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AUSTRALIAN Pork™

Target 25

Final Report
APL Project 2005/2102

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Contents

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Objectives

1. To assess the value of an on-farm, team-building approach to knowledge transfer within the Australian pork industry

2. To improve the reproductive efficiency of selected breeding herds through the selection of a single trait and subsequent intensive targeting of its improvement

Brief Synopsis of the Target 25 Approach

1. Paul Hughes visits the farm & sets up a "Target 25 team" which consists of himself, the state Target 25 coordinator & key breeding herd staff (N.B. it does not include the owner/manager unless that person is also a key person working with the breeding herd on a day-to-day basis).

2. During this first visit every aspect of day-to-day management of the breeding herd is reviewed & recorded – this takes approximately 4 hours. At this stage the team also decides which traits will be targeted – farrowing rate & litter size (total born) OR stillbirths & pre-weaning mortality.

3. On the basis of this review the team members all contribute ideas on how breeding herd performance can be improved. Normally the changes considered here are primarily or exclusively to the detail of day-to-day activities rather than major structural or other changes, as experience suggests that most improvements are to be gained through attention to detail within current practices rather than major alterations to sheds etc. (i.e. most, if not all, the suggested changes will incur little or no cost)

4. A 'shopping list' of the suggested changes, together with a very brief rationale for each, is then circulated within the team for feedback. The rationale is an important component at this stage as it allows everyone to understand why they would change any aspect of what they are doing. This approach allows some refinement of the suggested changes before any are actually implemented & normally results in a list of 8-20 changes that are tried on-farm.

5. If new SOPs are needed on-farm to assist with the implementation of these 'test changes' they are prepared by the team. The changes themselves are then trialled over a 6-month period, including a team meeting at 3 months to check on progress.

6. At the end of this trial period the team meets & finalises the changes that will be locked in for a 12-month experiment period. These are normally a combination of effective changes from the original change list & modified versions of changes from the original change list.

7. During the 12-month locked-in period Paul Hughes visits the farm every 3 months to run a team meeting to ensure all is going according to plan & to ensure the on-farm team don't drift off the planned changes.

Fate of Piggeries Joining the Program

A total of 21 piggeries eventually joined the Target 25 program. This was fewer than had been anticipated but did reflect the parlous state of the Australian pork industry when the program started. There was also an element of cynicism regarding the likely efficacy of the program which, when combined with a significant charge to join the program, deterred many producers from enrolling. In addition, several owners/managers had difficulty accepting that their breeding herd staff & an "outside expert" were going to take over decision-making for their breeding herd for a period of approximately 18 months.

The fate of the 21 enrolling piggeries was as follows:

Completed the Target 25 program	12
Withdrew early (before changes locked in)	3
Withdrew late (after changes locked in)	2
Piggery closed down or was sold	4

Reasons for early withdrawal were either a lack of belief the Target 25 system would work (2 piggeries) or a piggery management decision to institute major changes in the breeding herd that would confound data collected on the apparent effects of the Target 25 program (1 piggery).

Reasons for the two late withdrawals were 'lack of time' and a major change in the management structure of the piggery.

State	Completed piggeries	Withdrawn piggeries	Closed/sold piggeries
QLD	6	3	0
NSW	4	0	1
VIC	1	1	1
WA	1	0	1
SA	0	1	1

The herd size for the piggeries was as follows:

Completed piggeries	Withdrawn piggeries	Closed/sold piggeries
5,600	920	1,400
2,000	720	1,000
1,150	530	860
1,110	450	460
920	390	-
850	-	-
750	-	-
750	-	-
650	-	-
530	-	-
310	-	-
140	-	-
Means 1,230	602	930

Target 25 Results

In Table 1 a summary is provided of the 12 months herd performance prior to changes being made via the Target 25 program for all those herds that originally enrolled in Target 25.

Table 1: Starting performance data compared to best-practice targets

Trait	Best practice target	Mean	Range	Withdrawn herds only
Farrowing rate (%)	87+	75.3	57.9-87.0	69.9
Litter size (total)	12+	11.2	9.3-12.4	11.1
SBs + PWM (%)	<13*	18.2	13.0-23.9	19.3
Litter size (weaned)	10.4	9.0	7.7-9.8	9.0
Pigs weaned/sow/yr	25+	20.1	15.9-24.4	19.2

*Best practice target equates to a loss of 1.6 piglets out of a litter size (total born) of 12

What this shows is that overall breeding herd performance is extremely variable. For example, looking at the three traits being targeted in this program litter size (total born) ranges from 9.3 to 12.4, total piglet losses due to stillbirths & pre-weaning mortality ranges from 13% to 24% and farrowing rate varies from 58% to 87%. If these figures are compared with what are seen as worlds best – as per the benchmark figures given in the CD "Reproductive management of pigs" - it becomes clear that there is considerable scope for improvement.

Each farm on Target 25 received a full list of suggested changes to breeding herd management together with a brief explanation of why this change was proposed – examples of these are available on request. The changes suggested that were finally agreed to & implemented on each of the completed farms, together with their 'before & after' breeding herd performance data, are available on request (N.B. farms have been assigned a letter only to permit anonymity).

In Tables 2 and 3 the breeding herd performance data for before & after implementation of Target 25 data have been summarised. These data reflect the variability in response seen on the Target 25 program, something that would be expected in an extension study such as this where it was not possible to control all, or indeed most, of the variables. For example, the two herds that fared worst in the program both had significant other problems during the 12-month Target 25 implementation period – one had an unusual major seasonal infertility problem while the other had a disease breakdown in the weaner/grower section resulting in not only major pig losses but also the diversion of attention from the breeding herd & two changes in the leadership of the breeding herd labour group. Conversely, two of the herds saw positive changes in their staffing during the Target 25 period. These changes may well have contributed much to the observed improvements seen in breeding herd performance but this cannot be separated from any improvements due to the Target 25 changes. Given that such confounding effects are inevitable in a study such as this – i.e. no pig breeding herd remains entirely static over an 2.5-year period – the results given in Table 2 are the basic data without any attempt to account for external (non-Target 25) effects.

Table 2: Annual farrowing rate & litter size (total born) data for the 12 completing herds pre—Target 25 & during Target 25 implementation.

	Farrowing rate		Litter size (total born)	
Farm	Pre-T25	During T25	Pre-T25	During T25
A	82.0	85.3	11.4	11.2
B	68.6	79.9	10.6	11.6
C	80.1	86.7	10.6	13.1
D	74.8	82.5	10.2	10.4
E	65.4	89.7	11.3	12.1
F	78.7	77.0	10.6	10.8
G	75.1	82.7	11.3	12.5
H	86.0	78.9	11.2	11.5
I	80.4	80.6	11.8	11.5
J	82.0	89.2	12.4	12.3
K	87.0	85.0	12.2	12.9
L	79.8	82.5	11.5	12.1
Mean/farm	78.3[a]	83.3[b]	11.3[c]	11.8[d]
Mean/sow*	78.9[a]	84.5[b]	11.1[c]	12.3[d]
Mean/farm**	76.8[a]	82.3[a]	11.0[a]	11.6[a]
Mean/sow**	78.3[a]	84.1[b]	10.9[c]	12.3[d]

*based on a calculation using herd size for each of herds A-L.

**for the 9 farms targeting these traits only

a v. b and c v. d: within a row means are significantly different ($P<0.05$) based on paired t-test

These data suggest an overall positive effect of the Target 25 program on farrowing rate & litter size (total born), although little benefit appeared to accrue from targeting stillbirth & pre-weaning mortality rate. The improvement seen in litter size at weaning appears to result from application of Target 25 on the 9 farms targeting farrowing rate & litter size and not to any Target 25-related improvement in stillbirth or pre-weaning mortality rates on those farms targeting these traits. However, even with farrowing rate & litter size (total born) there is clearly great variation in the response seen to Target 25 intervention. This is most clearly demonstrated in Table 4.

Table 3: Annual stillbirth + pre-weaning mortality rate & litter size (weaned) for the 12 completing herds pre—Target 25 & during Target 25 implementation.

	Stillbirth + pre-weaning mortality rate		Litter size (weaned)	
Farm	Pre-T25	During T25	Pre-T25	During T25
A	16.7	14.3	9.5	9.6
B	23.6	24.1	8.1	8.8
C	18.9	20.6	8.6	10.4
D	18.6	18.3	8.3	8.5
E	23.9	24.8	8.6	9.0
F	15.1	16.7	9.0	9.0
G	18.6	20.0	9.2	10.0
H	16.1	19.1	9.4	9.3
I	16.9	14.8	9.8	9.8
J	21.8	22.0	9.7	9.6
K	19.7	18.6	9.8	10.5
L	21.7	22.3	9.0	9.4
Mean/farm	19.3	19.6	9.1[a]	9.5[b]
Mean/sow*	18.8	19.7	9.0[a]	9.8[b]
Mean/farm**	20.8	21.0	9.5	9.8
Mean/sow**	21.2	21.1	9.6	9.8

*based on a calculation using herd size for each of herds A-L.

**for the 3 farms targeting these traits only

a,b: within a row means are significantly different (P,0.05) based on paired t-test

Table 4: Percentage improvements in annual breeding herd performance data from pre-Target 25 to during Target 25 implementation

Farm	Farrowing rate	Litter size (total born)	Stillbirths + PWM	Litter size weaned
A	8.2	23.6	-9.4	20.9
B	8.8	-0.8	0.9	-1.0
C	37.2	7.1	-3.8	4.7
D	10.3	2.0	1.6	2.4
E	6.5	-1.8	14.4	1.1
F	19.0	9.4	-2.1	8.6
G	-2.2	1.9	-10.6	0
H	-2.3	5.7	4.6	7.1
I	10.1	10.6	-7.5	8.7
J	-8.3	2.7	18.6	1.1
K	0.2	2.5	11.2	0
L	3.4	5.2	2.8	4.4
Mean/farm	7.4	5.3	1.8	4.7
Mean/sow*	7.8	11.4	6.8	9.7

*based on a calculation using herd size for each of herds A-L.

In Table 5 these changes in herd performance have been combined with herd size & the data has then run through an AusPig simulation to provide an estimate of the dollar value of the change in breeding herd output. Taken on face value, these suggest that the average annual improvement in revenue per sow was $ & the benefit in $/kg of pig sold was c.

Table 5: The estimated financial value of the improvements in annual breeding herd performance seen in response to Target 25

Farm size (no. sows)	Estimated improvement in pigs weaned/sow/year (%)	Benefit ($/kg)	Benefit ($/pig sold)
5,600	22.6	0.23	$16.77
2,000	10.3	0.11	$7.86
1,150	-5.0	-0.01	-$0.46
1,100	3.8	0.04	$2.71
920	0.3	-.03	-$2.39
850	10.1	0.12	$8.93
750	1.8	0.02	$1.75
750	3.7	0.05	$3.37
650	-0.7	0.00	-
530	6.8	0.15	$10.40
310	1.0	-0.28	-$19.40
140	11.3	0.14	$10.56

It was originally planned that a full evaluation would be conducted by Knowledge Teams International Pty. Ltd. of on-farm attitudes to the Target 25 program. However, financial constraints made this impossible. Instead we instituted a simple assessment of owner/manager & staff/driver attitudes to the program, this being jointly conducted by Paul Hughes & the state coordinator. This assessment was based on a 1-10 score for each person/group both at the start of the program and at the end. The data for these assessments, & its relationship to herd performance, is shown in Table 6. Despite a belief that the on-farm attitude would drive adoption rate for Target 25 changes, this did not prove to be the case. Indeed, there was no obvious relationship between attitude & achieved improvements. However, it was apparent that the piggery's management's attitude to the Target 25 program was a major factor in withdrawal from the program (see Table 7).

Table 6: The relationship between improvements in annual breeding herd performance seen in response to Target 25 and Adoption Indices*

Farm size (no. sows)	Improvement PW/S/Y (%)	Start Adoption Indices		Finish Adoption Indices	
		Owner/manager	Driver	Owner/manager	Driver
5,600	22.6	5	4	6	7.5
2,000	10.3	7.5	7.5	7	7
1,150	-5.0	7.5	5.5	7.5	5.5
1,100	3.8	7.5	8	8	6.5
920	0.3	8.5	8	8.5	7
850	10.1	6	5.5	6	6
750	1.8	8	8	8	8.5
750	3.7	5.5	6	6.5	8
650	-0.7	8.5	7.5	8.5	7
530	6.8	7	6.5	7.5	7
340	1.0	9	8	8	8
140	11.3	9	9	9	9

*Adoption Indices are based on a 1-10 score for each person/group, 1 being an extremely negative attitude to the Target 25 program & 10 being an extremely positive attitude to the program.

Table 7: The relationship between Adoption Indices (AIs) & withdrawal from the program

Status on the program	No. of farms	Mean start AIs owners/managers	Range	Mean start AIs staff/driver	Range
Completed	12	7.4	5-9	7.0	4-9
Withdrawn	9	3.9	2-5.5	5.2	4-6

The actual changes suggested on each farm were different & were tailored to that farm's particular management strategy. However, there were several suggested changes that were common to at least half the farms on the Target 25 program that were targeting farrowing rate & litter size. These were:

1. Improve gilt management to increase efficacy of puberty stimulation & maximise the proportion of gilts first bred at second or later oestrus - the details of the suggested program varied from farm to farm but were in line with the framework presented in PigLink seminar 1 in 2009 (http://nationalporkcentre.com.au/secure/PigLink-2009-1.exe)

2. Re-set gilt management numbers to ensure the last 10-15% of gilts to reach puberty are automatically culled from the breeding herd as these will be mainly sub-fertile animals that will reduce overall herd performance & increase between-animal variability

3. Improve the housing & feeding of gilts to (a) allow more space (at least $2m^2$/gilt) & to ensure adequate body tissue reserves (particularly muscle) prior to herd entry & first farrowing

4. Change mating/insemination schedule to maximise the likelihood of there being fertile semen present at or just after ovulation. In most cases this meant delaying first mating by half a day for those sows returning to oestrus 3-5 days after weaning, giving the second mating/insemination 24 hours after the first & then providing a third mating/insemination 12 or 24 hours after the second mating/insemination for those gilts/sows still showing a good standing heat at this stage

5. Storage of semen was carefully checked on each farm to ensure the real temperature in the storage cabinet (semen fridge) was actually at 17-19°C – i.e. dataloggers were used to confirm or refute temperature readings displayed by the storage cabinet. Where displayed readings were inaccurate the settings were adjusted or, in some cases, the cabinet was replaced. In addition, many producers were stacking the semen doses too tightly, thus allowing microclimates to be set up, while others were not turning doses regularly to facilitate adequate mixing of sperm cells with the diluent to ensure ongoing nutrient supply to sperm.

6. Use of aged semen was a common feature on many Target 25 farms. The logistics of getting adequate deliveries of semen to cover inseminations on every day of the week were seen as a serious problem & were resulting in the use of a large amount of day 4 semen (or older). Changes were made in delivery protocols to ensure no day 4 semen was used &, where possible, day 3 semen use was minimised in the Summer months

7. Record the quality of a mating/insemination on a 1-3 scale where 1 = poor, 2 = suspect & 3 = good. This was used as a first step to convince staff that 'quality 1 & 2 matings/inseminations' resulted in poor farrowing rate and/or litter size outcomes & thus these should not be counted as actual matings/inseminations. The follow up from this was that any mating/insemination that was not considered 'good' was repeated within 6 hours

8. Improved gilt/sow body condition at weaning through better feeding during lactation &, where necessary, the use of differential suckled litter size for young v. older sows & the use of split weaning where needed

9. Better feeding of weaned sows to maximise the number & quality of ova shed at the post-weaning oestrus & thus maximise subsequent litter size. Many farms were using a restricted feeding system at this stage & a low quality Dry Sow diet. Where possible this was changed to a Lactating Sow diet but, regardless of diet fed, all weaned sows were put on a feeding regimen that provided a minimum of 3 kg/day &, preferably ad libitum access to feed.

10. Improved detection of non-pregnant sows at 18-28 days post-mating/insemination in combination with later pregnancy diagnosis (PD) using ultrasound at day 28+. Most herds pre-Target 25 had poor systems in place to detect oestrus in the dry sow shed. Specifically, most gilts/sows were in stalls & cursory heat detection was done with either a boar running loose in front of the sows along the length of the shed or without any boar contact. The suggested change here was to concentrate on those sows that were 18-28 days post-mating/insemination18-28 days post-mating/insemination18-28 days post-mating/insemination & to confine the boar to the heads of no more that 4 sows at a time. In addition, concerns with the accuracy of PDs done at 21-26 days post-mating/insemination resulting in a policy change whereby PDs were done at 28-35 days, often with a follow-up PD 3 weeks later

The common suggested changes (suggested to all 3 farms targeting these traits) for those farms on the Target 25 program that were targeting stillbirths & pre-weaning mortality were:

1. To use shift suckling in the first few hours after farrowing to ensure smaller, weaker piglets gained access to the udder & ingested colostrum & energy

2. Provision of a second creep heater located over the birth site during farrowing then moved to the side of the sow opposite the fixed heater once farrowing was complete. This minimised critical energy/heat loss by piglets immediately postpartum & facilitated more rapid piglet transit to the heated creep area & the sow's udder. It also provided a 'safety net' for those sows that opted to lie with their udders facing away from the fixed creep lamp & thus consigning their litter to lie in a non-heater area for the first 2-3 days postpartum

3. Injection of small & weak piglets with 0.1mg of oestradiol benzoate as soon as possible after birth to increase their activity levels & thus facilitate rapid piglet transit to the heated creep area & the sow's udder

In addition to the common suggested changes listed above there were a total of 26 other changes suggested for one or more of the participating farms. These were:

- Give cycling gilts regular (twice weekly) boar contact to maintain normal cyclicity
- Increase the quality of heat checking using contact with mating boars
- Record performance results where Regumate is used
- Check boar records for evidence of low farrowing rates
- Record the mating supervisor of AI inseminator
- Where an age-related drop is seen in litter size cull sows after 6/7 litters
- Trial a mycotoxin binder in breeder diets
- Where little or no culling occurs at the gilt stage cull more weaned sows on the basis of extending weaning-to-oestrus interval
- Prior to AI don't wash vulvas – use a dry paper towel to clean dirty vulvas
- After AI leave the catheter in place for 2-5 minutes & don't move the sow for 5 minutes after catheter removal
- Don't mix sows or apply other stressors in the first 2 weeks post-mating/insemination
- Improve washing, disinfecting & drying of farrowing pens
- Reduce the slipperiness of farrowing pen floors
- Use a farrowing induction program where stillbirth rates are high
- Where a farrowing induction program isn't working well try a different prostaglandin & apply as a split dose
- Intervene early in stalled farrowings – inter-pig birth interval >25 minutes
- Increase staff availability in the farrowing house to give required attention to farrowing sows & litters 1-3 days postpartum
- Play music in the farrowing house to habituate sows to noise disturbance
- Provide appropriate cooling in the farrowing house in the Summer months
- Consider using creep feeding if lactations are longer than 24 days and/or litter weaning weights are low
- Improve the quality of cross-fostering
- Avoid weaning at less than 19-21 days

In Tables 8 & 9 a summary is provided of both the frequency with which the top 13 suggestions were used & their adoption rate.

Table 8: The frequency with which each of the top 13 suggested changes were used & their adoption rate.

Suggested change	Frequency of use*	Adoption rate (%)
Improve gilt management	.89	88
Cull more gilts	.78	86
Improve gilt housing/feeding	.56	40
Change mating/AI schedule	.67	100
Store semen better	.55	100
Don't use aging semen	.55	100
Record mating/AI quality	.78	100
Improve sow weaning condition	.89	75
Feed weaned sows more	.67	83
Improve returns detection	.89	38
Use shift suckling	1.00	100
Provide a second creep heater	1.00	33
Use OB on weak piglets	1.00	0

*proportion of farms targeting the trait appropriate to this change where the suggestion was given

Table 9: The frequency with which each of the 26 less used suggested changes were used & their adoption rate.

Suggested change	Frequency of use*	Adoption rate (%)
Stimulate cycling gilts	.22	100
Better heat checking	.22	50
Regumate performance recording	.22	0
Low FR boars	.22	100
Record inseminator/mating supervisor	.55	80
Cull older sows	.11	100
Trial mycotoxin binder	.11	0
Cull more weaned sows	.44	100
Don't wash vulvas	.11	100
Better post-AI management	.33	67
Reduce stress in early gestation	.55	80
Cleaner, drier farrowing pens	.33	100
Less slippery farrowing floors	.33	100
Use a farrowing induction program	.33	100
Change farrowing induction program	.33	100
Early intervention in farrowing	.67	100
More farrowing house staff	.67	50
Play music in farrowing house	.67	0
Cool farrowing house	.33	100
Try creep feeding	.33	0
Improve cross-fostering	.33	100
Don't early wean	.44	75

*proportion of farms targeting the trait appropriate to this change where the suggestion was given

Conclusions & Recommendations

There is no doubt that Target 25 changes occurring on the farms reported here were not the sole causes of change in breeding herd performance. For example, major staff changes occurred on several farms during the Target 25 period, some of these being positive while others clearly had a negative effect on performance. Equally, on at least one farm a major health problem deflected attention from the Target 25 program. Nevertheless, there are several clear messages that emerge to date from this program:

- There is great variation in breeding herd performance between Australian herds
- Most Australian breeding herds are performing well below their potential
- Raising breeding herd performance is mainly a result of attention to known details rather than the application of new knowledge (i.e. this isn't rocket science !)
- Using the Target 25 approach can work on all farms, but the improvements seen are obviously greater on those farms where the starting performance is poor
- To adopt Target 25-type improvements requires that the farm's ownership/management believe the program will be of value
- To successfully improve breeding herd performance may not require that the 'coal-face' staff take ownership of the changes implemented