MEAT & LIVESTOCK AUSTRALIA

on farm

Technology Transfer in the Seedstock Sector

Project number MC.015
Final Report prepared for MLA by:
Animal Breeding Technology Pty Ltd
108 Taylor Street
ARMIDALE NSW 2350

Meat & Livestock Australia Limited
ABN 39 081 678 364

ISBN 9781741911411

March 1991

Improving Productivity

Table of Contents

1. Executive Summary

Our survey of 724 seedstock breeders of some major beef breeds operating in temperate and sub-tropical Australia gives important insights into their breeding practices and future intentions. The differences between users and non-users of BREEDPLAN are clearly defined.

The benefits of new breeding technology are not, and will not be fully exploited by the sector under the present mechanisms of technology transfer.

This means that the cost-benefit of breeding research is not being realised, and that industry projections of cost benefits based on effective exploitation of the advantages of the technology could be misleading.

Significant Findings

* The seedstock sector is insular in the way it sources technical information about breeding practises.

The sector has been clear in its identification of preferred delivery systems.

Specialists, be they specialist publications, specialist advisers or specialist workshops or field days, clearly outscore the more generalist sources of information.

Breeders in the sector rank other seedstock breeders and their breed societies and associations above State Department beef extension officers, and other professionals, as their primary sources of information about new breeding practices. Specialists and individuals with State Departments still offer an important resource to the sector.

There is a 'catch 22' situation within the seedstock sector regarding technology transfer. Traditional extension agencies have the resources but not the entry point of credibility, whilst the breed societies have the entry point but generally lack the resources.

With the continual scaling down of government extension services, long term extension planning to meet the needs of the seedstock sector must be more industry based, with reducing reliance upon government services.

The seedstock sector is facing a period of rationalisation with a trend towards fewer, larger seedstock breeders who will need to be more technically competent and have the finance and business skills to embrace new technology. This trend is expected to hasten as the commercial sector moves from being production driven to being market driven.

* Users of BREEDPLAN are one of the largest definable groups within the seedstock sector, and are the group that are identified as having increasing importance in the supply of seedstock to the commercial industry in the future.

Many BREEDPLAN users consider they have a good basic understanding of BREEDPLAN and its recording needs, when in fact they don't. The need for increased education and extension effort for the release of BREEDPLAN Version 3. is indicated.

It is the consultant's opinion that the position of National Coordinator of NBRS/BREEDPLAN should be permanently staffed and that the cost of that position should not be solely borne by the users. The benefits of the position spread widely to all sectors of the beef industry.

Almost 60% of seedstock breeders not using BREEDPLAN see herd size or cost factors as limits to joining the scheme. These issues must be addressed if a continued expansion of BREEDPLAN enrollments is to be sustained.

In consideration of other traits that might be added to the basic BREEDPLAN weight traits, respondents ranked the following five traits as the top out of the possible fourteen traits listed: 1: Fertility; 2: Calving Ease; 3: Scrotal Circumference; 4: Eye Muscle Area; 5: Feed Efficiency.

There was little interest in marbling as a future trait which is of concern given that marbling is an integral component of the McKinsey recommendation for repositioning the Australian product for the Japanese market.

* Nineteen per cent (19%) of breeders have used serving capacity tests in their breeding programs over the last five years and in the next five years, forty-seven per cent (47%) indicate they will be using it. This was perhaps the most unexpected result of the survey.

* The usefulness and potential benefits of systems of combining Estimated Breeding Values into a single value (eg. B-Object) are not understood by the sector. The introduction of these technologies should involve liaison with breed societies, private and public sector agencies and producers, and be proceeded only with clear definition and demonstration of the benefits to the sector.

There is also a clear need for quantification of the impact that future technologies such as cloning could have on the structure of the seedstock sector, before it happens

Major Recommendation

It is the consultants' opinion that the technology-transfer gap to the seedstock sector will not be satisfactorily resolved unless existing public and private resources are coordinated using a cooperative-group approach. Such a cooperative group would have to satisfy the sectors' need for an ongoing independent source of scientifically-founded, technical information.

There is now no single extension or service agency that has the entry point, skills and resources to provide such a service on a national basis.

It is recommended that AMLRDC fund a Beef Improvement Council which is responsible for technology transfer to the seedstock sector on a national basis.

It is proposed that the BIC would become a self-funding, industry-regulated entity within five years. Our report details the role, functions and funding requirements for such a body.

2. Introduction

The seedstock sector is the principal supplier of genetic material to the Australian beef industry.

Some 5 million beef calves are born each year of which more than 80% are sired by registered bulls bred from within the seedstock sector (Wilson Market Research Survey, 1987).

The value added component of improved genetics from the seedstock sector through the commercial and processing sectors is immense. For example;

- a 1% increase in daily rate of gain across the annual calf crop would increase production by an additional 5 to 6 million kgs of carcase beef each year.
- an increase of $\frac{1}{2}$% in carcase yield would increase nett production of saleable beef produced by 7.3 million kgs each year
- an increase of 1 marbling score would increase the value of carcases destined for the Japanese grain fed market by $50-$100 each

Each of the above are potentially achievable by the application of breeding technologies through the seedstock sector, and without any increase in the national breeding herd.

Any breeding research aimed at improving production, production efficiency, or market competitiveness of the commercial and processing sectors of the industry must first be filtered through the seedstock sector. Any impediment to the flow of that technology seriously depreciates the cost/benefit ratio of such research.

This study aims to better understand the forces operating within the seedstock sector and thereby develop a mechanism to increase the uptake and effective implementation of new breeding technology.

Achievement of this objective would be of significant economic benefit to all sectors of the Australian beef industry, and ultimately to the national economy.

The study was commissioned by the Australian Meat and Live-stock Research and Development Corporation (AMLRDC) and was carried out by Animal Breeding Technology Pty Ltd.

3. Terms of Reference

3.1 Objectives

To define the needs, the required products and the potential delivery systems to enhance the uptake of breeding technology by the seedstock industry in southern temperate Australia, incorporating the role of stud stock agents.

3.2 Terms of Reference

3.2.1 Conduct a situation analysis of the seedstock sector relative to the project objectives including;

(a) the conduct of a survey of the seedstock sector to ascertain the scope for and barriers to adoption of breeding technology containing questions on;
- seedstock producers' intentions relating to their future usage of BREEDPLAN, GROUP BREEDPLAN and reproductive technology;
- the level of understanding of basic genetics, BREEDPLAN, and applied animal breeding methods within the seedstock sector; and
- the sources of information used by the seedstock sector.

(b) a review of current and likely developments, and structural changes within the seedstock sector over the next decade.

(c) a review of the existing infrastructure of extension delivery to the seedstock sector and future needs.

(d) an analysis of the impact of influential Australian breeders and imported genetics on the industry.

(e) a review of the technical support capabilities of breed societies.

(f) an assessment of the interest in farm-secretarial services for pedigree and performance recording.

(g) a description of the influence and role of agents in selection and trading of seedstock and determine the level of understanding of agents in applied cattle breeding and BREEDPLAN.

(h) an invitation for submissions from relevant industry organisations.

3.2.2 Liaise and co-ordinate with the NSW Department of Agriculture and Fisheries to determine the role of agents in commercial bull buying.

3.2.3 Prepare a prioritised action plan for:

(a) a seedstock sector training extension program to enhance the uptake rate and efficient use of breeding technology; and

(b) the development of educational and extension material and training resources to support 3.2.3(a) above.

3.2.4 Identify commercial self-funding opportunities which can be initiated at the outset.

3.2.5 Identify the need for ongoing programs beyond the proposed five-year assisted time period.

4. Methodology

4.1 Australian Seedstock Industry Survey

Two mail-out surveys were designed with the assistance of Dr Ray Cooksey from the Department of Psychology at the University of New England.

(a) The **BREEDPLAN survey** was sent to all BREEDPLAN members whose properties were in temperate or sub-tropical Australia south of an east-west drawn line through Brisbane (see copy of survey in Appendix H).

A colour coded copy of the same survey was sent also to a group of BREEDPLAN members who had recently participated in N.S.W. Department of Agriculture and Fisheries BREEDPLAN Workshops held in N.S.W. These are shown as BREEDPLAN PLUS surveys.

(b) The **non-BREEDPLAN survey** was sent to 1200 non-BREEDPLAN breeders that were members of either Hereford, Shorthorn, Charolais or Santa Gertrudis Breed Societies in equal numbers (see copy of survey in Appendix I).

Each breed society provided a list of their members with cattle and after the BREEDPLAN members were eliminated 300 were chosen entirely at random to receive a survey.

Herefords were chosen to represent a British Breed Society with a large membership that had GROUP BREEDPLAN and a fulltime technical commitment.

Shorthorns were chosen to represent a British Breed Society that had a smaller membership, without GROUP BREEDPLAN but with a medium, and recent technical commitment.

Charolais to represent a European Breed with a recent upgrade in technical commitment.

Santa Gertrudis to represent a *Bos indicus* derived breed with a strong membership in temperate Australia.

Producers who sell bulls but are not known to be either a member of either a breed society or BREEDPLAN were also sent a copy of the non-BREEDPLAN Survey. The mail-out list was constructed with the assistance of the N.S.W. Department of Agriculture district beef cattle officers who nominated producers in their district who satisfied the criteria.

All surveys were sent with an accompanying letter of introduction and with a reply paid envelope. No methods of follow-up or incentives were employed.

4.1.1 Survey Response

Table 1(a) gives the numbers of each survey dispatched, the numbers returned and the percentage returned.

Table 1(a) : Numbers of surveys dispatched, returned and the percentages returned.

	Dispatch	Return	%
BREEDPLAN	1012	439	43.4
BREEDPLAN PLUS	35	25	71.4
Non-BREEDPLAN	1200	260	21.7
Total	**2 247**	**724**	**32.2**

The response rate to the survey should be considered satisfactory for a mail survey, and the sample size and response rate would validate conclusions so reached - (P. Taylor, Australian Bureau of Statistics - personal communication).

A response rate greater than 40% is usually only achieved when follow up or incentive procedures are adopted.

Variation in the response rate between BREEDPLAN PLUS, BREEDPLAN, and non-BREEDPLAN respondents was to be expected, according to Taylor, and reflected differences in interest and motivation between the groups with regards to new breeding technologies.

Table 1(b) gives the number of herds by State for BREEDPLAN and non-BREEDPLAN respondents.

Table 1(b) : Numbers of herds from BREEDPLAN and non-BREEDPLAN respondents by state

State	BREEDPLAN	Non-BREEDPLAN	Total
ACT	2	0	2
NSW	198	121	319
QLD**	28	33	61
SA	48	25	73
TAS	24	14	38
VIC	110	53	163
WA	51	14	65
Total	**464***	**260**	**724**

* Including 3 respondents who failed to specify state.
** Queensland responses were from southern breeders only as the terms of reference specified southern beef production.

Table 1(c) gives the number of herds by Breed for BREEDPLAN and non-BREEDPLAN respondents.

Table 1(c) : Number of herds from BREEDPLAN and non-BREEDPLAN respondents by breed

Breed	BREEDPLAN	Non-BREEDPLAN	Total
Angus	98	4	102
Brahman	4	4	8
Charolais	9	54	63
Devon	7	0	7
Hereford	80	61	141
Limousin	39	2	41
Murray Grey	30	1	31
Poll Hereford	85	4	89
Santa Gertrudis	5	60	65
Shorthorn	22	66	88
Simmental	56	3	59
Other	27	1	28
Total	**464***	**260**	**724***

* Including 2 respondents who failed to specify breed.

** For the non-BREEDPLAN survey certain breeds were targeted. These breeds were Hereford, Charolais, Santa Gertrudis and Shorthorn. Responses received from non-target breeds (e.g. Angus), were from breeders registered with a targeted society, but which was not their major breed.

4.2 Telephone Survey of Agents

An independent person conducted a telephone survey of 13 of the stud stock agents from Elders, NIAA and Dalgetys. For a copy of the questions asked refer to Appendix J.

4.3 Telephone Survey of Breed Societies

Similarly all Breed Societies who registered more than 1.0% of the total registered cattle were contacted to determine their technical support, personnel employed, magazine support and their various committees etc.

4.4 Industry Submissions and Personal Communication

Forty organisations or individuals were written to inviting submissions and comments.

5. Overview Of The Seedstock Sector

5.1 Introduction

The Australian beef cattle industry requires approximately 100,000 new bulls each year to join to the 9.9 million beef females of breeding age.

The Wilson Market Analysis (1987) reported that 82% of all bulls purchased were from stud herds. Their survey reported that 30 per cent of these bulls were purchased as unregistered bulls. These would either be bulls bred from unregistered cows run in association with a registered herd or bulls bred from registered cows but not registered with the respective breed society.

The survey showed that 18 per cent of bulls purchased were from commercial herds.

Table 2 : Breed society registrations 1990

Breed	Number	%
Angus	13 280	7.5
Braford	4 176	2.4
Brahman	18 496	10.5
Charolais	3 939	2.2
Devon	2 190	1.2
Droughtmaster	4 044	2.3
Hereford	32 764	18.6
Limousin	9 403	5.3
Murray Grey	11 072	6.3
Simmental	13 669	7.7
Poll Hereford	33 763	19.1
Red Poll	2 077	1.2
Santa Gertrudis	9 477	5.4
Shorthorn	8 119	4.6
South Devon	1 863	1.1
Others	8 410	5.1
Total	**176 742**	

Source: Australian Registered Cattle Breeders Association (ARCBA).

There are over 30 beef breed associations in Australia which registered 176,742 animals in 1990 (see Table 2). This was an increase of 7.7% in the 1990 figures suggesting a trend towards increasing numbers of registered cattle in Australia. The comparative figures for 1989 showed an increase of 3% over the previous year, however longer term trends are not easily available as figures have only been reported over more recent years.

5.1.1 Breed society dynamics and trends

Breed societies in Australia follow a characteristic hierarchical pattern, with a relatively small number of members registering a disproportionately large number of calves and a large number of members registering either none or only a small number of calves.

The Australian Hereford Society is used as a model for this study.

It can be seen from Table 3 that in 1990, 6.4% of members registered 49.9% of all calves registered by the Society. This group showed an average of 210 registrations per member as compared to the overall average of 26 registrations per member for the total membership.

Table 3 : 1990 Hereford Society registration analysis according to states

		STATE						
Size of Herd		NSW	Vic	Qld	WA	SA	TAS	Total 1990 (%)
Nil Calves	Members	186	144	43	10	9	15	**407**
1-9 Calves	Members	161	70	40	10	7	10	**298** (24.3%)
	Total calves	667	272	162	40	30	55	**1226** (38%)
10-19 Calves	Members	62	51	18	4	4	7	**146** (11.9%)
	Total calves	858	716	262	57	42	89	**2024** (6.2%)
20-49 Calves	Members	97	54	29	12	1	11	**204** (16.6%)
	Total calves	3218	1712	941	437	27	395	**6730** (20.5%)
50-99 Calves	Members	50	26	7	6	3	1	**93** (7.6%)
	Total calves	3420	1846	494	403	183	78	**6424** (19.6%)
Over 100 Calves	Members	40	18	14	2	3	1	**78** (6.4%)
	Total calves	8583	3679	3301	265	394	122	**16344** (49.9%)
Totals	Members	596	363	151	44	27	45	**1226** (100%)
	Total calves	16762	8225	5160	1202	674	739	**3276** (100%)
Percentage		51.0%	25.1%	13.8%	3.9%	2.4%	2.2%	100%

A further 7.6% of members registered 19.6% of calves, with the result that 14% of members register almost 70% of the calves.

Most breed societies reflect this general membership/registration distribution.

Table 4 shows the breed and herd size categories for all respondents to our survey.

Table 4 : No. of responses by breed+ and herd size category*

Size Cat.*	Breed A	B	C	D	H	L	MG	P/H	SG	S/H	S	Other	Total
1			1			1							2 (0.2%)
2	1		15		13	15	2	4	10	8	5	1	74 (10.5%)
3	11	2	23	1	18	14	8	15	17	15	18	8	150 (21.2%)
4	25	1	11	4	25	6	6	29	17	33	19	13	189 (26.7%)
5	62	5	12	2	83	4	13	38	21	32	15	6	293 (41.4%)
	99	8	62	7	139	40	29	86	65	88	57	28	708

Differences between these breed totals and totals in Table 1(c) are due to respondents specifying breed but not indicating number of breeders.

+ A(Angus); B(Brahman); C(Charolais); D(Devon); H(Hereford); L(Limousin); MG(Murray Grey); PH(Poll Hereford); SG(Santa Gertrudis); S/H(Shorthorn); S(Simmental).

* Category: 1: 1-9; 2: 10-19; 3: 20--49; 4: 50-99; 5: Over 100 calves.

Respondents to our survey represent the larger categories of breed society membership. As such our survey does not represent the smaller 'hobby' type breeders. Respondents to our survey represent the group most likely to make an impact on the future national breeding program.

It is the consultants opinion that over the next decade studs outside the BREEDPLAN system will find in increasingly difficult to remain competitive in the mainstream bull selling arena, and that the larger studs will increase in size at the expense of smaller studs.

This opinion is supported by our survey as shown in Table 5.

Table 5 : Expected average increase in the number of bulls offered for sale, by herd size (1990-95)

Size of Herd (no calves reg/year)		Registered Bulls	Unregistered Bulls
1-9	BREEDPLAN	5	12
	Non-BREEDPLAN	0	0
10-19	BREEDPLAN	7	4
	Non-BREEDPLAN	8	5
20-49	BREEDPLAN	10	4
	Non-BREEDPLAN	5	5
50-99	BREEDPLAN	10	6
	Non-BREEDPLAN	8	6
>100	BREEDPLAN	15	12
	Non-BREEDPLAN	6	7

When asked about expected increases in bull sales over the next years, BREEDPLAN respondents expected to sell more registered bulls than non-BREEDPLAN herds, within each size-of-herd category, and larger herds expected to increase bull sales at a higher rate than smaller herds.

5.2 Structure of the Seedstock Industry and the Impact of Influential Breeders, Studs and Imported Genetics.

The traditional structure of the bull breeding industry was a pyramid structure for each breed (Davey and Baker 1963). Daughter studs bought bulls from a few very influential studs with commercial cattle breeders generally buying from the daughter studs. There was no movement of genes from commercial herds to daughter studs because most breeds had a closed herdbook and there was little movement from daughter studs to the influential studs.

The influential studs were generally established by a combination of success in the showring and aggressive marketing. Influential studs generally had relatively short influential periods because breeding programs were based on show winners and the showring was, and remains, very inefficient in identifying true genetic superiority.

The first major change to the traditional structure occurred with the introduction of the European breeds in the early 1970s. These breeds were largely established by AI and there is little evidence that a pyramid structure has developed. Breeders in these breeds still rely on AI sires to introduce new genetic material into their herds. The pyramid structure started to break down with the introduction of Artificial Insemination for beef cattle in the early 70's. The use of AI made "superior" sires available to all other stud breeders. The introduction of synchronisation of AI programs increased the use of AI in stud herds and also commercial herds.

The disappearance of the pyramid structure has been hastened by the introduction of national genetic evaluations for beef cattle breeds. The first GROUP BREEDPLAN analysis was released for the Angus breed in 1986 and 4 breeds now publish an annual Sire Summary.

The speed with which the pyramid structure has diminished is directly related to the level of usage of AI and the availability of a National Sire Summary.

The level of use of AI is greatest in those breeds which do not impose restrictions on the use of AI and which use GROUP BREEDPLAN.

The Angus breed which has minimal limits on the use of AI and produces an annual Sire Summary now resembles the dairy industry where there are influential bulls rather than influential studs.

In general the *Bos indicus* breeds still have a strong pyramid structure due to the lower use of AI and the absence of a Sire Summary, however the usage of AI has increased in recent years.

Two elements of the seedstock sector have to be categorised when addressing uptake of technology and breeding practices.

(a) **Influential studs** are those herds which have a significant impact on the genetics of the breed as a whole.

(b) **Influential breeders** are those whose ideas and marketing methods have an impact in terms of breed direction and the uptake of breeding technology within a breed. Many of today's influential breeders are successful because of a "team" approach between husband and wife, parents and sons or daughters. It is the consultants' opinion that there are probably less than 20 per major breed and could be a priority target for incorporating any planned breeding extension activities.

In recent years a range of new entrepreneurial companies have emerged with embryo transfer and management packages to entice the city business person into investing in "high-tech cattle breed/showing programs". The major selling point for these schemes has been tax saving or more correctly, tax deferral, however the influence of these companies has been very low in terms of the impact of one herd's genetics or one company's influence on the uptake of embryo transfer for instance. In the case of one or two new breeds these entrepreneurial companies do have influences but only in the short term.

5.2.1 Influential studs

These are herds which make a major impact on a breed in terms of bulls sold at a nucleus or multiplier level through to the commercial herds. There is a distinction in the level of influence that one herd can make in a breed today based on the level of artificial insemination used in the registrations of a breed.

The Angus breed is an example of a breed using a relatively high level of AI; currently 20% of Angus registrations are by AI, including embryo transfer calves. There are questions about the influence that one or a few studs can make on the genetics of the breed today. That is to say with twenty per cent (20%) of calves registered by AI, fourteen per cent (14%) of the calves are in fact sired by the ten most popular AI sires. Nine of those ten sires are from North America. While some of those sires are owned by Australian herds and the semen marketed by them, an increasing number of AI sires have been marketed by Australian AI organisations with links to North American companies, e.g. Riverina Artificial Breeders with American Breeders Service, and Victorian Artificial Breeders with Select Sires in the USA.

Recent announcements by the National Association of Animal Breeders (NAAB) in USA, about the availability of funds to qualified private firms for promotion of USA origin bovine semen in international markets may accelerate the trend to use of imported semen in Australia.

Within many breeds there are significant groups of breeders with an anti-North American breeding bias due to perceived lack of adaptability to Australian grazing conditions or for marketing/commercial reasons.

A perusal of the 1991 breed Sire Summaries for Angus, Hereford and Poll Hereford however demonstrates the prominence of North American genetics in these breeds today.

Breeds where an individual herd's genetics have strong influences across the breed are rare today unlike for instance, the situation for the Hereford breed pre-1960 (Davey and Barker 1963). In the case of most breeds the international AI sires have become the dominant genetic force. Not surprisingly for European breeds, U.K. and Europe have been the country of origin of most of the genetics but for the British breeds, North America has been the source in the last decade. In recent times, due to the Bovine Spongiform Encephalitis (BSE) ban on export of genetic materials from UK and due to established marketing channels opened from North America, North American genetics have assumed an all-pervading influence on Australia's beef seedstock. The importance of imported genetics to the Australian beef industry is not a new phenomenon (Davey and Barker 1963).

The Murray Grey is an example of a traditional breed where there is no influence from overseas and a low level of AI and could be studied for the influence of individual herds on the breeds genetic structure. However, that study would be of academic interest only. In an attempt to form Murray Grey GROUP BREEDPLAN the breed has nominated AI reference or link sires to tie the performance databank together. Once GROUP BREEDPLAN is established the level of AI will have to rise to enable more herds to participate. It will be interesting to see if the traditional influential herds will provide the popular AI sires of the future, or the performance oriented herds.

Another aspect that needs to be addressed in terms of the influence that one or a few breeders can make on the genetics of a breed is information extracted from the 1988 registration for the registered Angus herd in Australia. In 1988, nine hundred and seventy-two (972) sires were used overall in the breed register. Only 75 of the sires had more than 30 registered calves in that year and that in a breed where there is no registration fee for calves, i.e., the fee is incorporated in the inventory fee for dams. Seedstock herds, because of a range of factors, e.g. risk, marketing and corrective mating etc. use sires at a lower male: female ratio than commercial herds. Influence on the commercial herd by one stud is therefore going to be primarily a function of sales volume.

5.2.2 Influential breeders

These are the breeders who have a strong influence on a breed's directions in terms of the uptake of technologies such as BREEDPLAN, GROUP BREEDPLAN, artificial insemination, embryo transfer etc. In terms of this project these are likely to be more important than influential herds. In some cases the influential breeders own the influential herds.

An influential breeder is likely to be involved in all technologies to a certain extent. It is apparent in recent years that the skills of communication through newsletters and image-building advertising are keys to an influential breeder. It is likely that an influential breeder would spend up to 10% of the turnover of the seedstock business on advertising, promotion etc. An influential breeder is usually supportive of the breed at a national, state or regional level.

In recent years we have seen the advent of a slightly different influence. This is the 'technology influential' person who has used technological advances such as embryo transfer or serving capacity testing to increase their influence, but they are different in that their influence spreads across breeds.

Success in selling seedstock has, of course, a major bearing on how influential breeders arise within an industry. Today the ability to speak publicly and to market a herd and its breeding objectives are part and parcel of the make-up of an influential breeder.

Of course just as some seedstock breeders will achieve success in different fields so they will influence different sectors of the seedstock business. A leading show team will influence breeders who are interested in showring success and new investors who believe that the showring is the area of breed business that they can achieve success. Proponents of carcase competitions and breeders who selected heavily for carcase traits will have influence on that segment of the market and so on.

A new element of influence is market derived. Some feedlot livestock managers are now very influential in breeding for the Japanese grain fed market. Their views on selection directions are widely sought by breeders, evidenced by the frequency of talks, judging appointments and articles attributed to them.

It is the consultants' opinion that for an influential breeder in terms of technology uptake to be successful in his seedstock venture, he will be a skilled marketer, a clear communicator, innovative and will be seen to have the breed's well-being as part of his makeup.There are probably less than twenty per breed who could be targeted by a planned breeding project.

5.3 The Existing Infrastructure of Extension Delivery to the Seedstock Sector

The Seedstock Sector is an insular, largely self-sustaining group with regard to how it sources technical information and how they adopt that technology. Our survey, of 724 seedstock breeders of many beef breeds operating in temperate and sub-tropical Australia shows quite clearly the insularity of their behaviour. For instance, they rank other seedstock breeders and their Breed Societies and Associations above State Department beef extension officers, and other professionals, as their primary source of information about new breeding practices.

Of all the media sources available, they rank Breed Society journals second to specialist beef magazines such as the "Beef Improvement News" or "Farm" magazine as a preferred media source of technical information.

Stud stock agents (usually employed by the major companies), with the exception of NSW, rated more highly than free government services and private veterinarians in influencing breeding decisions. When they in turn were surveyed, stud stock agents ranked breed societies

and stud breeders above department beef cattle extension services as their primary source of information, and breed journals as their most useful media source of technical information.

The recent and foreshadowed cuts in funding for State Departments of Agriculture in Victoria and Queensland together with a poor demand for advice following implementation of fee for service in Tasmania, and a move away from specialist beef cattle extension officers in South Australia and Western Australia suggests that State Department extension services will have an even smaller influence on breeding technology in the seedstock sector for the future. A low priority is now given to extension in extensive industries in Victoria and the forthcoming offer of voluntary redundancies to extension officers in Victoria and moves towards fee for service at a time for cost-cutting in the rural sector may restrict their potential impact in the seedstock sector.

An important trend which has occurred since 1986 is the use of full-time or part-time technical staff (ex-State Department) by Breed Societies. These technical officers augment breed society technical committees and have given rise to closer links with State beef extension services where they still exist as a strong resource. NSW Agriculture and Fisheries beef section does not follow the national trend at this stage and has a higher rating of influence (see Appendix A.4, Table A.21 page 64).

We consider that one of the greatest future needs for the uptake of breeding technology in the seedstock sector, is a continued independent source of scientifically-founded, technical information. The BREEDPLAN genetic evaluation and support services, for instance, can be cited as an independent source.

In the next five years slightly more herds are expected to be selling bulls than at present but on average all herds are expected to be selling 70% more bulls than at present. Clearly without an increase in the size of the commercial herd there will be more losers than winners. The seedstock sector is already facing a period of rationalisation with a trend towards fewer, larger seedstock operations who will have the finance, business and marketing skills to survive and grow. The advent of cloning at commercial prices at a future date could accelerate this trend.

At present twenty- four per cent of seedstock breeders, (see Appendix A.1 Table A.5 page 47) sell some semen each year. It is unlikely that in the next five years we will see an increase in numbers in that specialist market but those who are currently selling semen expect a large (150%) increase in sales. Their estimated total average sales in 1995, at 653 straws, does not represent a huge share of the AI market but it is another indicator of the trend to fewer, larger operators in the seedstock sector. While seedstock breeders are predicting almost a doubling of AI usage in the next five years (see Appendix A.1.5 page 46), the AB centres through their importation of overseas performance recorded sires with high accuracy EBVs (or EPDs) are likely to dominate the increase in sales of semen.

A similar trend is evidenced for the sale of embryos with about the same percentage of breeders selling embryos in five years time but these are predicting a 125% increase in sales (see Appendix A.1 5 Table A.6 page 47).

5.3.1 Contact level of NSW Beef Advisors with BREEDPLAN herds

Our survey has highlighted that seedstock breeders rank other people and entities above State Department beef extension officers as sources of information about new breeding practices. Information about the contact level of NSW Beef Officers with BREEDPLAN herds is available from a survey conducted by B. Sundstrom, Beef Breeding Specialist for the NSW Agriculture and Fisheries.

The 18 District Beef Officers in NSW were asked to score the level of contact they have with the BREEDPLAN herds in their districts.

% of Herds	Level of Contact
12%	Detailed advice on Breeding program.
29%	Some advice on breeding as well as general advice.
17%	Property not visited but occasional advisory contact.
22%	Known to advisor but no advisory contact.
20%	Not known to advisor.

Replies were received from districts covering 476 of the 500 BREEDPLAN herds in NSW.

* With approximately 40% of herds they had sufficient contact to assist in correct usage of BREEDPLAN. There were only 12% of herds however, with which they had close involvement in breeding decisions.

* The 20% of herds completely unknown to their advisors included a lot of what they described as 'hobby' studs surrounding the Sydney metropolitan area. They are a low extension priority and unlikely to be serviced by their staff. The remaining 40% are a challenge to them, but will include a large number of studs who traditionally don't relate to their advisory staff. Many of these will either continue this way or at best only relate to their top few staff.

5.3.2 National Beef Recording Scheme/BREEDPLAN

Breeders who use BREEDPLAN/GROUP BREEDPLAN are the largest and fastest growing definable group within the seedstock sector. The technologies embodied in BREEDPLAN and planned for future incorporation have been substantially funded by AMLC/AMLRDC (about 26 per cent of the total R & D investment for NBRS/BREEDPLAN).

Given the large potential returns to industry from the effective utilisation of these technologies. (An ACIL review of NBRS and BREEDPLAN considered the past and future benefits had a Net Present Value of around $500 m). It is appropriate that a national action plan for the seedstock sector contain a BREEDPLAN technology-transfer strategy as a major component and this is discussed in Section 10.1 on page 35. However the position of National Coordinator must be viewed independently of the national action plan and is discussed in the next section.

5.3.3 National Coordinator of NBRS/BREEDPLAN

The concept of a national coordinator for NBRS has been a very successful extension position albeit it has been under-resourced for the magnitude of the task. As well as the direct effect in extension terms, it has also been the training ground for a number of breed society technical personnel and the coordinator of the National Carcase Evaluation project,who are now a significant industry resource.

To this point in time the position has been a seconded position from State Departments on a rotated basis. It is now understood that Standing Committee on Agriculture (SCA) have decided that the position will not proceed beyond the present incumbent.

It is the consultant's opinion that the position should be permanently staffed and that the cost of that position should <u>not</u> be solely borne by the users. The benefits of the position spreads widely to all sectors of the beef industry.

It is therefore recommended that the position be part of the core funding for NBRS/BREEDPLAN. Whilst the position does not necessarily have to be based in ABRI, it clearly must be in Armidale so that the Coordinator can act as an independent resource to Breed Societies, State Departments and breeders, in the city with national focus for beef breeding.

Even permanently funded, the role of the National Coordinator needs to be specified more rigorously as a resource person rather than an extension person. This is alluded to in the current National Coordinator's program plan for 1991 (see Appendix G).

It must be recognised that a structure needs to be put in place below him to allow dissemination of the information through to the commercial sector. That need in terms of the seedstock sector is addressed in Section 7 on page 35.

5.3.4 Cost of GROUP BREEDPLAN Version 3.0

Individual breeders bear the costs of within-herd BREEDPLAN and that is considered appropriate. However individual breeders also bear the additional cost of across-herd GROUP BREEDPLAN although the benefits of GROUP BREEDPLAN accrue to the industry at large.

Discussions with GROUP BREEDPLAN users during the course of this study confirm the concerns of breeders about this situation and it became apparent that the participation in recording, analysis and evaluation of traits, other than those incorporated in the basic unit ie. growth traits, is at risk unless industry funds are input to support the system. The possible benefits to the industry as a whole from EBVs for fertility and carcase traits may be lost because of poor participation at the seedstock level.

6. Uptake of Technologies

Four technologies are considered in depth in this report.

They are (GROUP) BREEDPLAN, artificial insemination, embryo transfer and serving capacity testing.

6.1 (GROUP) BREEDPLAN

BREEDPLAN is a within-herd genetic evaluation program available to the Australian beef industry since 1985 from the National Beef Recording Scheme (NBRS). The product is state-of-the-art in world terms.

GROUP BREEDPLAN is an across-breed evaluation program available to breeds (groups) where adequate linkage between-herds is created by link or reference sires. To date Angus, Devon, Hereford, Poll Hereford and Simmental have had GROUP BREEDPLAN analyses with varied frequency since 1986. Brahman, Limousin, Belmont Red, Murray Grey, Charolais, Santa Gertrudis and Shorthorn are at various stages of preparation for involvement in GROUP BREEDPLAN.

Early adopters of BREEDPLAN were typically innovators but our analysis of the survey showed they did not have a higher level of education than non-adopters. Five years after the release of the technology BREEDPLAN adopters now show a higher educational profile than non-adopters. They are more likely to have a computer (52%) than non-adopters (35%) (see Appendix A.1.3 on page 45). BREEDPLAN herds sell more bulls, semen and embryos on average than non-BREEDPLAN herds (see Appendix A.1.5 page 46). They use more AI than non-BREEDPLAN herds (see Appendix A.1.7) and more embryo transfer (Appendix A.1.8 page 49), and more service capacity testing (Appendix A.1.9 page 50).

BREEDPLAN adopters responding to the survey had been members for 3.3 years on average. Eighteen per cent (18%) of BREEDPLAN members had not yet submitted records for a range of reasons. Forty-per cent (40%) of these said they had not submitted records yet, but still intended to (see Appendix A.2.4 page 52).

Of those breeders surveyed not already members of BREEDPLAN, thirty-seven per cent (37%) indicated they had recently joined or intended to join in the next twelve months. Of the sixty-three per cent (63%) of respondents who indicated they would not join BREEDPLAN, twenty-nine per cent (29%) considered they were too small (Appendix A.2.4). There is potential for an increase in BREEDPLAN enrollments above the 37% from a group who said they would join if NBRS and extension agencies address the issues raised in Appendix A.2.4 of this report.

BREEDPLAN users consider the technology with a rating just below "very useful" (Appendix A.2.5) but those in GROUP BREEDPLAN rate the across-herd evaluation slightly more useful than their within herd BREEDPLAN.

In answer to questions about their basic understanding of BREEDPLAN, users considered that they had a good knowledge of the information needs and the time to collect it. While breeders suggested a reasonable to good understanding on the recording of management groups, cross analysis of their responses on their **perception** of their understanding with their **actual** answers to set questions on management group recording showed a low correlation. In other words, many BREEDPLAN users consider they have a good basic understanding of BREEDPLAN and its recording needs, when in fact they don't.

There is an emerging push from the technical/geneticist level for a move towards the compilation of selection indexes.ABGU/ABRI are just about to commercialise B-OBJECT. In response to a question about incorporating EBVs (Estimated Breeding Values) into a combined value, 15% of BREEDPLAN users did not answer at all, 20% said they could make no

judgement and the 65% of BREEEDPLAN users who gave it a rating at all ranked it only moderately useful. Clearly, the introduction of combined value (index) needs clear messages to, and discussion with industry (see Appendices A.2.7 and A.2.8 pages 53 and 54).

For the delivery of 'future' traits in BREEDPLAN (see Appendix A.2.9 Table A.11 on page 54), users rankings for the first 5 out of 14 traits offered were;

Trait	Rank
Female Fertility	1
Calving Ease	2
Scrotal Circumference	3
Eye Muscle Area	4
Feed Efficiency	5

There was little interest in marbling as a future trait which is surprising because if the seedstock sector is not interested in evaluating marbling as a trait, the commercial feedlot sector may do it by itself. Identification of marbling sires is at the highest priority in the USA beef industries listing and marbling is an integral component of the McKinsey recommendation of repositioning the Australian product for the Japanese market.

In respect of delivery of female fertility traits only the Angus and Simmental integrated pedigree performance systems have a recording system in place which will capture the necessary data. A significant level of developmental work needs to be carried out by the other breeds before they can provide genetic evaluation of these traits for their breed.

6.2 Artificial Insemination (AI)

When asked to rate seventeen technologies on their usefulness in their breeding programs, AI came out first (see Appendix A.1.6 Table A.7 page 48).

Seventy three per cent (73%) of all seedstock breeders use some artificial insemination in their breeding herds (Appendix A.1.7 page 49). Respondents indicated a twenty five per cent (25%) increase in usage of artificial insemination in the next five years. Breeders of Angus, Charolais, Murray Grey Poll Herefords and Simmental gave AI a higher rating as a useful technology than Hereford, Limousin, Santa Gertrudis, Shorthorn, who in turn gave it a higher rating than Devon or Brahman breeders.

Although not included in the questionnaire, breeders commonly cite cost, labour, risk of increased calving spread, poor results from insemination after synchronised programs as reasons why they do not increase their use of AI. Autumn joining herds in the main are more favourable to AI than spring joining herds in the seedstock sector. This may be a factor in the southern state dominance of herds in GROUP BREEDPLAN.

Reference sire schemes, entry into GROUP BREEDPLAN and spread of genetics from overseas performance-recorded sires are all factors to encourage AI adoption, however it should be noted that the difference between BREEDPLAN users of the technology and non-BREEDPLAN users is only twenty two per cent (22%) (see Appendix A.1.7 page 49) and there is no difference in average numbers of AI calves between users in the two groups.

Some breeds have a higher level of AI usage than others. For example if we consider two similar breeds growing in similar parts of Australia, the Angus and the Murray Grey, we see two distinct trends. Twenty per cent (20%) of all Angus registrations are by AI and less than five per cent (5%) of Murray Grey are by AI. Factors such as those cited in the previous paragraphs have a bearing on the breed differences except in the case of Murray Greys where overseas genetics are not a factor. Angus have been involved in sire referencing nationally since 1979 (1972 in Victoria). They were the first breed to have GROUP BREEDPLAN in 1986 whereas the Murray Greys are only now addressing GROUP BREEDPLAN. Angus

have more than 100 herds adequately linked for GROUP BREEDPLAN, the Murray Greys may have 10, yet both breeds are of a similar size at the Breed Society level .

Although international comparison is outside the scope of this study the levels of AI used in the registered herds of Angus overseas are useful to place the uptake of AI in our highest beef breed user in perspective with that in overseas countries that have extensively-managed beef herds. For New Zealand the level is eleven per cent (11%), Canada: thirty per cent (30%), U.S.A.: thirty-seven per cent (37%) and Argentina : fifty per cent (50%). Therefore our highest beef breed user of AI in Australia (Angus) uses almost double of that breed in New Zealand but substantially less than our northern hemisphere counterparts. AI regulations for some breeds are still constraints to uptake of the technology. In some breeds, e.g, Poll Hereford, 2 straws of semen plus a registration can cost up to $1000. Even where semen costs $200 per straw the end result given a fair average result of 50-60% conception from AI, brings the cost up to more than $400 per calf. On the other hand Angus low cost semen from performance-recorded sires has always been available at commercial prices.

AI for breed societies is a difficult area. A proliferation of AI for a breed leads to breed improvement but can also lead to lower average prices for bulls. With an abundance of semen available from sires with merit, at commercial prices, people are more inclined to try to breed a 'good' bull themselves rather than buy one.

6.3 Embryo Transfer (ET)

In rating the usefulness of ET as a breeding technology breeders rated it 8th out of 17 (see Appendix A.1.6 Table A.7 page 48).

In spite of a potential doubling of genetic gain by the use of embryo transfer, the costs and poor results have deterred all but the most ambitious of seedstock breeders or entrepreneurial breeders catering for the tax deferral/investor market or importing new breeds. The highest usage of ET in a beef breed in Australia is 5% of registrations. If the entrepreneurial breeder disappears from the market because of any changes to the taxation laws the level of usage will probably drop to 2% or less. Our survey results suggest that for those 24% of seedstock breeders who have used ET there will be no increase over the next five years (see Appendix A.1.8 page 48).

Younger breeders see ET as a more useful technology and breeders of Simmental or Limousin see the technology as more useful than breeders of the more traditional breeds.

Breeding design theory (see Smith 1990) suggests that embryo transfer plus performance recording offers contemporary breeders the best route to genetic gains. However, even the most dedicated performance breeders in Australia have found the financial benefits from ET may not outweigh the costs. With few commercial breeders having clear breeding objectives which are put into place when they are buying seedstock, it is difficult for the seedstock breeder to get the premium rewards from the added genetics that might be delivered in an ET program. In a perfect world, with commercial breeders buying on selection indexes, the seedstock breeder might get the premium for his ET endeavours, but not yet.

Increased super-ovulation success and efficiency could lower the costs, however, it is the recommendation of the consultants that ET be left to find its commercial level in the marketplace without any strong extension effort, unless advances in technology lower costs considerably.

6.4 Serving capacity testing

NON BREEDPLAN breeders gave serving capacity a higher rank (5th) than BREEDPLAN breeders (7th) when asked about the usefulness of seventeen technologies in their breeding programs (see Appendix A.1 6 Table A.7 page 48)

The so-called Blockey Test or Serving Capacity testing has been one of the breeding industry's tools for some fifteen years now. After an initial promotion push in the early 80's and the provision of a professional service by a few cattle vets around the country plus a few Departmental beef officers, the technology has increased popularity. Perhaps the first public realisation of the popularity of the technology was from a show of hands from the 300 plus participants at the first BIA Conference in Armidale in 1989 when asked if they used the technology. There had been discussion until then by some industry commentators that the technology was dropping in popularity due to disillusionment with the test and for animal welfare reasons. Our survey has shown the opposite.

Nineteen per cent (19%) of breeders have used serving capacity tests in their breeding programs over the last five years and in the next five years, forty-seven per cent (47%) indicate they will be using it (Appendix A.1 9 Table A.9 page 50). BREEDPLAN users show a greater usage in the technology to date (ie. 24% compared to 11%) but for those not using the technology now and who indicate they will in the next five years (ie. 51% compared to 39%) there are no real differences between BREEDPLAN and non-BREEDPLAN users (27% and 28% respectively).

If the predictions of 47% usage in the next five years are realised, no public extension of service capacity testing is required because its success in the market place will ensure its increased adoption. However two issues must be addressed. They are the welfare issues and standardisation of the test to produce genetic evaluation. The Beef Improvement Association is going to carry out research on both subjects. The authors suggest that the future usage of the technology should be monitored where possible to see if the predicted increase in usage is realised. NSW Agriculture and Fisheries could perhaps coordinate with the Australian Veterinary Association when they survey the Veterinary Practitioners as part of this Planned Breeding Study.

7. Technical Capacity of Breed Societies and Stud Stock Agents

7.1 Breed Societies

Breed societies and some of their influential breeders have a potential to be a potent force as an extension agency within the seedstock sector and to facilitate the uptake of new breeding technology.

Seedstock breeders identified breed societies second only to other breeders, and ahead of government extension agencies, as their most important source of information on breeding.

Similarly breed society journals rated second only to specialist beef journals, and ahead of public domain media channels, as their most important media source.

Whilst breed societies are seen by the seedstock sector as an important part of the technology transfer system, the technical capacity of the societies to fulfil that role is varied.

There are 30 recognised beef breed societies operating in Australia, of which 15 each register more than 1.0% of total seedstock registrations (see Table 2 page 11).

Breed societies can be categorised into 4 distinct groups based on their ability to utilise breeding technology and to provide a technical service to its members.

High Technical Capacity

The only two societies in this category are Angus and Hereford, representing 7.5% and 18.6% of total registrations respectively.

These societies both employ high profile, graduate technical officers who are registered agricultural consultants, have broad extension and international consulting experience, are past national co-ordinators of NBRS, and provide technical input to industry activities and R & D committees.

Both societies have technical sub-committees and specific breed development and extension programs, produce technical bulletins, conduct field days and workshops, handle ad-hoc enquiries of a technical nature, conduct and/or co-ordinate breed specific research programs, and produce annual sire summaries utilising GROUP BREEDPLAN.

Moderate Technical Capacity

These societies, representing about 51% of total seedstock registrations, do not employ graduate staff dedicated solely to breed development and/or extension activities but do have varying degrees of technical capacity in utilising and extending breeding technology, either by way of graduate executive officers (Simmental, Shorthorn, Brahman and South Devon), or by the employment of non graduate field officers (Santa Gertrudis, Poll Hereford), and/or by the use of part-time consultants on contract assignments (Shorthorn, Charolais, Santa Gertrudis, Poll Hereford, Brahman).

All of these societies produce a varying array of technical and semi technical publications and most have technical sub-committees.

Note: Some of the breed development/extension activities of the Poll Hereford Society are now conducted as jointly funded programs with the Hereford Society, utilising Hereford Society technical capacity.

Limited Technical Capacity

These societies, representing about 18% of total seedstock registrations, have very limited technical capabilities when compared with those in categories 1 and 2 above.

They do have breed development sub-committees and produce a society publication at least annually.

Breeds in this category include, Droughtmaster, Limousin, Braford, Murray Grey, and Red Poll.

Note: Murray Grey have recently joined with Angus in a joint market research project.

Minimal Technical Capacity

This group represents the smaller Societies, none of which employ full time staff, and none of whom account for more than 1.0% of total seedstock registrations.

These societies have not been included in the summary in Appendix B on page 66.

7.1.1 Impact of breed society technical services

The Hereford and Poll Hereford Societies make an interesting comparison relative to the effect of in-house technical capacity on the technology transfer process.

Both societies register a similar number of animals per year (approximately 30,000), both have a similar commitment to BREEDPLAN - approximately 200 members each - and a similar commitment to GROUP BREEDPLAN.

The Hereford Society, since 1985, has employed a full time graduate Technical Officer whose main activities relate to breed development whilst the Poll Hereford Society employs 2 Field Officers whose main activities are related to breed promotion, but now adopting a more technical emphasis.

Table 6 gives the ranking by BREEDPLAN members from both societies on where they obtain information about new breeding practices.

Hereford breeders indicated a greater reliance upon their society for the provision of technical information and a reduced reliance on traditional extension services and agents for information than did Poll Hereford breeders.

Table 6: Ranked differences in preferred source information on breeding technology

	Hereford	Poll Hereford
Other Breeders	2	1
Breed Society	1	3
Veterinarians	3	4
Stud Stock Agents	8	6
Commercial Agents	9	9
Beef Extension Officers	4	2
Generalist Extension Officers	7	7
A B Companies	5	5
Consultants	6	8

Note: Seedstock producers from the other "high technical capacity" society, Angus, echoed the Hereford response in the above table.

Breed societies have a distinct advantage in the seedstock sector as being a preferred "pick up" point for new technology, either directly or indirectly, and should be considered an integral part of the technology transfer system.

There is a lot of sense in having breed societies more directly involved in the extension process.

Experienced breed technical officers continually report that many technology transfer attempts by some extension agencies are so insensitive to the commercial reality of seedstock operation, that they are counterproductive.

Breed society personnel are perceived by members to be working for their direct benefit and as such are more directly accountable for their performance, and they better understand the social and competitive interactions that can be constraints in the adoption of new technology.

However for this advantage to be exploited, the technical capacity of breed societies needs to be enhanced by providing practical, unbiased technical information on breeding that can be disseminated through the breed society communication channels.

7.2 The Influence and Role of Stud Stock Agents in the Seedstock Sector

Stud stock agents are an elite group within the stock and station agency sector who specialise in the marketing of seedstock.

Whilst there is a general perception within the seedstock industry that stud stock agents have considerable influence our survey showed that agents ranked low as a source of new information about breeding technology.

They do have considerable influence on selection decisions however, and ranked higher than departmental extension officers (with the exception of NSW) and veterinarians as an influencing force in this regard, particularly with the more conservative breeder.

A separate survey of thirteen (13) key stud stock agents was conducted to ascertain their general training, knowledge and perceived needs relative to new breeding technology (see Appendix D on page 68).

Stud stock agents are generally less well educated than seedstock breeders and have had limited opportunity to learn about new technology through in-service training or attendance at industry schools or conferences.

Stud agents are in a position to, and do, exert considerable influence in the uptake of breeding technology. This level of influence is not related to their level of training in animal breeding and is likely to be a function of their marketing role and skills, and their part in seedstock sales.

8. Future Developments and their Likely Impact on the Seedstock Sector

8.1 Genetic Evaluation

The impact of artificial insemination and national sire evaluations on the traditional pyramid structure of the breeding industry has been outlined in Section 5.2 on page 15.

The genetic evaluation system utilised for within herd analysis (BREEDPLAN) and across herd analysis (GROUP BREEDPLAN) utilises the Best Linear Unbiased Production (BLUP) technology in a multi-trait animal model. From 1985 to 1989 BLUP was used to provide estimated breeding values (EBVs) for direct and maternal growth traits. In 1989 the first EBVs for carcase traits were made available to breeders. In the first half of 1991 EBVs for the first fertility traits will also be provided to some breeders.

Estimated Breeding Values can be provided for almost any trait that can be measured or scored with a reasonable degree of accuracy and repeatability. The data to allow the calculation of the genetic parameters for a number of new traits will be collected in the UNE 30 Validation Project which will commence in early 1991. Table 7 lists the traits for which EBVs are currently provided or may be provided in the future.

Table 7: Traits which have EBVs currently provided or may have EBVs in the future.

Growth:	
*	Birth weight
*	200 day weight (direct)
*	200 day weight (maternal)
*	400 day weight
	500 day weight (*Bos indicus* BP)
*	600 day weight
	700 day weight (*Bos indicus* BP)
	900 day weight (*Bos indicus* BP)
Fertility:	
	Scrotal size
	Days to calving
	Gestation length
*	Calving ease (direct and maternal)
	Pelvic size
Carcase traits:	
*	Fat depth
*	Eye muscle area
	Carcase weight
	Estimated lean meat yield
	Marbling
	Tenderness
	Fat colour
	Temperament
	Tick resistance
	Feet structure
	Leg structure
	Udder attachment
	Teat size
	Sheath score

* Traits which currently have EBVs.

The number of EBVs currently available is already presenting a sizeable challenge to breeders and bull buyers. The addition of EBVs for more traits will almost certainly be perceived as "information overload" even though intuitive decisions are already made on some or all of these traits when selecting or culling.

8.2 Breeding indexes (Combined breeding values)

One classical and intuitive method of making selection decisions using a large number of traits is to use breeding indexes which combine traits according to their economic importance. However most contemporary seedstock breeders use independent culling levels and/or tandem selection of traits in their selection.

Considerable effort and progress has been made by the AGBU group in association with the CSIRO Cattle Breeding group at Rockhampton in the development of B-Object system which provides the capacity to rank animals for a single index incorporating a large number of economically weighted traits. The B-Object system runs on a micro computer and is customized to allow individual breeders to rank animals according to their own breeding objectives and economic weightings. The B-Object system will be marketed by ABRI as a package which can be provided on a consultancy basis and will be available in 1991.

The uptake of B-Object is likely to be slow at first but will be a further technology challenge to breeders. As stated previously, survey respondents indicated a lack of understanding of this technology. There was a great divergence of opinion on the usefulness of these enhancements at the 1989 BIA Conference in Armidale. While the stated aims of the technology is to simplify EBVs by combining them to one value, some influential breeders suggested the introduction of $EBVs would confuse the commercial sector at its present level of understanding of EBVs, and were openly hostile to its incorporation in BREEDPLAN.

8.3 Multiple ovulation and embryo transfer (MOET)

Multiple ovulation and embryo transfer technology is currently used quite widely (albeit at a low <5% level) in the stud industry to increase the number of calves born to cows considered to be superior. While the use of MOET in Australia is currently based largely on an entrepreneurial basis (quick returns), Smith (1990) has calculated that if used in a planned breeding program it has the capacity to increase genetic change by 50-100%.

Such a program if undertaken by a major feedlot or artificial breeding centre could have a major impact on the structure of the bull breeding industry and move the source of supply away from the registered sector.

At the current cost per live calf of MOET programs, McClintock and Nicholas (1990) have calculated that "only very large scale MOET nucleus programs from which many thousands of bulls are sold are expected to be cost effective".

8.4 Semen sexing and embryo sexing

Semen sexing is not yet possible. Embryo sexing is available in Australia but at a cost of $100 per embryo. If semen sexing is achieved or embryo sexing becomes much cheaper it does present the opportunity to breed large numbers of beef bulls by utilising the dairy industry. Half the dairy cows could be inseminated with "female" semen or female embryos to breed dairy replacements and the other half of the herd could be implanted with beef bull embryos.

8.5 Cloning

The current methods of "cloning" are advanced embryo splitting techniques which are limited by the viability of split cells to grow to the 16 or 32 cell stage. Considerable research is being directed at the development of culture techniques for embryonic stem cells.

Success in this area may change the structure of the bull breeding industry in a similar way to the introduction of AI. Breeders would have access to large numbers of cloned embryos which have been thoroughly evaluated for production traits. A clear understanding of genetic evaluation will be required for optimum use of clones.

Smith (1990) estimates that if unlimited numbers of cheap embryos from selected clones were to become available a one step improvement of 15-30% of the mean could be achieved for any trait.

He also indicated that genetic selection using larger numbers of the best clones can also be maximized while maintaining genetic variation.

8.6 Gene mapping

A major gene mapping project is underway at CSIRO, Rockhampton. This research aims to identify the location of genes which control commercially important traits. According to McClintock and Nicholas "much more needs to be known about the physiology of animals before promises of commercialisation of genetic markers can be fulfilled".

However the potential to identify these gene loci presents another potential challenge to breeders of cattle.

8.7 Transgenics

While animals with transferred genes have been produced none have been commercially advantageous. Any animals produced by gene transfer would require extensive testing and progeny evaluation as for normal animals to assess their viability and economic value. The most likely genes to be transferred would be those that offer disease or parasite resistance. For example the transfer of tick resistance to British breeds of cattle could see a major change in the ratio of British and *Bos indicus* sires in the northern beef industry.

The correct use of transgenics would require a solid education program.

8.8 Discussion

Some of these "future" technologies were included in a list of 17 breeding practices which breeders were asked to rate for usefulness in their breeding programs. Respondents in general gave these technologies the lowest ranking (Appendix 1.6 Table A.7 on page 48) and these technologies received the lowest response rates. Seedstock breeders in general have not considered the implications of these technologies at this stage. Induced twinning received a relatively high response (Appendix 1.6 Table A.7 on page 48) but the poorest ranking of all. Seedstock breeders tend to focus on individual animal performance at a higher level than commercial breeders and twins are rarely seen as a bonus at the seedstock level, more often as a liability. It remains to be seen what priority the commercial sector would put on twinning.

All of these technologies have the capacity to make major changes to the traditional bull breeding industry as it currently exists.

However the costs of AI programs will ensure that the vast majority of commercial cows will be mated by natural service bulls. The number of natural service bulls required by the industry is unlikely to change much from current levels. However the methods used to produce these bulls may change markedly. This will be especially true if the dairy sector becomes the 'incubator' for beef bulls to join with commercial cows in the future.

There is a clear need for quantification of the impact that future 'novel' technologies could have on the structure of the seedstock sector, before it happens.

9. Developing a National Action Plan for the Seedstock Sector

This study has identified the needs, constraints, opportunities and methods appropriate to the development of a national plan to increase the adoption rate of breeding technology in the seedstock sector of the Australian beef industry.

9.1 Needs of the Seedstock Sector

(a) A better understanding of the principles of basic mendelian and population genetics so that the relevance of developments in breeding technology are more apparent.

(b) A better understanding of the application of technology so that the maximum cost benefits of the implementation of technology will be realised at both the herd and national level.

(c) A source of relevant, authoritative and independent information on breeding technology to reduce selective usage of information and to better utilise scarce and diminishing resources. Unlike most extension agencies, the seedstock sector knows no geographic boundaries, and the supply of information needs a national perspective.

(d) Sector specific education, e.g., AB Companies and Stud Stock Agencies, opportunities for service organisations and personnel that would allow them to be a more effective force in technology transfer.

(e) Ongoing field support at the breeder, Society and technical/extension level for the BREEDPLAN, GROUP BREEDPLAN genetic evaluation system as it enters new trait areas e.g. days to calving, scan traits and other fertility traits.

(f) Careful introduction of new technologies e.g. B - Object, a system of combining EBVs.

(g) More effective liaison between the seedstock sector and the research sector in regards to directions of genetic and breeding technology research e.g. B-Object and twinning.

(h) Industry resources e.g. resource funds should be better balanced between research and technology transfer. For instance what sense is there in looking at further traits in BREEDPLAN if a basic BREEDPLAN manual and national extension plan is not in place.

9.2 Constraints to the Adoption of New Technology

(a) Education: The generally low level of tertiary education of seedstock producers is a significant constraint, either directly through difficulty in understanding new technology, or indirectly through a "culture gap" with technologists.

(b) Industry Structure: The structure of the industry is a major constraint and/or disincentive to the uptake of the skills and technology that are vital to its purpose.

Strong internal competition for market share between individual seedstock producers encourages the adoption of "immediate response" practices at the expense of longer term genetic improvement.
The small size of many seedstock herds limits the opportunity to implement practises based on the theory of population genetics.

(c) Limited Entry Point for Technology: Because of the insular nature of the sector traditional extension agencies have had only limited opportunity to interact with it, yet few service organisations within the sector have the resources to be an effective source of information.

(d) Cost of Technology: Each new introduction of technology carries with it new and additional costs.

Unless commercial breeders demonstrate their demand for this technology, for example BREEDPLAN EBVs or serving capacity testing, by payment or marketing action, the conservative seedstock breeder will be hesitant to provide them.

Similarly the cost of GROUP BREEDPLAN with the advent of additional traits is rapidly approaching a cost level where seedstock producers might choose between traits recorded, based on cost factors rather than future benefit, thereby inhibiting progress towards the development of EBVs combining a number of traits determining profit at the commercial level.

(e) Resources: it is paradoxical that at the time of greatest availability of new technology, extension resources are at their lowest availability.

With announcement of voluntary redundancy offers to beef extension officers in Victoria and a foreshadowed 10% reduction in beef extension staff in Queensland only NSW has a full strength beef extension service and as such cannot be used as a typical model for extension to the seedstock sector which has a national perspective.

Similarly breed societies vary greatly in their capacity to provide technical support to the seedstock sector.

There is uncertainty about the continuity of the position of national Field Coordinator for BREEDPLAN. Such a position is considered critical to the ongoing successful uptake of the technology to a large percentage of the seedstock sector.

Thus the imbalance that exists between the level of information available to individual seedstock producers, depending upon which state or breed society in which one resides or belongs, will increase dramatically over the next few years.

Available resources need to be co-ordinated and complementary if an effective extension effort is to be achieved.

9.3 Opportunities for Increasing Uptake of New Technology

Change brings about change, and new developments in technology occurring in the beef industry at large are starting to impact on the seedstock industry. This impact is creating an awareness of the need to change, or at least a more positive attitude to change resulting in increased demand for information.

(a) The Beef Improvement Association, although currently lacking a future plan has created a forum for adoption of breeding technology within the comfort zone of both seedstock and commercial producers.

(b) Breed societies are more pro-active with regard to the usage of technology, with a growing trend to appointment of technically qualified staff or consultants, the establishment of technical committees, and the growing influence of those committees within breed society function.

(c) The emergence of strong and definitive market feedback will necessitate the development of market-based breeding programs focusing on a greater range of economic and biological traits.

(d) The increasing success of the early adopters of performance-based technology which can no longer be ignored by the conservative breeder.

(e) Increasing computer and electronic familiarity of seedstock producers is occurring, and will further change attitudes towards sourcing information.

Although the survey response to videos as a means of learning and updating knowledge was not high, it is a fact that few videos on breeding technologies exist. In other disciplines the popularity of instructional videos has increased with maturity of the video market. Sixty-five per cent (65%) of seedstock producers now have video recorders.

(f) The Federal government's new training guaranteed levy introduced 1/7/90 will affect all employers with an annual payroll of more than $200 000.

Employers who fall into that category will be required to spend a minimum of 1%, rising to 1.5% from 1 July 1992, of total payroll on "eligible training".
Thus, service industry companies who have not in the past invested in in-service training programs will be more receptive to useful training opportunities.

9.4 Preferred Delivery Systems

The seedstock sector has been clear in its identification of preferred delivery systems.

Specialists, be they specialist publications, specialist advisers or specialist workshops or field days, clearly outscore the more generalist sources of information.

The sector has also defined a narrow "comfort zone" in the agencies from which they source information, preferring sources that are "close to the heart of the sector", as exemplified in preferential differences between information from breed societies, beef extension officers, and external consultants.

There are problems inherent in the provision of specialist services.

(a) Specialist publications are exposed to the rigours of economic reality and to survive have to balance advertising with editorial. The advertiser gets the editorial he wants but the reader does not necessarily get the information he needs.

(b) Specialist personnel achieve that status as a result of education, experience and empathy relevant to the situation. Such specialists do not come either plentifully or cheaply, and thus need to be used efficiently within the system.

If an effective technology transfer system is to be implemented within the seedstock sector it will need to be an industry based co-operative effort utilising the skills, resources, and goodwill of surviving public and private operatives.

10. A National Action Plan

The current pressure on the seedstock sector is to identify superior seedstock relative to market needs in an overall environment shifting quickly towards a market-driven rather than a production-driven mode. A large amount of the technology and information to allow these changes to occur is already in place or being planned.

A more effective technology transfer system is required if this new technology is to be more widely disseminated and implemented to the benefit of the national beef industry.

10.1 A National Cooperative Breeding Extension Group

The previous sections have addressed the primary technology transfer needs but falls short of transferring this technology to the 'grass-root' breeders on a national basis. In addition BREEDPLAN needs to be blended with other technologies to facilitate a balanced delivery of improved breeding techniques to the national herd.

It is the consultants' opinion that the technology-transfer gap to the seedstock sector will not be satisfactorily resolved unless existing public and private resources are coordinated using a cooperative-group approach. Such a cooperative group would have to satisfy the sectors' need for an ongoing independent source of scientifically-founded, technical information (see Section 5.3 on page 17).

As previously detailed in this report there is no single extension or service agency that has the entry point, skills or resources to provide such a service on a national basis.

For example:

State Department Beef Extension Services -a wide disparity between states with regard to beef extension resources and are restricted to State boundaries. As a group they did not have a high level of entry to the Seedstock sector however Breeding Specialists and individuals have a potential to make valuable contributions.

Universities and Agricultural Colleges have highly specialised resources but have little direct input to extension.

Breed Societies have a national perspective and entry-point but varying levels of technical and financial resources.

Artificial Breeding companies are an important, under-utilised resource which should be used in the extension effort given the increasing importance of artificial breeding in the seedstock sector.

Private consultants and specialist vets are highly specialised individuals whose present skills are regional, but could have a greater national influence.

The Beef Improvement Association (BIA) is a producer-driven, grass-roots organisation with great potential importance but lacking the inter-relationship with the scientific community and at this stage a national focus or plan.

The Australian Registered Cattle Breeders Association (ARCBA) is a breed society (beef and dairy) lobby group.

The Breed Society Technical Committee of the NBRS Board of Management is a feedback mechanism to NBRS on BREEDPLAN and assists in guidelines for BREEDPLAN but is too narrow in its perspective. The future of the NBRS Board is under review at present.

The National Coordinator of NBRS is at present an extension position, however is under-resourced for such a role and would be better placed as a resource person to service other extension agencies.

Coordinator of AMLRDC Projects eg the M8A Project or the National Carcase Evaluation Project offer valuable resources to the information transfer process.

Animal Genetics and Breeding Unit is a research and development unit with limited skills in extension.

An 'umbrella structure' incorporating all of the above-mentioned organisations could be a potent force in the development and delivery of a National Planned Breeding Program for the Seedstock Sector given the appropriate funding assistance.

The Beef Improvement Federation (BIF) of USA provides a useful model for such a group. The BIF began in the the late 60s/early 70s in the States to coordinate the large number of performance recording schemes run by various State Departments of Agriculture, Breed Societies and Universities. It has now developed into the single authority of the seedstock sector on all breeding technologies including uniform guidelines and extension direction. Its committees include:

Live animal and carcase evaluation
Central bull tests
Education materials
Genetic prediction
Growth
Reproduction
Guidelines

The BIF is made up of persons representing Universities, Federal and State Departments of Agriculture, County extension agencies, Breed Societies, AB companies, seedstock breeders and commercial breeders.

It is important to note that representation on the Board of BIF is based on the person's abilities and contribution potential rather than on an institutional basis.

The BIF prepares guidelines for all genetic evaluation and improvement programs, extension and educational materials, and conducts a highly-regarded annual conference, the proceedings of which are in demand world-wide.

The impact of the BIF now goes well beyond the seedstock sector and reaches the commercial breeder, the lot-feeding and the processing sector.

In the initial stages it was underwritten with personnel and secretarial support from the USDA but is now self-funding from subscriptions, levies on breed societies and widespread sponsorship, albeit still with substantial support from certain College/University extension programs.

10.2 Beef Improvement Council (BIC)

We propose a national cooperative breeding extension group with the suggested name Beef Improvement Council (BIC) to foster strong collaborative links between R and D agencies, extension services (public and private) and producers.

The basis of this structure would be an Executive Officer with secretarial support, whose primary role would be to establish operational structure of the Council and committees, to coordinate resources,to facilitate the communication process and to create the forum and means for information exchange of new technologies including scientists and breeders.

Such a person would have to be technically competent and with wide seedstock industry knowledge and credibility.

Another main role of the Executive Officer would be to progress the Council to a self-funding situation within five years.

There would be a Board for the Council as well as specialist committees.

10.2.1 The purpose of the BIC would be to:

(a) be an independent source of scientifically-founded technical information,
(b) continually monitor the information needs of the seedstock sector,
(c) prepare or contract the preparation of appropriate extension materials;
(d) edit information and release under BIC logo,
(e) identify resource persons to the seedstock sector,
(f) co-ordinate and facilitate the development and conduct of sector-based training programs, workshops, etc.,
(g) act as an independent consultative body to the seedstock sector,
(h) provide guidance and co-ordination to extension and service agencies to achieve an equitable and efficient use of resources in achieving national breeding objectives,
(i) examine and monitor the potential impact of new technologies to the seedstock sector.
(j) promote stronger involvement of producers in the development of technology and the extension process.

10.2.2 The Board of the BIC

Nominations for the Board in the first instance should be in response to advertisements placed in national newspapers for five positions. A selection committee will then choose the best five nominees based on relevant skills. Those positions will be honorary (cost reimbursement). The selection committee will consist of a panel from key institutions including NSW Department of Agriculture, ARCBA, Cattle Council and AMLRDC (the funding body), plus two other persons chosen by AMLRDC on a special skills basis.

The Board will be composed of five elected positions plus one position nominated by AMLRDC. In the first instance, the chairman will be elected from within those seven positions. The Executive Officer will make up the seventh position on the Board.

Board members will be appointed for a 3 year term and will be eligible for a further term. Near the completion of the first three year period, the Board and the membership can address the long-term structure of the organisation under a self-funding basis.

Meetings should be no less than twice a year, one meeting of which should be in conjunction with an annual conference/AGM.

10.2.3 BIC Committees

The Board should appoint key people to the committees (on an honorary basis).

We recommend that committee be formed to cover the following key areas:

1. Live animal and carcase evaluation
2. Reproduction performance
3. Genetic prediction

Each committee will have the power to co-opt and to form sub-committees as required. They will elect their own convenor. Each committee should be charged with the responsibility to organise a workshop on its subject area at the annual meeting and to organise educational and extension materials and procedures in conjunction with the Executive Officer. Their appointment will be for three years.

The Board will institute new committees as required. Each committee should meet at least twice per year (for which funding will be provided).

10.2.4 The function of the Board

The primary role of the Board will be to identify and prioritise the needs of the seedstock sector in relation to update of breeding technologies. It will also allocate fresh functions to the committees and generally provide directions for the BIC. In addition it will need to develop a self-funding pathway for the BIC within five years. The Board will provide an annual budget to AMLRDC until self-funding is in place.

10.2.5 The function of the Committees

- To investigate and report to the Board on matters in their areas of expertise and to develop extension activities.
- To make recommendations to the Board for areas that need to be addressed.
- To act as a development resource for the Board.
- To monitor and make recommendations to the Board on new technologies.
- To convene an annual meeting or workshop for interested persons.

10.2.6 Job description of the Executive Officer

- To act as the Chief Executive Officer of the BIC
- To implement Board policy and recommendations.
- To facilitate the technology transfer in the planned breeding area.
- To expedite the purposes of the BIC as in Section 10..2.1
- To manage all business of the BIC.

10.2.7 Funding of the BIC

It is envisaged that funding would be provided by AMLRDC for a period of 5 years for the appointment and support costs of the Executive Officer as outlined in the following budget.

Within two years once the structure is in place and benefits can be seen, support should be solicited from breed societies, state departments of agriculture, the rural media, AB organisations, pastoral houses and producers etc. in the form of membership fees and sponsorship, to provide ongoing funding. Profits from sales of extension and audio visuals, materials etc., will contribute to ongoing funding. In this five year period AMLRDC would provide 'bridging' support between budget costs and income.

The conduct of group based training activities such as workshops would be co-ordinated by the BIC and conducted under contract as self funding activities.

Similarly the development of extension and educational resources would be contracted wherever possible on a self funding basis, with commercial sponsorship or AMLRDC support to individual projects on merit.

A newsletter would be produced on a regular basis to update the membership and for information transfer.

10.3 BIC Program Plan

10.3.1 Year 1

A suggested plan is put forward based on the outcomes of our study and our survey of the seedstock sector. Clearly the final program is the domain of the Executive Officer and the Board of the BIC. However the preferred delivery systems of the sector (see Section 9.4 on page 34) need to be addressed in the formulation of the first year's program.

10.3.2 Directory of specialist skills and resources

By conducting a national audit of skills and resources of the breeding sector, the Executive Officer will familiarise himself with these important people and institutions. People within many organisations who offer specialist skills will be contacted. A useful outcome would be a Directory of special skills, which could be circulated within the sector. This Directory would assist 'grass roots' organisations who for instance, may wish to conduct a field day on a special subject.

10.3.3 Specialist publications and other information transfer

Liaison with publishers and editors of specialist publications could identify opportunities for BIC 'Breeding Notes' to be incorporated. BIC factsheets could be written in a way which encourages their reproduction in a range of publications, in all cases sporting the BIC logo to establish sector credibility. Of course there would be spill-over to the commercial sector for instance, but this is seen as a positive benefit. The Beef Improvement News should be targeted.

Other opportunities can be researched e.g. videos, given that the sector has a high ownership of video recorders. Instructive tapes could play a strong role. Seedstock breeders can lend video tapes to their regular customers etc.

The role of desktop publishing for production of factsheets, technical updates and newsletters must also be researched. By the BIC producing such factsheets it can prevent the duplication of effort that is often carried out e.g. different state departments producing different factsheets on the same subjects.

10.3.4 Attend BIF of USA annual conference

In May of each year the BIF have their annual meeting in conjunction with a conference. The Executive Officer should attend this year's meeting to familiarise himself with that organisation, to update our sector on the scene there and to meet key people.

10.3.5 Liaison with breed societies, BIA etc

The Executive Officer should meet with breed societies to familiarise himself with their people, especially technical committees and to determine the key change agents in those societies in regard to uptake of technologies. The opportunities for assistance with articles for breed journals or speakers for breed society functions, field days and for presentations to breed society federal councils should be explored. The role and objectives of the BIC and the need for support from breed societies should be detailed to breed society staff, councillors and influentials.

A similar liaison should be made with the BIA and its executive. This group offers entry to the commercial and crossbreeding sector.

10.3.6 Education and extension materials

Throughout these foregoing discussions the needs of the seedstock sector in terms of education and extension materials needs to be assessed and prioritised. The publication and production intentions of public sector agencies need to be canvassed and coordinated to prevent duplication and conflicting messages.

10.3.7 Annual Conference and AGM of the BIC

The Executive Officer should organise the annual conference of the BIC as a self-funding initiative. It should be open to all-comers for an attendance fee. It should have updating talks from speakers on topics of high priority. At least half a day should be sent aside for concurrent committee workshops to be organised by the members of that committee. Press releases should be organised from this annual meeting and the attendance of journalists sought for. It is seen that this meeting could be a coming together of many people from different parts of the sectors from scientists to producers. This annual BIC meeting will be distinct from annual BIA conferences but should aim at being some months away and geographically different from the BIA meeting.

10.3.8 BIC programme plan years 2-5

The consultants believed it would be presumptuous to go beyond year 1. Year 2 and beyond would have to address such issues as membership categories, fees, funding etc.

10.4 Estimates of Funding Required

		Annual costs
Salary - E.O.	60,000	
On-costs	10,000	70,000
Travelling		20,000
Legal costs		1,000
Audit costs		1,000
Office support		
* Rental of fully serviced office	10,000	
* Telephone and fax (estimate based on comparative positions)	10,000	
* Stationery costs (letterheads, envelopes etc)	500	
* Photocopying and laser printing 1,100/month @ 15 cents	2,000	
* Postage and freight	2,000	24,500
Secretarial expenses for services separate to serviced office agreement.		
Typing @ $15/hour Estimate 10 hours per week	7,800	
Desktop publishing (in-house) @ $20/hour - estimate 5 hours/week	5,200	
Research assistant @ $20/hour estimate 4 weeks	3,040	
Accounting to audit stage @ $28/hour @ 2 hours/week	2,600	18,640
Meeting costs		
(i) Board		
7 board members x 2 meetings x $1500/meeting	21,000	
(ii) Committees		
3 committees x 4 members x 2 meetings	36,000	57,000
Total annual costs		192,140
Plus First year only costs*		
* Phone connection (1 line)	250	
* Attend BIF conference in U.S.A.	6,000	

Notes: These figures do not include removal costs of E.O. if applicable.

They do not include the printing costs of extension material but do include preparation to printing stage via desktop publishing procedures.

11. References

Australian Bureau of Statistics (1988-89), Livestock and Livestock Products Australia.

Australian Institute of Agricultural Science Proceedings from National Conference and Workshop on Agricultural Extension, A.I.A.S. Occasional Publication No. 50, August 1990.

Australian Registered Cattle Breeders Association (1990), Australian Beef Cattle Registrations by Breed Within Group.

Davey, G.P., and Barker, J.S.F. (1963). The breed structure and genetic analysis of the pedigree cattle breeds in Australia III The Hereford. Australian Journal of Agricultural Research 14(1), pp. 93-118.

McClintock, A.E. and Nicholas, F.W. (1990), The Implications of Advanced Breeding Techniques, Draft Report for AMLRDC.

Smith, C. (1990), Breeding Technologies: Utilizing Biotechnologies, Proceedings of the Beef Improvement Federation Research Symposium and Annual Meeting.

Wilson Market Research Survey (1987), BREEDPLAN - A Market Analysis, Report prepared for the National Beef Recording Scheme Board of Management .

12. Appendices

Appendix A

Results of the Seedstock Breeder Survey

A.1 Some important details about a seedstock beef breeder in Australia

A.1.1 Age

Table A.1 shows that:

* the most common age bracket for a seedstock breeder was 35-49 years
* the second most common bracket was the 50-64 group.

Table A.1 : Distribution of the age of beef seedstock breeders (%)

Age Groups	18-24	25-34	35-49	50-64	>65	All
Percentage	2	19	42	32	5	100

A.1.2 Education

Table A.2 shows that:

* 76% of seedstock breeders were educated to at least Leaving or Higher School Certificate level
* more BREEDPLAN members (41%) were educated to College Diploma or higher compared to non-BREEDPLAN (26%).

Table A.2 : Distribution of the highest educational level attained by beef seedstock breeders (%)

Educational Level	Primary	Inter-mediate School Cert.	Leaving or HSC	Trade/College Certificate	Uni/College Diploma	Degree	Postgrad Degree
BREEDPLAN	2	17	28	12	20	16	5
Non-BREEDPLAN	7	24	30	13	13	9	4
ALL	**4**	**20**	**29**	**12**	**17**	**13**	**5**

A.1.3 Equipment

Television - 94% of seedstock breeders have television.

Video Cassette Recorders (VCR) - 65% of seedstock breeders have VCRs.

Computer - 52% of BREEDPLAN members have a computer compared to 35% of NON BREEDPLAN.

Modem - 12% of BREEDPLAN members have a modem compared to 7% of non-BREEDPLAN.

Facsimile - 34% of BREEDPLAN members have a facsimile compared to 26% of non-BREEDPLAN.

Teletext decoders - did not rate more than 1% ownership.

A.1.4 Female herd size

The average female herd size for respondents to the survey did not show a great difference between BREEDPLAN herds and non-BREEDPLAN herds.

For BREEDPLAN herds the average size across all breeds was 133 head.

For the non-BREEDPLAN herds the average was higher at 175 head, but that figure was influenced by some very large herds in the 19 herds responding in the "Other" category, i.e., outside the four target breeds for non-BREEDPLAN membership. Excluding those 19 "Other" breed category herds brought the average non-BREEDPLAN average to 123 females.

A.1.5 Sales of bulls, semen and embryos

Bull Sales - current and predicted for 1995

Table A.3 shows that seventy-two (72) per cent of respondents sold registered bulls last year, with more BREEDPLAN herds (80%) indicating sales than non-BREEDPLAN (64%). For non-registered bulls 54% of all respondents had sales.

Table A.3 : Percentage of breeders selling registered and unregistered bulls in two years plus average numbers sold or estimated.

	Registered Bull Sales		Unregistered Bull Sales	
	(1989)	(no. sold)	(1989)	(no. sold)
BREEDPLAN	80%	19	53%	13
non-BREEDPLAN	64%	12	56%	9
ALL	72%		54%	

Looking forward to 1995 about the same percentage of BREEDPLAN herds expect to be selling bulls as now, however, for non-BREEDPLAN herds 9% more expect to be selling registered bulls (Table A.4). It could be deduced from this that a barrier to entry to BREEDPLAN is that some non-BREEDPLAN herds have not reached the stage where they believe their cattle are good enough to sell or they have enough to sell or record in BREEDPLAN.

Table A.4 : A prediction of the percentage of breeders planning to sell registered and unregistered bulls in 1995 and average numbers that might be sold

	Registered Bull Sales		Unregistered Bull Sales	
	(1995)	(no. sold)	(1995)	(no. sold)
BREEDPLAN	83%	30	50%	23
Non-BREEDPLAN	73%	21	50%	16
ALL	78%		50%	

Last year the average registered bull sales for BREEDPLAN herds was 19 and for non-BREEDPLAN herds was 12. Expectations of annual registered bull sales in 5 years time were 30 for BREEDPLAN herds and 21 for non-BREEDPLAN thus maintaining the relativity between both groups but showing a higher number of average sales for both groups

A similar trend was evident for non-registered bulls. BREEDPLAN herds sell more on average now (13 versus 9) and expectations for increases in sales by 1995 are similar to those for registered.

Semen Sales

For last year's semen sales, the percentage of breeders selling semen and future semen sale estimates are shown in Table A.5.

Table A.5 : Percentage of breeders selling semen in 1989 and the average numbers of straws being sold, and a prediction for the future (1995)

	1989 (av. sales)	1995 (av. sales)
BREEDPLAN	30%# (328)*	27% (722)
Non-BREEDPLAN	18% (198)	17% (583)
ALL	24% (263)	22% (653)

Percentage of breeders

* Average numbers (for those selling semen)

Twenty-four (24) per cent of seedstock breeders sold some semen last year with more BREEDPLAN people (30%) selling more straws (328) than those not using BREEDPLAN (18% and 198, respectively).

Future expectations are for more than a doubling of semen sales in 1995 by virtually the same number of sellers, and BREEDPLAN breeders maintaining their relatively higher market share than non-BREEDPLAN breeders.

Embryo Sales

For last year's embryo sales, the percentage of breeders selling embryos and estimated embryo sales for 1995 are shown in Table A.6.

Table A.6 : Percentage of breeders selling embryos in 1989 and the average sales and a prediction for the future (1995)

	1989 (av. sales)	1995 (av. sales)
BREEDPLAN	19%# (26)*	23% (50)
Non-BREEDPLAN	14% (6)	16% (22)
ALL	17% (16)	20% (36)

Percentage of breeders

* Average number sold (for those selling embryos)

In comparing last year's figures, a greater percentage of BREEDPLAN herds (19% vs 14%) sold a greater number of embryos (26 vs 6) than non-BREEDPLAN herds. In 1995 slightly more BREEDPLAN herds (23%) expect to be selling more embryos (50) per year relative to 16% of non-BREEDPLAN herds selling 22 embryos per year.

A.1.6 How breeders rate a range of technologies.

All people surveyed were asked how they rated the usefulness of a range of practices in their breeding program, now or in the future. The ratings were from 0 - not at all useful to 4 - extremely useful with a no opinion option. For those respondents expressing an opinion the number, mean and variances are shown in Table A.7.

Table A.7 : BREEDPLAN and non-BREEDPLAN breeders' ratings on a range of technologies.

	BREEDPLAN herds				Non-BREEDPLAN herds			
	n	$\bar{x}$	S.D.	Rank	n	$\bar{x}$	S.D.	Rank
AI	458	3.39	0.93	1	240	3.17	1.08	1
Scrotal measurement	464	3.23	0.85	2	240	3.00	1.03	3
GROUP BREEDPLAN	445	2.99	1.04	3	209	2.11	1.34	9
BREEDPLAN	460	2.97	0.92	4	222	2.26	1.16	7
Scanning for carcase traits	450	2.95	0.94	5	231	2.79	1.12	4
Semen Testing of bulls	459	2.57	1.15	6	236	3.03	1.03	2
Serving Capacity Tests	456	2.43	1.25	7	233	2.45	1.28	5
ET	441	2.31	1.44	8	2.19	1.14	1.43	8
Pelvic Measurement	434	2.25	1.15	9	225	2.38	1.22	6
Sexing of semen	416	2.10	1.53	10	210	2.02	1.65	11
Measure of pasture intake	419	2.03	1.29	11	217	2.07	1.27	10
Electronic animal Id.	395	2.02	1.43	12	208	1.75	1.50	12
Embryo Splitting	407	1.54	1.40	13	196	1.36	1.43	13
Gene mapping	297	1.43	1.50	14	161	1.20	1.42	15
Gene transfer	304	1.33	1.48	15	160	1.08	1.35	14
Cloning	337	1.22	1.41	16	170	1.08	1.41	14
Induced twinning	410	0.59	1.00	17	198	0.77	1.23	16
		2.20				2.04		

The first five ranked technologies out of the seventeen included are shown for BREEDPLAN and non-BREEDPLAN respondents in Table A..8.

Table A.8 : The top five ranked useful technologies for respondents

Rank	BREEDPLAN		Non-BREEDPLAN	
#1	AI	(3.39)	AI	(3.17)
#2	Scrotal measurement	(3.23)	Semen testing of bulls	(3.03)
#3	GROUP BREEDPLAN	(2.99)	Scrotal measurement	(3.00)
#4	BREEDPLAN	(2.97)	Scanning for carcase	(2.79)
#5	Scanning for carcase	(2.95)	Serving capacity tests	(2.45)

Artificial insemination (AI) ranked highest for both groups of respondents. Scrotal measurement was next being #2 for BREEDPLAN respondents and #3 for the other group. The non-BREEDPLAN group ranked semen testing at #2 whereas the BREEDPLAN put it #6. GROUP

BREEDPLAN (#3) and BREEDPLAN (#4) ranked next for the BREEDPLAN respondents whereas those technologies ranked #9 and #7 respectively for the non-BREEDPLAN respondents.

Serving capacity testing came up quite high being #5 for non-BREEDPLAN respondents and #7 for the BREEDPLAN group.

At the lowest ranking was induced twinning (#17 and #16 respectively). The technologies of gene mapping, gene transfer and cloning were just behind twinning on the bottom rankings, perhaps reflecting the existing level of appreciation that breeders have of those technologies. At this stage most breeders would have seen few articles or talks through their preferred media sources on these topics. Semen sexing although again a 'future' technology probably ranks higher (#10 and #10 respectively) because without detailed explanations, the implications for AI which is their highest ranked technology are obvious, although again not well defined at this stage.

The high ranking for semen testing of bulls, scrotal measurement and servicing capacity tests highlights respondents' concerns for direct measurements which they believe impinges on theirs and their clients immediate profitability.

A.1.7 Artificial insemination (AI)

When asked to rate seventeen breeding technologies on their usefulness in their breeding programs, AI came out first (see Table A.7).

Seventy-three (73%) per cent of all seedstock breeders use some artificial insemination in their breeding herds. More BREEDPLAN breeders (84%) use this technology than non-BREEDPLAN breeders (62%). For those breeders who used the technology their records show 30 AI calves in 1985, 44 AI calves in 1990 and estimated 55 for 1995 and showed no differences in average numbers of AI calves for those herds using BREEDPLAN or non-BREEDPLAN herds.

In considering the usefulness of artificial insemination relative to other breeding practices (A.1.6), the breed of cattle the seedstock breeder owned had a significant effect on the rating. Angus, Charolais, Murray Grey, Poll Hereford and Simmental all gave AI a higher rating than Hereford, Limousin, Santa Gertrudis or Shorthorn, who in turn gave it a higher rating than Devons or Brahmans. None of the categories of age, educational level nor BREEDPLAN status affected breeders ratings of AI as a technology.

A.1.8 Embryo transfer (ET)

In rating the usefulness of ET as a breeding technology (see Table A.7) breeders rate it 8th out of 17.

Twenty-four (24%) per cent of all seedstock breeders use embryo transfer in their breeding programs, with twice as many (36%) BREEDPLAN breeders involved compared to non-BREEDPLAN breeders (18%). As in the case of AI, for those breeders who used ET there were no differences in numbers of calves born by ET between BREEDPLAN and non-BREEDPLAN herds (7 in 1985, 23 in 1990 and an estimated 23 in 1995.). This suggests that seedstock breeders do not see an expansion in the usage of embryo transfer in their breeding programs in future.

In rating ET as a useful technology relative to other technologies (see Section A.1.10), further analysis showed that age of the seedstock breeder plus the beef breed owned showed significant effects. Younger breeders or BREEDPLAN users rated ET higher than older and NON BREEDPLAN users. Simmental or Limousin breeders gave ET a higher rating compared to Angus, Charolais, Hereford, Murray Grey, Poll Hereford and Shorthorn with Devon and Santa Gertrudis lowest.

A.1.9 Serving capacity

Breeders were asked about their usage of serving capacity tests in the last five years, now and their estimates for usage in the next five years. Results are shown in Table A.9.

Table A.9 : Percentage estimates of past, present and future usage of servicing capacity tests

When	In the past five years	Now	In the next five years
BREEDPLAN	26%	24%	51%
Non-BREEDPLAN	8%	11%	39%
ALL	**19%**	**19%**	**47%**

Nineteen (19%) per cent of breeders have used service capacity tests in their breeding programs in the last five years with BREEDPLAN herds (26%) showing a higher participation than non-BREEDPLAN herds (8%). Similar levels are shown for present use but it is with future usage that large changes are foreshadowed. Forty-seven per cent (47%) of breeders predicted that they would use serving capacity tests in the next five years, with 51% of BREEDPLAN herds using the technology and 39% of non-BREEDPLAN herds.

Comments:
This may be the first national survey for the usage of service capacity tests. The proposed increase in usage by breeders over the next five years is perhaps the most unexpected of the whole survey. Industry commentators have suggested that due to welfare concerns the usage of service capacity tests would drop in ensuing years. Only in Argentina where Dr Blockey has stimulated veterinarians interest in the technology and up to twenty per cent (20%) are tested do we see a similar interest. In New Zealand the interest has dropped and in North America no commercial interest has been stimulated in spite of the large amount of experimental work done there.

Indeed, more research has been conducted on the technology in USA than in Australia but with no real uptake by Seedstock breeders there. The difference may be that the large majority of work conducted in Australia has shown dramatic, clear cut, positive results, whereas overseas work has shown mixed results and has highlighted the need for 'pre-test' schooling of bulls.

This large, predicted increase in the level of usage over the next five years needs follow-up in the NSW Department of Agriculture & Fisheries survey of veterinary practitioners. In the authors' experience, seedstock producers will often say they intend to start service capacity testing their bulls, yet years seem to pass and they still say they are 'going to'. A follow-up to see if indeed a higher level of usage of service capacity testing ensues is recommended in two years.

A.1.10 Use of sire summaries

Breeders with herds not enrolled in BREEDPLAN were asked if their Breed Societies published a Sire Summary. Thirty-seven (37%) per cent said "yes", thirty-three (33%) per cent said "no" and thirty (30%) per cent said "don't know".

Further examination of these results revealed that of those breeders who answered yes, thirty-five (35%) per cent belonged to breeds that do not publish a Sire Summary in Australia.

Furthermore, in answer to the question of all breeders, who said their breed published a Sire Summary, "did they use it in their breeding selections", seventy (70%) per cent answered yes. However, further examination of the background of those respondents who answered yes to the first question and their breed in Australia doesn't publish a Sire Summary, revealed that fifty-eight (58%) per cent in fact said they use the Sire Summary. A possible explanation for this strange result could be that some breed societies in fact publish lists of approved AI donor sires and there could be some confusion about what a Sire Summary is. Also there could be some leakage of Sire Summaries from overseas Breed Societies into Australian breeders' hands.

The response for Australian Herefords, however, gives the more typical response since that breed publishes an annual Sire Summary and does not have an approved AI donor list. For Herefords, non-BREEDPLAN breeders eighty-six (86%) per cent said they were aware of the Sire Summary, eight (8%) per cent said one wasn't published and six (6%) per cent said they didn't know. Of those who knew that the breed published a Sire Summary, fifty-four (54%) per cent said they used it in their selections.

The Hereford response also reflects an education/communication component in that that breed has employed a Technical Officer on their staff for the last five years.

A.2 BREEDPLAN, GROUP BREEDPLAN Usage and Attitudes

A.2.1 The average number of years in BREEDPLAN for respondents was 3.32. Given that BREEDPLAN is only 5 years old and that only eighteen per cent (18%) (see following Section A.2.2) had not submitted weights, the level of BREEDPLAN experience for BREEDPLAN respondents is not inconsiderable.

A.2.2 Eighty-two per cent (82%) of BREEDPLAN members had submitted weight records for analysis. Eighteen per cent (18%) of members had not yet submitted weight records. This latter group were asked for the major reason for not submitting up to the date of the survey. Forty per cent (40%) of them said they had not submitted records yet but still intended to. Twenty-seven per cent (27%) had not submitted because they had recently joined. Seven per cent (7%) had in fact stopped performance recording. Another seven per cent (7%) said their facilities weren't adequate for weighing. The balance of responses (making up 19%) indicates other reasons why they had not yet submitted.

A.2.3 (a) Non-BREEDPLAN breeders were asked if they had the facilities to weigh their cattle. Sixty-one (61%) responded positively.

(b) Those who had the facilities, were questioned further on what stages (ages) they weighed their cattle. Twenty-six (26%) per cent weigh their calves at birth, seventy (70%) per cent at weaning, sixty-two (62%) at yearling and seventy-eight (78%) per cent pre-sale. Twenty-three (23%) per cent weigh their heifers pre-joining and twenty (20%) per cent weigh their cattle at other times or stages.

A.2.4 Those breeders previously identified as non-BREEDPLAN members were asked if they intended to join BREEDPLAN in the next 12 months. Thirty-seven per cent (37%) indicated they had recently joined or intended to join in the next twelve months.

The sixty-three per cent (63%) of respondents who indicated they would not join were asked for reasons. The most popular reason was that twenty-nine per cent (29%) considered their herds too small. Seventeen per cent (17%) did not consider the expense was justified. Twelve per cent (12%) did not consider the scheme important enough to join. Eleven per cent (11%) considered their facilities for weighing were not adequate to be involved. Another eleven per cent (11%) did not know what was required to participate in BREEDPLAN and six per cent (6%) stated they were not sure what was needed to join the scheme. The balance of fourteen per cent (14%) had a range of other reasons for not joining.

Comment:
There is potential for an increase in BREEDPLAN enrollments if some of the reasons given are addressed. Seventeen per cent (17%) were not sure how to join the scheme or what was needed to participate. Stronger promotion and extension of the financial benefits of the scheme could lead to join ups from those who consider that the expense is not justified or whose facilities are not adequate at present. Together they represent a target audience of twenty-eight (28%) per cent of the seedstock industry not enrolled in BREEDPLAN. In considering their herd is too small more than quarter have probably eliminated BREEDPLAN from their options of objective measurement. It begs the question what size of herd is too small for BREEDPLAN? Better guidelines need to be given.

A.2.5 BREEDPLAN participants were asked to rate the usefulness of BREEDPLAN for making selection decisions in their herds. They were asked to rate the technology on a scale from "0 = Not at all useful" to "4 = Extremely useful" with the option to give a "9 = Cannot make a judgement". Three (3%) per cent of respondents could not make a judgement and for the remainder who could, their mean rating was 2.86, where 2 was Moderately Useful and 3 was Very Useful.

A.2.6 Forty-one (41%) of the BREEDPLAN users had also used GROUP BREEDPLAN. These GROUP BREEDPLAN users were asked for their rating of how useful GROUP BREEDPLAN is relative to the BREEDPLAN reports, for making their selection decisions in their herds. Twenty two (22%) per cent of GROUP BREEDPLAN users said they hadn't used the GROUP BREEDPLAN report. For those who had, they gave their ratings on a scale from "0 = Much less useful" to "4 = Much more useful". Their mean response showed 2.64 where 2 = About as useful as BREEDPLAN report and 3 = More useful. So we can deduce that they rate GROUP BREEDPLAN as slightly more useful than their BREEDPLAN report.

A.2.7 BREEDPLAN users were asked to give their basic understanding of various facets of the system. Their responses and their ratings of their understanding are shown in Table A.10.

Table A.10 : Responses and ratings of BREEDPLAN users about their basic understanding of various facets of the technology

BREEDPLAN facet	% of BREEDPLAN respondents answering	Average rating*
What information needs to be collected	100	3.26
When information should be collected to obtain best results	99	3.16
How to record information on cattle treated differently or moving in different paddocks	99	2.81
How to record embryo transfer (ET) calves	96	1.58
How to interpret the reports you receive back	99	2.82
How to use EBVs in selection decisions	99	2.96
How to use EBVs in buying decisions	99	2.97
How to use EBVs in marketing	99	2.75
How to use selection indexes	62	1.91

* 0 = No understanding
1 = Limited understanding
2 = Reasonable understanding
3 = Good understanding
4 = Thorough understanding.

Breeders considered they had a good understanding of the information needs and the time to collect it. They said that they had a reasonable to good understanding of how to record treatment or management groups, how to interpret the reports and use the EBVs in their selections, their buying decisions and in their marketing. For those who answered the question on selection indexes their rating of 1.91 suggested a reasonable understanding. The lowest perceived understanding was for the recording of embryo transfer (ET) calves (1.58).

The perceived understanding of ET recording was examined further according to whether the breeder used ET or not. Predictably, users of ET scored their understanding as 2.28, just above reasonable understanding, while NON-users of ET gave 1.16 (limited) as their understanding.

The breeders' ratings of perceived understanding fell in well with the authors' pre-survey expectations except for their rating of cattle treated differently, i.e., the recording of management or treatment groups. In the authors' experience, the recording of management groups is the area of recording which is most often overlooked or badly recorded. Given the reasonable to good (2.81) perceived understanding given by respondents, suggests to the authors, that breeders may not be aware of the importance of this facet and the implications of poor recording. Alternatively it could suggest they overrated their abilities in all areas.

A.2.8 $EBVs

Much of genetic theory revolves around selection based on indexes where the traits in the breeding objective are weighted according to different levels of emphasis. The users of BREEDPLAN were asked how useful they would find it if the BREEDPLAN system reported EBVs in a single combined value for use in selection. Fifteen (15%) per cent of BREEDPLAN users did not answer this question. Twenty (20%) per cent answered that they could not make a judgement. On a scale ranging from "0 = Not at all useful" to "4 = Extremely useful", those people who were willing to make a judgement gave an average rating of 2.05 where 2 was Moderately useful and 3 was Very useful. Clearly there is a lack of knowledge amongst BREEDPLAN users on the subject of $EBVs and more discussion about its usefulness and possible implementation is needed.

A.2.9 Future traits

BREEDPLAN participants were asked to list in order of preference five traits that they would like included in future analyses. They were asked to assume a fixed additional cost per trait for estimation of EBVs. Their preferences, number of votes and a weighted preference total are shown in Table A.11.

Table A.11 : Preferences of BREEDPLAN users for future trait analysis

Trait	1st Prefer -ences	2nd Prefer -ences	3rd Prefer -ences	4th Prefer -ences	5th Prefer -ences	**Total Votes**	**Weighted† Prefer- ences**	Rank
Female Fertility	135	116	51	34	29	**365**	**1389**	1
Calving Ease	87	96	74	44	39	**340**	**1168**	2
Scrotal Circumference	62	45	64	56	27	**254**	**821**	3
Eye Muscle Area	32	37	59	71	67	**266**	**694**	4
Feed Efficiency	29	38	46	43	52	**208**	**573**	5
Serving Capacity	30	32	40	35	14	**151**	**482**	6
Lean Meat Yield	14	14	30	35	62	**155**	**348**	7
Mature Weight	18	15	23	26	14	**96**	**285**	8
Hip height	18	8	18	18	23	**85**	**235**	9
Fat Depth	4	18	13	31	34	**100**	**227**	10
Marbling	6	11	11	19	24	**71**	**169**	11
Eye Pigmentation	4	10	12	18	33	**77**	**165**	12
Other	8	4	4	5	10	**31**	**88**	13
Feedlot Gain	0	2	1	8	11	**22**	**38**	14

† 1st Preference = 5 pts 2nd Preference = 4 pts 3rd Preference = 3 pts
4th Preference = 2 pts 5th Preference = 1 pt.

It is clear from the results in Table A.11 that the fertility traits are those in highest demand for future analysis and EBV estimation. Female Fertility was the most popular with 1389 points and seventy-eight (78%) per cent of BREEDPLAN herds voting for it. Calving Ease was second with 1168 points and seventy-three (73%) per cent of BREEDPLAN herds voting for the trait. Third was Scrotal Circumference with 821 points and fifty-five (55%) per cent of participants voting for it.

Eye Muscle Area (EMA) was the fourth most popular trait with 694 points and fifty-seven (57%) per cent of participants choosing it at least once in their preferences. Feed Efficiency ranked fifth with 573 points and forty-five (45%) per cent voting for it. The other traits followed according to the rank shown in Table 8. Eye Pigmentation results should be read remembering that only 165 Hereford and Poll Hereford BREEDPLAN herds responded and that if we include only those breeds, forty-seven (47%) per cent of respondents recorded a preference for the trait. Some breeds may have little interest in marbling because their breeds have too low levels for selection within a reasonable time scale. If we consider the 315 votes from the four breeds participating in the M8A project and Shorthorns, only twenty-three (23%) per cent recorded a preference for this trait which ranked fourth last overall in the list of fourteen.

A.2.10 What information is made available by seedstock breeders to their clients?

Those breeders selling bulls (BREEDPLAN and non-BREEDPLAN) were asked to detail what information they made available to prospective clients. Their responses are shown in Table A.12.

Table A.12 : The information bull sellers provide to their clients and the proportion of breeders providing it

Trait or Value	BREEDPLAN	Non-BREEDPLAN
Herd EBVs	57%	
Group BREEDPLAN EBVs	34%	
Weight or weight gain	-	57%
Adjusted weight or weight ratio	-	11%
Scrotal measurement	69%	53%
Serving capacity	23%	12%
Hip heights	24%	19%
Frame score	37%	31%
Muscle score	17%	9%
Eye muscle area (scan)	15%	2%
Fat depth (scan)	14%	6%
Condition score	8%	7%
Sale weight	75%	50%
Other	34%	22%

As a group, seedstock breeders supply their commercial clients with a range of objective and phenotypic values to assist their selections.

The proportion of BREEDPLAN users who give Herd or Group EBVs (57 + 34 = 91%) is higher than the number of non-BREEDPLAN breeders (57%) who supply their buyers with weights or weight gain. **It raises the doubt "do commercial breeders have an appreciation of the difference between a phenotypic measurement on an animal without any adjustment factors and an EBV with all its adjustments".** It could be that commercial buyers believe that non-BREEDPLAN sellers are providing as useful information (weight gains) as BREEDPLAN users (EBVs). We have asked the NSW Agriculture and Fisheries to consider this aspect in their survey of commercial breeders.

Eighty three per cent (83%) of BREEDPLAN users present the sale weights of bulls, so clearly BREEDPLAN users still think their buyers want some phenotypic values.

Scrotal measurement was the most popular figure presented overall (69% for BREEDPLAN, and 53% for non-BREEDPLAN) after EBVs for growth traits and, weights. Frame score was the next most popular measurement presented (37% for BREEDPLAN and 31% for non-BREEDPLAN).

Predictably, BREEDPLAN breeders presented their clients with more information than the non-BREEDPLAN breeders. However, the information presented by this latter group is still substantial.

A.2.11 Breeders knowledge of genetics

All seedstock breeders were asked to indicate how fast they believed the rate of change by selection was to six questions on six traits considered important in beef cattle breeding. These questions were asked as an indication of breeders' knowledge of the genetics underlying the traits in focus with the technologies covered in this survey. Their answers were scored relative to an 'ideal' answer supplied by a geneticist out of a possible score of 5 for each question or a possible total of 30. Their responses are shown in Table A.13

Table A.13 : Breeders knowledge of possible rates of change for various traits.

Trait	Male fertility	Female fertility	400-day weight	Carcase traits	Tempera-ment	Feet problems	Total
Scores:							
BREEDPLAN*	2.3	1.7	3.1	2.8	2.6	1.8	14.3
Non-BREEDPLAN	1.9	1.5	2.7	2.7	2.5	1.4	12.9

* includes BREEDPLAN PLUS group.

The results were consistent across breeds. The BREEDPLAN users scored slightly better for each trait and overall. However, relative to the best possible score (5 each question) neither group fared too well for individual traits or overall.

A.2.12 BREEDPLAN users' knowledge of management group recording

BREEDPLAN users were asked to answer four questions on situations where a management or treatment code might or might not be needed to give the best comparisons for BREEDPLAN analysis. Out of a possible score of 5 points per answer the following shows their scores on all questions.

		Score
Q.1.	Where cows with male calves at foot are run separately from cows with female calves at foot.	1.9
Q.2.	Where some animals receive a feed supplement	4.5
Q.3	Where a few calves in the herd are affected by pink eye	0.9
Q.4	Where cows and calves are run in different paddocks with significantly different feed conditions.	4.4
		10.7

In relation to Question 1, it is important to note that the BREEDPLAN system does not actually compare male calves and females calves within the same contemporary management group and that fact is often stated in BREEDPLAN literature, however respondents were clearly unaware of the fact given their low score. Questions two and four received the highest scores and rightly so, given that they have always been basic premises for performance recording and "record like with like". Question three was the most difficult because it is judgmental whether pink eye would affect performance. Pink eye can set back a calf for the period it is affected and clearly breeders do not believe that it is a situation where a management group needs to be recorded. Yet the consultants considered that "if a few calves in a herd are affected by pink eye" they should be recorded in a separate management group.

A.2.13 BREEDPLAN PLUS group

This group had attended a $\frac{1}{2}$ day seminar convened by the NSW Agriculture & Fisheries to improve their understanding and use of BREEDPLAN, not long before the survey was conducted including the following facets.

Basic genetics
How BREEDPLAN works
Management groups
Updates on new developments

We further analysed the responses to the previous two questions to see how the BREEDPLAN PLUS group fared relative to the BREEDPLAN respondents as a whole. For the first question on possible rates of change the BREEDPLAN PLUS group scored higher (15.3) over the rest of the BREEDPLAN group (14.5) although the result was not significant statistically. Both groups, however, gave a significantly higher score than the non-BREEDPLAN respondents (12.9) at the 1% significance level.

For the second question on management groups non-BREEDPLAN breeders were not questioned. However, the BREEDPLAN PLUS group showed a significantly higher score for this question (13.6 versus 11.7 respectively) at the 5% significance level.

These results confirm the potential effectiveness of extension effort through special meetings or field days in raising breeders' knowledge.

A.3 Where Seedstock Breeders Obtain their Information

A.3.1 Most important sources

The importance of different resource people and media and extension methods as sources of information about **new breeding practices** was determined. The results are shown in Table A.14.

Table A.14 : The sources of information for seedstock breeders

	BREEDPLAN	RANKING	Non-BREEDPLAN	RANKING	ALL	RANKING
Other Breeders	2.49	1	2.68	1	2.59	1
Breed Societies	2.26	2	2.62	2	2.44	2
Media	2.18	3	2.07	3	2.13	3
Veterinarians	2.00	5	1.86	4	1.93	4
Dept. of Ag. Beef	2.05	4	1.69	5	1.87	5
A.I. breeding company	1.65	6	1.59	6	1.62	6
Dept. of Ag. Others	1.07	7	1.17	7	1.12	7
Consultants	1.06	8	1.09	8	1.08	8
Studstock Agents	0.81	9	1.01	9	0.92	9
Local Agents	0.66	10	0.87	10	0.76	10

The most important sources of information on new breeding practices were Other Breeders (2.59) and Breed Societies (2.44). At a lower tier of importance were the media (2.13), vets (1.93), Department of Agriculture beef officers (1.87) and AB companies (1.62). The lowest level of importance was given to Other Department of Agriculture officers (1.12), Consultants (1.08), Stud stock agents (0.92) and local stock and station agents lowest of all (0.76).

Some small differences were evident between BREEDPLAN and non-BREEDPLAN seedstock breeders. Non-BREEDPLAN breeders gave breed societies and other breeders higher ratings than BREEDPLAN breeders and gave Department of Agriculture Beef officers a lower rating.

A.3.1.1 State differences for Department beef officers

A further refinement of the analysis examined the 'between State' differences for breeders scoring of the beef officers in the State Departments' extension services. These results are shown in Table A.15.

Table A.15 : How the breeders in different states rate their Government beef extension services as sources of information

State	NSW	QLD[1]	SA	TAS	VIC	WA
BREEDPLAN	2.40	1.89	1.96	1.64	1.79	1.59
Non-BREEDPLAN	1.99	1.86	1.47	0.90	1.33	0.90

[1] Queensland - only southern Queensland breeders were surveyed.

For BREEDPLAN and non-BREEDPLAN respondents, NSW beef officers showed the highest score. State had a significant effect on the score given at the 5% level.

3.1.2 How Hereford breeders get their information

The Hereford breed was examined for consistency with the overall results (see Table A.16)

Table A.16 : The sources of information for Hereford breeders

	BREEDPLAN	Non-BREEDPLAN	$\tilde{X}$	RANKING
Media	2.11	1.92	2.02	4
Breed Societies	2.56	2.68	2.62	2
Other Breeders	2.56	2.92	2.74	1
Veterinarians	2.16	1.94	2.05	3
Local Agents	.65	.82	0.74	10
Studstock Agents	.71	1.05	0.88	9
Dept. of Ag. Beef	2.13	1.66	1.90	5
Dept. of Ag. Others	.91	1.12	1.02	8
Consultants	1.10	1.09	1.10	7
A.I. breeding company	1.32	1.68	1.5	6

The ratings were similar for all Hereford herds relative to the overall result. The relative answers for Hereford BREEDPLAN or non-BREEDPLAN herds were consistent with the overall trends except that they gave vets a higher ranking and Hereford BREEDPLAN herds gave AI companies a lower score.

A.3.2 Media information sources

Breeders were asked to rate the most useful media sources for information about new breeding practices. Their preferences, notes and rankings based on a weighted preference are shown in Table A.17.

Table A.17 : Media sources as preferred information sources on new beef breeding practices

Media Source	1st Preference	2nd Preference	3rd Preference	Votes	Weighted preference	Rank
Specialist magazines (e.g., "Farm" or "BIN"	324	153	86	563	1364	1
Major State Rural Weeklies e.g., "Land"	127	236	170	533	922	3
ABC regional programs	5	18	52	75	103	6
ABC Country Hour	10	30	66	106	156	4
Breed Society journals/ newsletters	162	170	153	485	979	2
Specialist TV programs e.g., "Countrywide"	8	26	74	108	150	5
Bulletin Boards e.g., Elderlink	0	0	2	2	2	8
Other sources	16	10	16	42	84	7

1st Preference = 3 points
2nd Preference = 2 points
3rd Preference = 1 point
1 = Rank based on weighted preferences.

Specialist magazines such as the monthly "Farm" magazine and the "Beef Improvement News" rated highest. "Farm" magazine has been available for ten years and has recently focussed more regularly on modern breeding practices. "Beef Improvement News" is an innovative monthly sent free to all seedstock breeders and specialises in beef seedstock topics. Eighty-four (84%) per cent of respondents gave a vote to specialist magazines.

Breed Society Journals rated second (72% gave a vote) closely followed by the major rural weeklies.

It is clear that seedstock breeders rate the print media highly.

Fourth rank went to the ABC Country Hour program on radio each weekday, and then TV.

A.3.3 Initial learning sources

Another question asked the preferred methods for **initially learning** about new breeding practices and technologies. Twelve methods were listed for breeders to rate their first through to fourth most preferred. The results are shown in Table A.18.

Table A.18 : The preferred methods of initially learning about a new breeding practice

Method	1st Preference	2nd Preference	3rd Preference	4th Preference	Total	Weighted Preferences†	Rank[1]
Personal contact with specialist	186	76	74	67	403	1187	1
Full day workshops	113	113	65	56	347	977	2
Specialist publications	85	90	106	99	380	921	3
Half day field days/meetings	82	112	95	60	349	914	4
Newsletters	63	75	91	79	308	738	5
Newspapers	43	60	73	83	259	581	6
Comprehensive training activities	46	51	50	39	186	476	7
Videos	12	26	42	48	128	258	8
Night meetings	12	22	40	33	107	227	9
Radio	4	9	30	43	86	146	10
Software	0	7	5	11	23	48	11
Electronic mail	0	0	1	1	2	3	12

†1st Preference = 4 points, 2nd Preference = 3 points, 3rd Preference = 2 points, 4th Preference = 1 point

[1]Rank based on weighted preferences.

Personal contact with a specialist came out on top, followed by full day workshops, specialist publications and half day field days/meetings. **It is clear that the direct approach is favoured for picking up information on new practices.** Night meetings are not popular. Electronic mail and software are hardly considered and radio is not at all popular.

A.3.4 Updating knowledge

Breeders were also asked their preferred method of updating their knowledge on breeding practices and technologies. Their preferences are shown in Table A.19.

Table A.19 : The preferred methods of updating their knowledge by seedstock breeders

Method	1st Preference	2nd Preference	3rd Preference	4th Preference	Total	Weighted Preferences†	Rank[1]
Personal contact with specialist	201	70	73	72	416	1232	1
Full day workshops	122	136	48	63	369	1055	2
Half day field days/meetings	109	101	91	59	360	980	3
Specialist publications	66	110	108	102	386	912	4
Newsletters	43	67	107	89	306	676	5
Comprehensive training activities	51	42	38	42	173	468	6
Newspapers	18	41	64	95	218	418	7
Videos	16	34	45	56	151	312	8
Night meetings	18	24	33	36	111	246	9
Radio	2	9	18	36	65	107	10
Software	1	7	4	18	30	51	11
Electronic mail	0	0	1	-	1	2	12

†1st Preference = 4 points
2nd Preference = 3 points
3rd Preference = 2 points
4th Preference = 1 point
[1]Rank based on weighted preferences.

The response is very similar to the previous question except that specialist publications have reversed order with half day field days/meetings which now rank third and comprehensive training activities have climbed above newspapers.

A.4 Influences on Seedstock Industry

A.4.1 The influence of agents, department of agriculture beef advisors, veterinary practitioners and other breeders

When asked to rate the current influence of agents, Department of Agriculture beef advisers, veterinarians or other breeders in the stud industry at large, breeders responded as shown in Table A.20.

Table A.20 : Mean ratings of the influence of various people in the stud industry

Class	Agents	Dept. of Ag. Beef Advisors	Vets	Other Breeders
BREEDPLAN	1.78	1.86	1.58	3.02
Non-BREEDPLAN	1.67	1.95	1.65	3.08
ALL	**1.73**	**1.90**	**1.62**	**3.05**

Other breeders were rated the most influential people in the industry. Department of Agriculture Beef Advisors were the second most important influence followed by agents and vets.

The data were further examined to determine if the influences varied between States. The results are shown in Table A.21.

Table A.21 : Mean ratings of people's influence on the stud industry by State

Class	Agents	Dept. of Ag. Beef Advisors	Vets	Other Breeders
NSW				
BREEDPLAN	1.70	2.13	1.64	3.09
Non-BREEDPLAN	1.70	2.25	1.74	3.06
VIC				
BREEDPLAN	1.63	1.68	1.51	3.02
Non-BREEDPLAN	1.63	1.61	1.52	3.01
SA				
BREEDPLAN	1.82	1.83	1.60	2.97
Non-BREEDPLAN	1.58	1.81	1.64	3.16
TAS				
BREEDPLAN	1.83	1.91	1.86	2.79
Non-BREEDPLAN	1.41	1.09	1.36	3.00
WA				
BREEDPLAN	2.30	1.36	1.40	2.96
Non-BREEDPLAN	2.38	1.63	1.50	2.91
QLD				
BREEDPLAN	1.68	1.49	1.46	2.77
Non-BREEDPLAN	1.48	1.93	1.71	3.29
AVERAGE	**1.73**	**1.90**	**1.62**	**3.05**

The trends tend to be repeated between states with some important differences. Western Australia rated agents as a higher influence than breeders in other states. New South Wales Department of Agriculture Beef Advisors were rated by that State's breeders as having a stronger influence than were advisors in other states. There was no state effect on the rating of vets. There is a potential bias in the response for Queensland given that only southern breeders were surveyed. Western Australian breeders gave Department of Agriculture Beef Advisors a low rating as did non-BREEDPLAN Tasmanian herds. Both states have generalist advisors rather than specialist beef advisors. Relative to New South Wales and South Australia, the rating of Victoria's beef advisors is lower than might have been expected.

A.4.2 Farm secretarial services

Breeders were asked if a farm secretarial service for pedigree and performance recording, on a fee for service basis, was available in their region, would they use it?

The responses to that question are shown for the various states in Table A.22 based on a rating scale where 0 = not at all interested to 4 = extremely interested and 9 = no opinion.

Table A.22 : Responses by State to a farm secretarial service - breeders reactions

State	Responses	Mean Score
NSW	187	1.21
QLD	26	0.92
SA	43	1.09
TAS	24	0.92
VIC	99	1.21
WA	49	1.34
		1.11

Nationally, breeders were slightly interested in such a service with Western Australia, New South Wales and Victoria showing a slightly better response then the other states. It is concluded therefore that some stud breeders could be interested in farm secretarial services but the response is such that the benefits would have to be clearly defined to stimulate use.

Appendix B

Appendix B : Summary of Survey on Breed Society Support Capabilities.

Breed Society	% of total registered	Technical Staff	Field Officer	Executive Officer with Technical Training	Separate Office/ Records	GROUP BREEDPLAN Offered	Integrated Performance Pedigree	Magazine Support Capabilities	Technical Sub-committee
Angus	7.5	contract	no	no	yes/ABRI	yes	yes	annual glossy + newsletters	yes
Braford	2.4	no	no	no	yes/ABRI	no	no	glossy annual 3 others	no
Brahman	10.5	no	no	no	yes/ABRI	no	no	quarterly	no
Charolais	2.2	no	no	no	yes/ABRI	no	no	quarterly	no
Devon	1.2	no	yes	no	no/ABRI	yes	no	quarterly	no
Droughtmaster	2.3	no	no	no	Yes/ABRI	no	no	quarterly	no
Hereford	18.6	full time	no	no	yes/ABRI	yes	in progress	quarterly	yes
Limousin	5.3	no	no	no	yes/ABRI	no	no	quarterly	no
Murray Grey	6.3	no	no	no	yes/ABRI	no	no	2 monthly	no
Poll Hereford	19.1	contract	yes	no	yes/ABRI	yes	yes	quarterly	no
Red Poll	1.2	no	no	no	no/ABRI	no	no	yes	no
Santa Gertrudis	5.4	no	yes	no	yes/separate	no	no	quarterly	yes
Shorthorn	4.6	contract	no	yes	yes/ABRI	no	no	glossy annual + 5 others + newsletters	yes
Simmental	7.7	no	no	yes	yes/ABRI	yes	no	quarterly	yes
South Devon	11.1	no	no	yes	no/ABRI	no	no	annual glossy + quarterly newsletter	yes

Appendix C

Seedstock Producers Outside The Breed Society/BREEDPLAN Infrastructure

Within the seedstock sector there are a number of breeders producing unregistered bulls for sale who are neither members of a breed society or of BREEDPLAN, and as such were thought to be outside the normal infrastructure of the seedstock sector.

Whilst some of these breeders produce 50 or more unregistered bulls each year, most produce less than 10 bulls each year and sell within close proximity to the home base.

In assessing the needs of the seedstock sector it was important to ascertain the sources of information of breeders who were outside the sector infrastructure.

NSW was taken as a model for this sub-survey, and NSW Agriculture and Fisheries district beef extension officers were asked to provide the names of appropriate seedstock breeders in their districts.

District officers nominated some 80 breeders who they considered were outside the infrastructure mentioned earlier. Surprisingly, closer examination revealed that **almost 50%** of these breeders were in fact low profile members of a breed society, either as full or commercial members.

Highlights from the sub-survey revealed that:

- The 40 breeders surveyed sold an average of 17 bulls each year year. This represented 2.3% of the bulls bred and intended for service in NSW in any year.

- 43% of bulls sold by this classification of seedstock breeder were Angus, compared to the breeds market share of registered bulls of about 10%, largely reflecting the more open semen usage policy of the Angus Society.

  By contrast 18% of such bulls were Hereford/Poll Herefords, breeds with a combined market share of registered bulls of about 65%, but with more restrictive semen access.

- 34% of bulls sold were from one extension district and 63% were from 3 extension districts, perhaps reflecting individual extension officer activity.

- There was not any significant difference in age, education of these breeders, or where these breeders sourced their information about breeding technology relative to breed Society/group members, although there was a trend for these breeders to be more closely aligned to one individual source.

It was concluded that the national action plan as outlined in this report would adequately access and meet the needs of this sub group of seedstock breeders.

Appendix D

The Influence of Stud Stock Agents in the Seedstock Sector

Stud stock agents are an elite group within the stock and station agency sector who specialise in the marketing of seedstock.

Whilst there is a general perception within the seedstock industry that stud stock agents have considerable influence, the Australian Seedstock Industry Survey showed that agents ranked low as a source of new information about breeding technology.

They do have considerable influence on selection decisions, however, and ranked higher than departmental extension officers (with the exception of NSW) and veterinarians as an influencing force in this regard, particularly with the more conservative breeder.

A telephone survey of 13 key stud stock agents (almost 50% of that sector) was conducted to ascertain their general education, training, knowledge and perceived needs relative to the role in the transfer of breeding technology.

D.1 Summary of Results of the Survey of Stud Stock Agents.

Personal Background, Education and Training

Average Age :

25-34 years	15%
35-49 years	62%
50-65 years	23%

Highest level of education :

	Agents	Seedstock Breeders (see Table A.2)
Intermediate/school certificate	8%	20%
Leaving/higher school certificate	62%	29%
Trade/college certificate	15%	12%
University/college diploma	15%	17%
University degree	0%	13%

Average Years in Agency field :	23 years	
Average Years as stud stock agent :	14.3 years	
Receive company organised training in breeding technology :	No	62%
	Yes	38%
Attended Breeding workshop in last 5 years :	No	38%
	Yes	62%
Undertaken self development course last 5 years :	No	85%
	Yes	15%

The three most useful source of information on breeding :	Breed Societies	1
	Stud Breeders	2
	Departmental Extension Officers	3
Preferred media source of breeding information :	Breed journals	1
	Specialist magazines	2

Preferred method of learning about new technology : Full day or half day (Morning) comprehensive workshops were the preferred method of learning.

Main training needs : The main area of training requested revolved around the development of skills in identifying superior performing breeding stock.

Knowledge of BREEDPLAN : when asked a test question about the use of EBVs in sale catalogues, 54% gave the correct answer, whilst 46% answered incorrectly.

D.2 Influence in Seedstock Sector

Assessing the actual influence of stud stock agents in terms of numbers and dollar values is difficult because of overlaps in territories, partitioning of sales and at times seemingly extravagant claims. Regardless of the accuracy of the figures quoted, there is little doubt they do exert considerable influence within the seedstock sector. For example, the 13 agents surveyed reported the following:

	Total	Average
Number of bulls sold/year :	41400	3184
Total value of bulls sold:	$120 million	$9.17 million
Number of breeding programs directly influenced :	average 37/agent	
Number of bulls sold from influenced herds :	average 525 bulls/agent	
Number of commercial and stud bull buying decisions influenced :	average 215/agent (top = 1000)	
Value of bull buying decisions influenced :	average $730 000/agent (top = $2.5 m)	

In summary :

* agents are in a position to, and do, exert considerable influence in the uptake of breeding technology. This level of influence is not justified by virtue of their level of training in animal breeding and probably reflects more on their marketing role.

* most agents interviewed identified a need for better training in some areas of breeding technology but had the general self perception that they were reasonably well informed on most matters.

* agents are in a difficult position with regards to the transfer of technology.

  Firstly, they need to demonstrate that they are knowledgeable in any area that their client may think important yet they are not well trained in animal breeding technology and the very nature of their work precludes opportunity for learning.

Secondly, they are in the business of buying and selling bulls and need to be "different things to different people" as quoted by one senior agent. Going against a client's beliefs is not good for sales.

* At least one major agency sees the possibility of becoming redundant in the seedstock sector. Innovative breeders are already becoming less dependant upon agents to sell their bulls, developing their own clientele and relying on paddock sales of objectively measured and described bulls.

* If agents are to fulfil a more useful role in increasing the uptake of technology then specialist training programs will need to be developed and implemented. Such programs will need to be sensitive to the work pattern of agents, for example night meetings ranked very low as a preferred method of learning because that is when they transact a lot of business by phone.

Appendix E

Industry Submissions

Submissions relative to the terms of reference were invited from 40 industry organisations including breed societies, government departments and industry organisations.

Nine (9) submissions were received and comments generally echoed findings from the seedstock survey.

We quote from one particular submission from Wacol AB Centre which was most complete in making and/or reinforcing some significant points;

Industry Needs: The beef cattle industry in the next decade faces the prospect of more change than it has witnessed in the last century. These changes will be seen in all facets of the industry from seedstock suppliers through to the consumer. The primary cause of these changes is that the industry is fast becoming market driven rather than production driven as it has historically been.

The technology needed to bring about the necessary changes in the cattle industry is already in existence or is in advanced stages of development. The biggest task remaining is the provision of extension systems capable of delivering this technology.

Government Extension Services Contracting: *In every state the provision of government extension services in the rural industry is being reduced or withdrawn. It is not unrealistic to anticipate that in the next decade without outside funding most of these existing services will cease to be available. The situation probably will not be altered even in the advent of a change of government.*

The provision of extension services on a fee for service basis is not seen as a viable method of extension in the beef industry.

Educational Establishments Not Effective : *An industry problem is that approximately only 3% of farm managers have a tertiary level of education, as compared with 70% in the USA.*

Compounding this issue, much of the existing content of the curriculum of our Agricultural Colleges and Veterinary schools is well behind the current "cutting edge" of technology in certain areas. Many students are graduating with minimal awareness of the existence and application of techniques such as BREEDPLAN and BLUP technology, or live animal assessment or the marketing aspects such as Ausmeat chiller based assessment payment methods.

Service Industry : *The burden of extension of technology in the beef industry is falling increasingly on the service industry, at a time when some components of this sector are withdrawing from the field.*

Private consulting firms and veterinary practitioners have by their very nature only limited and specialised contact with the beef cattle industry and have never had a major impact on the uptake of technology on a widespread scale.

The sectors of the service industry that can and are taking up the slack to hasten technology uptake are those specialist organisations such as AB Centres, Breed Societies through their

technical officers (Angus and Hereford), and some of the technology organisations such as ABRI with BREEDPLAN.

***Required Products and Services** : Changes in the beef cattle industry will affect different parts of the industry in different ways. Specialisation will become more common with certain producers targeting certain markets and seedstock producers supplying breeding stock designed for those specialist producers and markets.*

Cattle breeders will require advice from extension sources in three key areas;

(a) Genetics and selection technology such as that provided by BREEDPLAN

(b) Management advice on how to adopt and utilise the available technology

(c) Market opportunities and how to specialise to meet certain markets to convert activity in Sections (a) and (b) into profit.

The delivery systems needed to provide this extension must meet a number of criteria. That is they must:

- *possess technical competence,*
- *have widespread industry contact,*
- *be able to fund a large part of their activity from internal sources and,*
- *be an active part of the industry, and be accountable to the industry.*

Invited Industry Submissions

Submissions were invited from the following organisations:

* State Departments of Agriculture
* Beef cattle breed societies
* Beef Improvement Association
* Cattle Council of Australia
* Veterinary Associations
* Other Service Agencies to the seedstock sector.

Responses were received from:

* Wacol AI Centre (Qld Department of Agriculture)
* S.A. Department of Agriculture
* Cattle Council of Australia
* Limousin Society
* Australian Poll Hereford Society
* Quirindi Veterinary Clinic
* Angus Society of Australia
* Australian Hereford Society
* Shorthorn Society of Australia

Appendix F

National Conference on Agricultural Extension

A national conference on agricultural extension was held in Canberra in May 1990.

Convened by the Australian Institute of Agricultural Science and attended by some 260 delegates from all sectors of Australia's agricultural industries and support services, the conference declared a number of conclusions and objectives that are relevant to this report.

Significant points from contributed papers and the executive summary of the conference were:

***

Major changes that will influence technology transfer in the future are;

- *An overall trend from national to regional and farm level strategies*
- *The importance of producer attitudes towards information*
- *The declining importance of government activities on the provision of production related information and advice*
- *An increase in the importance of private industry in the technology transfer process*
- *An increase in diversity in the technology transfer process. Producers cannot be considered as a single homogeneous group.*

The net result of these forces is that successful transfer technology projects in the future will have clear objectives and will require a strong one-on-one relationship with the producer.

Although it should not be assumed that state government agencies will be phasing out of extension, competing priorities and public policy issues will increasingly limit their capacity to provide one-on-one producer contact services.

***

Broadly the conference concluded that the main needs to improve the relevance and value of extension services were:

- *Stronger market orientation in extension planning and activities relating to technology transfer.*
- *Improved flexibility of service delivery between public and private sectors making full use of public, private and industry resources.*
- *Evolvement of extension services based on the principles of;*

  (a) user pays for private good services with active education of public sector involvement in provision of these services.

  (b) the prime focus of publicly funded extension service to be public good issues, needs and opportunities

(c) *fostering a system of public and private extension services which are interrelated, co-ordinated and complementary.*

- *Foster strong collaborative links between R&D agencies, extension agencies (public and private) and producers to provide*

  (a) *an effective, interactive environment for information transfer*

  (b) *the most efficient use of all resources available to assist the communication process*

- *Stronger involvement of farmers in the development of technology and the extension process.*

Appendix G

Program Plan for Extending BREEDPLAN V.3

Ross Fenwick
National Field Co-ordinator

Version 3 of BREEDPLAN will include changes both in the number and presentation of EBV's and the relationship between BREEDPLAN and GROUP BREEDPLAN. These changes add up to the largest alteration to BREEDPLAN since the introduction of GROUP BREEDPLAN five years ago.

The activities that may be used to extend V.3 are listed below. They are ranked in priority order.

The **time frame** for these activities fall into 3 periods:

I	Pre-launch (to August 1991)
II	Launch and early post-launch (August-December 1991)
III	1992

Activities may have different priorities in different periods of the extension program

Activity	Priority	Time Frame
BREEDPLAN Manual (incl. V.3)	1	I
High Profile Launch	2	II
NBRS Schools for Industry Specialists (Breed Society, D of A and Private Consultants (incl. vets)	3	
* First School-Advanced (July 1991)		I
* Second School-Introductory (Aug/Sept 1991)		II
NBRS School for Breeders	4	II
Written notes for breeders noting changes. (Distributed with 1st report with the change)	5	I and II

Other meetings with NBRS Contribution		6	
* National	- Rockhampton		I
	- AAABG		I
	- BIA/BIF		III
* State		Low	
* Regional		Very low	
* District		Very low	
Specific Initiatives Instigated by:		**7**	
* Breed Societies	- Technical Officer		II/III
	- Congresses		I/II/III
	- Schools		II/III
* State Departments	- Qld BGIP		II/III
	- NSW/Vic Planned Breeding		
	- Others		
* Private Consultants (incl. vets and agents)			
Video		8	III

In addition there will be Training Clinics for commercial operators of the Breeding Objective package, B-OBJECT.

Resource people available for the above activities include:

National Field Co-ordinator
ABRI Technical Staff
AGBU Technical Staff
CSIRO Technical Staff
State Department Technical Staff
Outstanding breeders
Providers of Specialist Services

Appendix H
AUSTRALIAN SEEDSTOCK INDUSTRY SURVEY

INSTRUCTIONS

* **Please read each question carefully**
** **Answer all questions as accurately as possible**
*** **Where there are numbers next to the responses please circle your selection(s) which best answers the question**
**** **Please be assured your responses will remain ANONYMOUS**
N.B. **The term BREEDPLAN also refers to Breed Society integrated systems e.g. LIMPLAN, Angus BREEDPLAN etc..**

I. SOME DETAILS ABOUT YOURSELF

1. In what age group do you belong?

18-24 yrs	...	1	50-64 yrs	...	4
25-34 yrs	...	2	65 yrs and over	...	5
35-49 yrs	...	3			

2. What is your **highest** level of education?

Primary	...	1	University/College diploma	...	5
Intermediate/School certificate	...	2	University degree	...	6
Leaving/Higher school certificate	...	3	Postgraduate degree	...	7
Trade/College certificate	...	4			

3. In which State is your BREEDPLAN herd located? _____

4. What items listed below do you have in your home or office? (Answer more than one if applicable)

TV	...	1	Fax	...	4
Video recorder	...	2	Teletext decoder	...	5
Computer	...	3	Modem	...	6

II. SOME DETAILS ABOUT YOUR BREEDPLAN HERD

5. What **breed** are you running? (Only your major breed)

Angus	...	1	Hereford	...	5	Santa Gertrudis	...	9
Brahman	...	2	Limousin	...	6	Shorthorn	...	10
Charolais	...	3	Murray Grey	...	7	Simmental	...	11
Devon	...	4	Poll Hereford	...	8	Other (please specify)	...	12

_____

6. Please indicate approximately how many females will be joined in your BREEDPLAN herd this year.

_____

7. Please indicate approximately how many of the following categories of seedstock you sold **last year** and indicate the number you anticipate selling in 1995.

	1989	1995 (estimate)
Registered Bulls	____	____
Unregistered Bulls	____	____
Semen (no. of straws)	____	____
Embryos (frozen + pregnant recipients)	____	____

III. SOME INFORMATION ON YOUR USE OF BREEDING PRACTICES

8. Write the number which best represents how useful you feel each of the following practices is, or could be, in your breeding program.

0 Not at all useful	**1** Slightly useful	**2** Moderately useful	**3** Very useful	**4** Extremely useful	**9** No opinion

BREEDPLAN	____	Artificial Insemination (AI)	____
GROUP BREEDPLAN	____	Embryo transfer (ET)	____
Electronic animal identification	____	Embryo splitting	____
		Induced twinning	____
Scrotal measurement	____	Sexing of semen	____
Serving capacity tests	____		
Semen testing of bulls	____		
Pelvic measurement	____	Cloning	____
		Gene transfer	____
Measurement of Pasture intake	____	Gene mapping	____
Scanning for carcase traits	____		

9. Do you currently use **artificial insemination (AI)** in your overall breeding program?

YES ... 1 NO ... 2

If **YES** please indicate the approximate **percentage** of calves born or expected to be born using this practice in:

1985 ____%

1990 ____%

1995 (best estimate) ____%

10. Do you currently conduct an **embryo transfer (ET)** program in your breeding herd?

YES ... 1 NO ... 2

If **YES** please indicate the approximate **percentage** of calves born or expected to be born using this technology in:

1985 _____%

1990 _____%

1995 (best estimate) _____%

11. For each time period given below please indicate your use of **serving capacity tests:**

Used within last 5 years	YES	...	1	NO	...	2
Use now	YES	...	1	NO	...	2
Will use in the next 5 years	YES	...	1	NO	...	2

IV. BREEDPLAN/GROUP BREEDPLAN USAGE

12. How many years records have you had analysed in BREEDPLAN? _____

13. Have you submitted weight records for analysis in BREEDPLAN within the last 18 months?

YES ... 1 NO ... 2

If NO please circle the number which **best** describes the reason you have not submitted:

Just joined, no opportunity yet	.....	1
Haven't done so, but still intend to	.....	2
Not sure what records are needed	.....	3
Don't know how to submit my records	.....	4
Facilities for weighing not adequate	.....	5
Joined, but not planning to submit records	.....	6
Have been active but have now stopped recording	.....	7
Other (please specify)_____	...	8

14. Does your Breed Society conduct GROUP BREEDPLAN analyses?

YES ... 1 NO ... 2 NOT SURE ... 3

15. Has your herd been analysed in GROUP BREEDPLAN?

YES ... 1 NO ... 2

If NO please circle the number which **best** describes the reason why it hasn't been analysed.

GROUP BREEDPLAN is not available to me	....	1
Don't consider that between herd comparisons are valid	....	2
Concern that my herd would be disadvantaged in GROUP BREEDPLAN	....	3
Not prepared to use AI to link my herd	....	4
Too costly	....	5
Other (please specify)_____	....	6

16. How do you rate the usefulness of **BREEDPLAN** for making **selection** decisions in your herd? Please circle the number.

Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	Cannot make a judgement
0	1	2	3	4	9

17. **For GROUP BREEDPLAN users only.**

How useful is the GROUP BREEDPLAN report **relative** to the BREEDPLAN report for making **selection** decisions in your herd?

Much less useful	Less useful	About as useful as BREEDPLAN report	More useful	Much more useful	Haven't used the GROUP BREEDPLAN report
0	1	2	3	4	9

18. Please write the number which best rates your basic understanding of the following facets of BREEDPLAN.

0 No understanding	1 Limited understanding	2 Reasonable understanding	3 Good understanding	4 Thorough understanding

What information needs to be collected ____

When information should be collected to obtain best results ____

How to record information on cattle treated differently or running in different paddocks ____

How to record embryo transfer (ET) calves ____

How to interpret the reports you receive back ____

How to use EBVs in making selection decisions ____

How to use EBVs in buying decisions ____

How to use EBVs in marketing (in sales catalogues etc) ____

How to use selection indexes

19. Assuming a fixed additional cost per trait for producing an EBV assessment, in addition to the basic BREEDPLAN costs, **list in order of preference** five (5) traits that you would like included in future BREEDPLAN analyses.

1. Hip height
2. Mature weights
3. Eye pigmentation
4. Scrotal circumference
5. Serving capacity
6. Female fertility
7. Calving ease
8. Feed efficiency
9. Feedlot gain
10. Fat depth
11. Marbling
12. Eye muscle area
13. Lean meat yield
14. Other (please specify)

_____

First preference ____

Second preference ____

Third preference ____

Fourth preference ____

Fifth preference ____

20. How useful would you find it if BREEDPLAN integrated your preferred EBVs into a single value (index) for selection decisions?

Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	Cannot make a judgement
0	1	2	3	4	9

21. There is some disagreement amongst cattle breeders regarding the rate of change that can be made in a herd by selecting cattle for different traits. For each of the following traits would you please indicate (by circling the appropriate number) if you think the rate of change by selection is slow, medium, rapid or if you are uncertain?

	Slow	Medium	Rapid	Uncertain
. Male fertility traits ...	1	2	3	9
. Female fertility traits ...	1	2	3	9
. 400 day weight ...	1	2	3	9
. Carcase traits ...	1	2	3	9
. Temperament ...	1	2	3	9
. Feet problems ...	1	2	3	9

22. Breeders seem to have differing views as to what constitutes a management/treatment group. For BREEDPLAN analysis which of the following circumstances would you record separate management codes on your recording sheets.

	Yes	No	Uncertain
. Where cows with male calves at foot are run separately from cows with female calves at foot ...	1	2	9
. Where some animals receive a feed supplement ...	1	2	9
. Where a few calves in the herd are affected by pink eye ...	1	2	9
- Where cows and calves are run in different paddocks with significantly different feed conditions ...	1	2	9

23(a). If you sell bulls which of the following information do you make available to your prospective clients?

Herd EBVs	...	1	Muscle Score	...	7
Group EBVs	...	2	Eye Muscle area (scan)	...	8
Scrotal measurement	...	3	Fat depth (scan)	...	9
Serving capacity	...	4	Condition score	...	10
Hip height	...	5	Sale weight	...	11
Frame score	...	6	Other (please specify)		
			_____	...	12

V. WHERE DO YOU OBTAIN INFORMATION ABOUT NEW BREEDING PRACTICES

23(b). Beside each category listed below, write the number which best describes their importance to you as a source of information about new breeding practices.

0 Not at all useful	1 Slightly useful	2 Moderately useful	3 Very useful	4 Extremely useful	9 No opinion

1. Breed Societies ____
2. Other breeders ____
3. Veterinarians ____
4. Local stock agents ____
5. Stud Stock agents ____
6. Department of Agriculture - Beef Advisors ____
7. Department of Agriculture - Other personnel ____
8. Cattle Consultants - private ____
9. AI breeding company ____
10. Media (newspapers, radio, television) ____
11. Field days/seminars ____
12. Other (please specify) ____

_____

24. Please rank, from the list of media below, the three (3) most useful sources of information about new breeding practices.

1. Specialist magazine (e.g. 'Farm Magazine', 'Beef Improvement News') **Most useful** ____
2. Major state rural weeklies (e.g. 'The Land', 'Stock and Land', 'Weekly Times' etc) **Second Most useful** ____
3. ABC regional programs **Third most useful** ____
4. ABC Country Hour
5. Breed Society journals/newsletters
6. Specialist TV programs (eg. 'Countrywide', 'Cross Country')
7. Electronic bulletin board (eg. Elderlink, Viatel)
8. Other (please specify) _____

25. What are your preferred methods for **initially learning** about new breeding practices and technologies?

1.	Half day field days/meetings	**Most preferred**	____
2.	Full day workshops		
3.	Night meetings	**Second most preferred**	____
4.	Comprehensive training activities of more than one day's duration	**Third most preferred**	____
5.	Newsletters		
6.	Newspapers	**Fourth most preferred**	____
7.	Radio		
8.	Specialist publications		
9.	Videos		
10.	Electronic mail (e.g. Elder Link Viatel)		
11.	Computer software		
12.	Personal contact with specialist		

26. What are your preferred methods of **updating your knowledge on** breeding practices and technologies?

1.	Half day field days/meetings	**Most preferred**	____
2.	Full day workshops		
3.	Night meetings	**Second most preferred**	____
4.	Comprehensive training activities of more than one day's duration	**Third most preferred**	____
5.	Newsletters		
6.	Newspapers	**Fourth most preferred**	____
7.	Radio		
8.	Specialist publications		
9.	Videos		
10.	Electronic mail (e.g. Elder Link Viatel)		
11.	Computer software		
12.	Personal contact with specialist		

27. Would you please rate the influence that you believe the following currently have in the stud industry at large.

0 No at all influential	**1** Slightly influential	**2** Moderately influential	**3** Very influential	**4** Extremely influential	**9** Cannot make a judgement

Agents ____

Department of Agriculture - Beef Advisors ____

Veterinarians ____

Other breeders ____

28. If a farm-secretarial service for pedigree and performance-recording was available in your region on a fee for service basis, please indicate your level of interest in utilising such a service.

Not at all interested	Slightly interested	Moderately interested	Very interested	Extremely interested	No opinion
0	1	2	3	4	9

VI. GENERAL COMMENTS

29. Please express briefly what you believe to be:

(i) the strengths of BREEDPLAN

(ii) the areas you would like to be improved with BREEDPLAN

30. Please make any comments regarding special needs, preferences or any other aspects of breeding practices which we may not have directly addressed in this survey.

THANK YOU FOR YOUR TIME AND CONSIDERATION IN COMPLETING THIS SURVEY

Please return this survey in the enclosed Freepost envelope

or alternatively if you have misplaced the envelope then address your reply :

FREEPOST ARMIDALE 23
P.O. BOX 601
ARMIDALE NSW 2350

Appendix I
AUSTRALIAN SEEDSTOCK INDUSTRY SURVEY

INSTRUCTIONS

* **Please read each question carefully**
** **Answer all questions as accurately as possible**
*** **Where there are numbers next to the responses please circle your selection(s) which best answers the question**
**** **Please be assured your responses will remain ANONYMOUS**
N.B. **The term BREEDPLAN also refers to Breed Society integrated systems e.g. LIMPLAN, Angus BREEDPLAN etc..**

I. SOME DETAILS ABOUT YOURSELF

1. In what age group do you belong?

18-24 yrs	...	1	50-64 yrs	...	4
25-34 yrs	...	2	65 yrs and over	...	5
35-49 yrs	...	3			

2. What is your **highest** level of education?

Primary	...	1	University/College diploma	...	5
Intermediate/School certifieate	...	2	University degree	...	6
Leaving/Higher school certificate	...	3	Postgraduate degree	...	7
Trade/College certificate	...	4			

3. In which State is your herd located? _____

4. What items listed below do you have in your home or office? (Answer more than one if applicable)

TV	...	1	Fax	...	4
Video recorder	...	2	Teletext decoder	...	5
Computer	...	3	Modem	...	6

II. SOME DETAILS ABOUT YOUR HERD

5. What **breed** are you running? (Only your major breed)

Angus	...	1	Hereford	...	5	Santa Gertrudis	...	9
Brahman	...	2	Limousin	...	6	Shorthorn	...	10
Charolais	...	3	Murray Grey	...	7	Simmental	...	11
Devon	...	4	Poll Hereford	...	8	Other (please specify)	...	12

_____

6. Please indicate approximately how many females will be joined in your herd this year.

_____

7. Please indicate approximately how many of the following categories of seedstock you sold **last year** and indicate the number you anticipate selling in 1995.

	1989	1995 (estimate)
Registered Bulls	____	____
Unregistered Bulls	____	____
Semen (no. of straws)	____	____
Embryos (frozen + pregnant recipients)	____	____

III. SOME INFORMATION ON YOUR USE OF BREEDING PRACTICES

8. Write the number which best represents how useful you feel each of the following practices is, or could be, in your breeding program.

0 Not at all useful	1 Slightly useful	2 Moderately useful	3 Very useful	4 Extremely useful	9 No opinion

Breedplan	____	Artificial Insemination (AI)	____
Group Breedplan	____	Embryo transfer (ET)	____
Electronic animal identification	____	Embryo splitting	____
		Induced twinning	____
Scrotal measurement	____	Sexing of semen	____
Serving capacity tests	____		
Semen testing of bulls	____		
Pelvic measurement	____	Cloning	____
		Gene transfer	____
Measurement of Pasture intake	____	Gene mapping	____
Scanning for carcase traits	____		

9. Do you currently use **artificial insemination (AI)** in your overall breeding program?

YES ... 1 NO ... 2

If **YES** please indicate the approximate **percentage** of calves born or expected to be born using this practice in:

1985 ____%

1990 ____%

1995 (best estimate) ____%

10. Do you currently conduct an **embryo transfer (ET)** program in your breeding herd?

YES ... 1 NO ... 2

If **YES** please indicate the approximate **percentage** of calves born or expected to be born using this technology in:

1985 ____%

1990 ____%

1995 (best estimate) ____%

11. For each time period given below please indicate your use of **serving capacity tests:**

Used within last 5 years	YES	...	1	NO	...	2
Use now	YES	...	1	NO	...	2
Will use in the next 5 years	YES	...	1	NO	...	2

12. Do you have the facilities to weigh your cattle?

YES ... 1 NO ... 2

If YES please indicate the stages at which they are weighed.

At birth	...	1	Pre sale	...	4
At weaning	...	2	Pre-joining (heifers)	...	5
At yearling	..	3	Other (please specify) _____		... 6

13. Are you a member of Breedplan?

YES ... 1 NO ... 2

If NO do you intend to join in the next twelve months?

YES ... 1 NO ... 2

If NO please circle the number which best describes the reason why you have not joined.

Do not consider it is important	.....	1
Do not consider the expense is justified	.....	2
Not sure what is needed to join the scheme	.....	3
Do not know what is needed to participate in the scheme	.....	4
Herd is too small	.....	5
Facilities for weighing are not adequate	.....	6
Was a member but resigned	.....	7
Other (please specify)	.....	8

_____

_____

14. Does you Breed Society publish a sire summary?

YES ... 1 NO ... 2 DON'T KNOW ... 3

If YES do you use this summary as an aid in your selection?

YES ... 1 NO ... 2

15. There is some disagreement amongst cattle breeders regarding the rate of change that can be made in a herd by selecting cattle for different traits. For each of the following traits would you please indicate (by circling the appropriate number) if you think the rate of change by selection is slow, medium, rapid or if you are uncertain?

		Slow	Medium	Rapid	Uncertain
. Male fertility traits	...	1	2	3	9
. Female fertility traits	...	1	2	3	9
. 400 day weight	...	1	2	3	9
. Carcase traits	...	1	2	3	9
. Temperament	...	1	2	3	9
. Feet problems	...	1	2	3	9

16. If you sell bulls which of the following information do you make available to your prospective clients?

Weight or weight gain	...	1	Muscle Score	...	7
Adjusted weight or weight ratio	...	2	Eye Muscle area (scan)	...	8
Scrotal measurement	...	3	Fat depth (scan)	...	9
Serving capacity	...	4	Condition score	...	10
Hip height	...	5	Sale weight	...	11
Frame score	...	6	Other (please specify)		
			_____	...	12

IV. WHERE DO YOU OBTAIN INFORMATION ABOUT NEW BREEDING PRACTICES

17. Beside each category listed below, write the number which best describes their importance to you as a source of information about new breeding practices.

0 Not at all useful	1 Slightly useful	2 Moderately useful	3 Very useful	4 Extremely useful	9 No opinion

1. Breed Societies ____
2. Other breeders ____
3. Veterinarians ____
4. Local stock agents ____
5. Stud Stock agents ____
6. Department of Agriculture - Beef Advisors ____
7. Department of Agriculture - Other personnel ____
8. Cattle Consultants - private ____
9. AI breeding company ____
10. Media (newspapers, radio, television) ____
11. Field days/seminars ____
12. Other (please specify) ____

_____

18. Please rank, from the list of media below, the three (3) most useful sources of information about new breeding practices.

1. Specialist magazine (e.g. 'Farm Magazine', 'Beef Improvement News') — **Most useful** _____
2. Major state rural weeklies (e.g. 'The Land', 'Stock and Land', 'Weekly Times' etc) — **Second Most useful** _____
3. ABC regional programs — **Third most useful** _____
4. ABC Country Hour
5. Breed Society journals/newsletters
6. Specialist TV programs (eg. 'Countrywide', 'Cross Country')
7. Electronic bulletin board (eg. Elderlink, Viatel)
8. Other (please specify) _____

19. What are your preferred methods for **initially learning** about new breeding practices and technologies?

1. Half day field days/meetings — **Most preferred** _____
2. Full day workshops
3. Night meetings — **Second most preferred** _____
4. Comprehensive training activities of more than one day's duration — **Third most preferred** _____
5. Newsletters
6. Newspapers — **Fourth most preferred** _____
7. Radio
8. Specialist publications
9. Videos
10. Electronic mail (e.g. Elder Link Viatel)
11. Computer software
12. Personal contact with specialist

20 What are your preferred methods of **updating your knowledge on** breeding practices and technologies?

1. Half day field days/meetings — **Most preferred** _____
2. Full day workshops
3. Night meetings — **Second most preferred** _____
4. Comprehensive training activities of more than one day's duration — **Third most preferred** _____
5. Newsletters
6. Newspapers — **Fourth most preferred** _____
7. Radio
8. Specialist publications
9. Videos
10. Electronic mail (e.g. Elder Link Viatel)
11. Computer software
12. Personal contact with specialist

21. Would you please rate the influence that you believe the following currently have in the stud industry at large.

0	1	2	3	4	9
No at all influential	Slightly influential	Moderately influential	Very influential	Extremely influential	Cannot make a judgement

Agents _____

Department of Agriculture - Beef Advisors _____

Veterinarians _____

Other breeders _____

22. If a farm-secretarial service for pedigree and performance-recording was available in your region on a fee for service basis, please indicate your level of interest in utilising such a service.

Not at all interested	Slightly interested	Moderately interested	Very interested	Extremely interested	No opinion
0	1	2	3	4	9

VI. GENERAL COMMENTS

23. Please make any comments regarding special needs, preferences or any other aspects of breeding practices which we may not have directly addressed in this survey.

_____

_____

_____

_____

THANK YOU FOR YOUR TIME AND CONSIDERATION IN COMPLETING THIS SURVEY

Please return this survey in the enclosed Freepost envelope

or alternatively if you have misplaced the envelope then address your reply :

FREEPOST ARMIDALE 23
P.O. BOX 601
ARMIDALE NSW 2350

Appendix J
STUD STOCK AGENTS SURVEY

NAME: ..... COMPANY: .....

ADDRESS:..... POSITION: .....

.....

I. SOME DETAILS ABOUT YOURSELF

1. In what age group do you belong?

18-24 yrs	...	1	50-64 yrs	...	4
25-34 yrs	...	2	65 yrs and over	...	5
35-49 yrs	...	3			

2. What is your **highest** level of education?

Primary	...	1	University/College diploma	...	5
Intermediate/School certificate	...	2	University degree	...	6
Leaving/Higher school certificate	...	3	Postgraduate degree	...	7
Trade/College certificate	...	4			

3. How many years have you been in the agency field?.....

4. How many years in the Stud Stock Sector?.....

5. How many years with the Company? .....

6. Previous employment with other Agents? .....

.....

THE FOLLOWING QUESTIONS RELATE TO YOUR EXPERIENCE, UNDERSTANDING AND TRAINING NEEDS RELATIVE TO DEVELOPMENTS IN BREEDING TECHNOLOGY

7. In your time as a Stud Stock Agent - what **in-service-training** have you had?

.....

.....

.....

8. Over the last 5 years what technically based industry events have you attended (eg. Workshops/Conferences)?

.....

.....

.....

9. Have you undertaken any self development courses or lecturers over the last 5 years? YES/NO

If YES which ones?.....

.....

.....

10. For the following sources on a score of 0 to 4 how do you rate them on usefulness for providing information on breeding practices.?

0 Not at all useful	1 Slightly useful	2 Moderately useful	3 Very useful	4 Extremely useful

1. Breed Societies ____
2. Stud breeders ____
3. Veterinarians ____
4. Local stock agents ____
5. Other Stud Stock agents ____
6. Department of Agriculture - Beef Advisors ____
7. Department of Agriculture - Other personnel ____
8. Cattle Consultants - private ____
9. AI breeding company ____
10. Media (newspapers, radio, television) ____
11. Field days/seminars ____
12. Other (please specify) ____

_____

11. Please rank from 0-4 the most useful sources of information about new breeding practices.

0	1	2	3	4
Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful

1. Specialist magazine (e.g. 'Farm Magazine', 'Beef Improvement News')
2. Major state rural weeklies (e.g. 'The Land', 'Stock and Land', 'Weekly Times' etc)
3. ABC regional programs
4. ABC Country Hour
5. Breed Society journals/newsletters
6. Specialist TV programs (eg. 'Countrywide', 'Cross Country')
7. Electronic bulletin board (eg. Elderlink, Viatel)
8. Other (please specify) _____

WHICH DO YOU FEEL IS THE MOST USEFUL .....

12. Rate from 0-4 how useful you find the following methods for **initially learning** about new breeding practices and technologies?

0	1	2	3	4
Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful

1. Half day field days/meetings ____
2. Full day workshops ____
3. Night meetings ____
4. Comprehensive training activities of more than one day's duration ____
5. Newsletters ____
6. Newspapers ____
7. Radio ____
8. Specialist publications ____
9. Videos ____
10. Electronic mail (e.g. Elder Link Viatel) ____
11. Computer software ____
12. Personal contact with specialist ____

WHICH DO YOU FEEL IS THE MOST USEFUL .....

13. Rank from 0-4 how useful you find the following methods of **updating your knowledge on** breeding practices and technologies?

0	1	2	3	4
Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful

1. Half day field days/meetings ____
2. Full day workshops ____
3. Night meetings ____
4. Comprehensive training activities of more than one day's duration ____
5. Newsletters ____
6. Newspapers ____
7. Radio ____
8. Specialist publications ____
9. Videos ____
10. Electronic mail (e.g. Elder Link Viatel) ____
11. Computer software ____
12. Personal contact with specialist ____

WHICH DO YOU FEEL IS THE MOST USEFUL .....

14. How confident are you in interpreting and/or advising clients in the use of the following:

		Question 14 (Confidence Ranking)	**Question 15 (Training Needs)**
1.	Breedplan	_____	_____
2.	Group Breedplan	_____	_____
3.	A.I.	_____	_____
4.	E.T.	_____	_____
5.	Servicing capacity	_____	_____
6.	Scrotal circumferance	_____	_____
7.	Scanning for carcase traits	_____	_____
8.	Semen testing of bulls	_____	_____

Rank here on a 0 to 4 basis where:

0 = no confidence;
1 = general understanding of the concept but no confidence to give advice;
2 = confidence in some aspects but not many;
3 = confident on most aspects;
4 = very confident on all aspects.

15. For the previous areas could you provide an assessment of your training needs on a basis of 0 to 3.

0 = don't need any training;
1 = need training on fundamentals on basic principles;
2 = require advanced training in application;
3 = need refresher courses on new developments

16. How do you perceive the usefulness of the following practices for the future.

0 Not at all useful	1 Slightly useful	2 Moderately useful	3 Very useful	4 Extremely useful

BREEDPLAN _____
GROUP BREEDPLAN _____
Electronic animal identification _____
Scrotal measurement _____
Serving capacity tests _____
Semen testing of bulls _____
Pelvic measurement _____
Measurement of Pasture intake _____
Scanning for carcase traits _____

Artificial Insemination (AI) _____
Embryo transfer (ET) _____
Embryo splitting _____
Induced twinning _____
Sexing of semen _____
Cloning _____
Gene transfer _____
Gene mapping _____

17. (a) Approximately how many bulls would you sell each year? .....

(b) What's the approximate total value of those sales? .....

18. (a) How many clients would you consider you would directly influence in relation to their breeding programs?

(b) How many bulls would those clients sell each year? .....

19. (a) How many clients do you influence in their buying decision? .....

(b) How many bulls would you buy on behalf of clients or directly influence their buying decision and approximate $ value?

No.	$ (value)
----------	----------
----------	----------

20. What following information do you recommend to your clients to make available in their catalogue.

Herd EBVs	...	1	Muscle Score	...	7
Group EBVs	...	2	Eye Muscle area (scan)	...	8
Scrotal measurement	...	3	Fat depth (scan)	...	9
Serving capacity	...	4	Condition score	...	10
Hip height	...	5	Sale weight	...	11
Frame score	...	6	Other (please specify)		
			_____	...	12

21. In a multi-vendor sale do you feel that where available EBV's should be in the catalgoue?
YES/NO

If YES do you prefer Breedplan EBVs' or Group EBV's to be catalogued?

If NO why?

.....

.....

.....