new horses entering the paddock(s) are drenched? Yes ☐ No ☐

E. COSTS (Please provide approximate figures)

55. What does it cost, on average, to feed your horse(s)? $ [ ] per horse per month

56. If you agist your horse(s), what is the usual agistment cost? $ [ ] per horse per month

57. How much was spent in the past year on?: Medicines and Drenches $ [ ] per horse

    Veterinary consultations $[ ] per horse Dental care $ [ ] per horse

58. How much was spent during the past year for general care? Such as:

    Saddlery, rugs, grooming materials,etc.$ [ ] per horse Farrier's charges $[ ] per horse

GENERAL ISSUES

59. What are the main problems or concerns you have with agistment or depasturing of your horse(s)?
    (please rank in order of importance)
    1._____
    2._____
    3._____
    4._____
    5._____

60. What priorities need research attention in this area?
    (please rank in order of importance)
    1._____
    2._____
    3._____
    4._____
    5._____

Thank you for completing the questionnaire

Please return it in the reply paid envelope by November 15th,1996

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