The Effect of BIOACTIVE on the Health and Growth Performance of Pigs.

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Executive Summary:

(a) Background

Reduction in feed usage by decreasing wastage and/or by improving feed conversion and reducing the use of anti-biotics are the key factors in economically sustainable pig production.

As feed costs account for approximately 60% of piggery running costs in Australia even small changes in FCR can have a dramatic impact on profit.

Furthermore the inability (due to legislation) for continued use of anti-biotic in pig feeds is placing pressure on pig producers to find alternatives to anti-biotic use.

It has been suggested that certain feed additives will improve both FCR and animal health.

BioAktiv Animal food additive is an oxygen activated chalk powder, which has a combination of "Homeopathic frequency Information" accumulated or loaded into it. According to the manufacturers, BioAktiv operates as a "biological conditioner" and is designed to influence and improve the natural bacterial process that occurs in the digestive system and the overall health of the animal.

This project focuses on the possibility that BioAktiv will, when added to the pig diets, improve the health of the status of the pigs and improve feed conversion of the sows and liters, weaners, and grower and finisher pigs.

(b) Objectives

The overall objective of this work was to investigate the efficiency of Bioaktiv as a feed additive, primarily in terms of its ability to improve FCR and secondly in terms of the improved health status of pigs.

Three studies were undertaken:

The effect of BioAktiv on lactating sow and sucker performance,
The effect of BioAktiv on weaner pig performance, and
The effect of BioAktiv on grower/ finisher pig performance.

Methodology

The pigs used in both studies were sourced from the University of Queensland Research piggery at Gatton. This multi-site facility is a 380 sow intensive piggery with high health status. The breeder unit, with limited grow-out capacity is located at Gatton, and the grow-out unit is located in Wacol.

Study 1.

The effects of BioAktiv on lactating sow and sucker performance.
Animal and Housing:

Gatton Piggery. Twenty multi parous Large White x Landrace sows and litters were used in the study. At 10 days pre-farrowing sows were randomly assigned to one of two dietary treatments, so that 10 sows were assigned to each treatment. (see below for feeding details). The sows were then moved to the farrowing sheds and randomly allocated to a farrowing pen. Following the allocation, the sows were condition scored. Sows were condition scored again at weaning (24 d lactation).

Within 24 hours of farrowing piglets were fostered between sows within a treatment group (no mixing between dietary treatments) so that each sow had 10 piglets. The "new" litters was then weighed, the numbers of males and female recorded, pigs were ear notched or tattooed, teeth were clipped and an iron injection given.

Dietary Treatments: Two dietary treatments were used. (i) BioAktiv included at 300g/tonne. (ii) Control – no BioAktiv used. The sow diet milled and mixed by Ridley Agriproducts (Toowoomba Qld) (See Appendix 1 for dietary specifications) No antibiotics were used in any of the diets.

Feeding Sows: The sows were fed approximately 2.5kg/d from seven days prior to farrowing. Four days prior to farrowing bran was added to the feed. No or little feed was given on the day of the farrowing. Feed offered was then increased over the first seven days of lactation to a level, which allow

the sow to eat to appetite. The feed was supplied as a pellet. Feed intake was measured for each sow on daily basis. Suckers: Given access to creep feed (no BioAktiv) from day 10 of life.

Piglet health: Pigs were monitored for signs of scouring or general ill health through lactation and weaning. Treatment was given if necessary after consultation with veterinarian.

Climatic Conditions: Ambient temperature and relative humidity were measured for the duration of the study.

Statistical Analysis: Pig performance was analysed using the Proc GLM of SAS (1990). The dietary treatment means for sow feed intake, piglet mortality, average daily gains of piglets, weight/loss of sows, and sow condition score were compared using the WThaller-Duncan k-ratio t- test. The data were also analysed using Tukey's studentized range test. The level of significance was taken as $P<0.05$.

Study 2.

The effect of BioAktiv on weaner pig performance.

Animal and Housing:

Gatton Piggery. At 24 days of age 208 piglets from study 1 were individually weighed and weaned. The pigs have been previously ear notched or tattooed for indentification. The male and female pigs were then separated and allocated to a weaner pen (without treatment) by sex and weight. Approximately 25 pigs were allocated to a pen.

At the end of the weaner stage (63 days of age) the piglets were again individually weighed.

Dietary Treatments: Two dietary treatments were used. (i) BioAktiv included at 300g/tonne. (ii) Control – no BioAktiv used. The weaner diet was milled and mixed by Ridley Agriproducts (Toowoomba Qld) (See Appendix 1 for dietary specifications) No antibiotics were used in any of the diets.

Feeding Weaners: The weaners were fed ad-libitum in wet/dry feeders. The feed was supplied as a crumble. Feed intake was measured weekly on a pen basis.

Weaner Health: Weaner pigs were monitored for signs of scouring or general ill health. Treatment was given if necessary after consultation with a veterinarian.

Climatic Conditions: Ambient temperature and relative humidity were measured for the duration of the study.

Statistical Analysis: Pig performance was analysed using the Proc GLM of SAS (1990). The dietary treatment means for intake, mortality, average daily gains, and weight gain were compare using the Waller- Duncan k-ratio t test. The data was also analysed using Tukey's studentized range test. The effect of sex within treatment was also investigated. The level of significance was taken as P,0.05.

Study 3.

The effects for BioAktiv on grower/finisher pig performance.

Animal and Housing:

Grow-out Facility: Two hundred (100 male and 100 female) 49-day old pigs (14kg
Live-weight; LW) were selected at Gatton and then transported to the grow-out facility at Wacol. On arrival on Wacol (day 1) the pigs were individually weighed, given an individually tattoo, and then allocated by sex and weight to a pen (10 pigs/pen). The pigs remained in these pens for the remainder of the growing period (91 days).
The pigs were individually weighed weekly, and prior to transport to the slaughtered facility. Backfat depth (P_2) was measured weekly from day 56 of the study, and at slaughter.

Dietary Treatment: Two dietary treatments were used. (i) BioAktiv included at 300 g/tonne. (ii) Control – no BioAktiv used. The weaner diet was milled and mixed by Riverina Stockfeed (Brisbane Qld). (See appendix 1 for dietary specifications). No anti-biotics were used in any of the diets.

Within each dietary treatment the following diets were used. A weaner diet (15 MJ DE/kg, 1.2 g available lysine/MJ DE) was fed from 14 to 30 kg LW. A grower diet (14.0 MJ DE/kg, 0.72 g available lysine/MJ DE) was fed from 30 to 65 kg LW. From 65kg LW (day 56 of study) the female pigs were fed a diet containing 12.8 MJ DE/kg, 0.54 available lysine/ MJ DE, and the males were fed a diet containing 13.2 MJ DE/kg, 0.56 g available lysine/ MJ DE. The diets were pelleted and offered ad-libitum.

Slaughter: At approximately 140 days of age the pigs were transported to Darling Downs Bacon (approximately 120 km by road from the grow- out facility). During transport the pigs remained within their pen group. At slaughter carcass weight, backfat depth and eye muscle area were recorded. A veterinarian at slaughter undertook herd health monitoring.

Pig Health: The pigs were monitored for signs of scouring or general ill health. Treatment was given if necessary after consultation with the veterinarian.

Climatic Condition: Ambient temperature and relative humidity were measure for the duration of the study.

Statistical Analysis: Pig performance were analysed using the Proc GLM of SAS (1990). Dietary treatment means for feed intake, mortality, average daily gains.
weight gain . Carcass weight, backfat depth, eye muscle area were compared using the Waller-Duncan k-ration t test. The data was also analysed using the Tukey's studentized range test. The effect of sex within the treatmemt was also investigated. The levelof significance was taken as $P<0.05$.

Significant result and conclusions

Study 1.
Lactating sows fed BioAktiv, ate more (12% increase), and lost less (18% less) weight during lactation.

Piglets on sows which were fed on BioAktiv, had a lower incidence of scours than did piglets on sow not fed BioAktiv (4.8% vs 20.0)

There was a 6% improvement in piglet growth rate when lactating sows were

fed BioAktiv

The overall improvement in performance suggests that BioAktiv is a suitable feed additive for lactating sows.

Feeding lactating sows BioAktiv appears to provide benefits to sucker pigs.

Study 2.

Weaner FCR was improved by 7.6% with the addition of BioAktiv to the diet.

Pigs fed the diets with BioAktiv were healthier – no scours.

The overall improvement in performance suggests that BioAktiv is a suitable feed additive for weaner pigs.

Study 3.

The overall (male and female performance combined) FCR for grower anf finisher pigs was 7% better for the BioAktiv pigs.

There were significant sex effects with males fed BioAktiv growing at 30.5 g/d faster.

There appear to be significant health benefits in using BioAktiv. Only 1 BioAktiv pig was removed from the study (due to injury), while 7 control pigs were removed or died during the study.No antibiotics were used within the

BioAktiv group. A total of 8 control pigs underwent a program of antibiotics due to scouring.

The overall improvement in performance suggests that BioAktiv is a suitable feed additive for grower/finisher pigs.

$ advantage

Using BioAktiv in weaner, grower and finisher diets (300g/t) resulted in a

saving of $8.02 per pig (health and feed costs)

Recommendation and further activities.

BioAktiv may have a major role in maintaining the image of the Australian Pig Industry as " Clean and Green". In order for this to happen some basic research needs to be undertaken.

Strongly recommend that the feed study be replicated

Need to know the "science " behind BioAktiv.

Results and Discussion

Study 1.

Climatic Conditions: During the lactation stage of the study the farrowing house temperature ranged from 22^{O}C to 38^{O} C, with a mean temperature of 26^{O} C. The mean maximum during this period was 33^{O}C. Although sows had access to water drippers and fans, marked feed intake depression was

noted when room temperature exceeded 28^{O}C, even for short periods of time.

Feed Intake Sows: The sows fed BioAktiv ate on average 850g more feed per day than the control sows. Mean intake for the BioAktiv sows was 5.43kg/d, and 4.58kg/d for the control sows. Feed intakes in both groups were lower then expected (5.8 kg/d) due to hot climatic conditions during the lactation phrase of the study.

Condition Scores and Weight Change: The mean condition score (CS) at farrowing was the same (2.8) for each of the treatment group. At weaning the BioAktiv sows has a mean CS of 2.5, while the control sows had a mean of 2.1. However, the BioAktiv fed sows lost less weight (22kg vs. 27 kg) over lactation.

The higher feed intake of the BioAktiv sows may explain the better ADG of their sucker pigs
(see below)

Sucker Pigs – Health: The total amount of pigs born within the BioAktiv group and the control group were the same at 104. As the mortality rate was also the same within each treatment group at 2.88%, a total of 101 were weaned from each group. The incidence of piglet scours was higher in the control group. Approximately 20% of litters in the control group scoured, while in the BioAktiv group the incidence of scours was 4.8%.

Sucker Pigs – Growth Performance: Sow dietary treatment had a significant effect ($P<0.05$) on litter weight gain and ADG of the piglets (Table 1). The piglets within the BioAktiv group grew faster over the 24 day lactation period than the did the control group. Overall performance, for the measured traits were within the expected range.

General Observation: Sows fed the BioAktiv appeared to be quieter and more content than the control sows. There were no differences in days to re-mating following weaning.

Table 1. The effect of dietary treatment on litter weight gain (Kg), ADG (g/d) and mortality (%)

Treatment	Weight Gain (kg)	ADG (g/d)	Mortality (%)
BioAktiv	6.98^{a}	291^{a}	2.88
Control	6.57^{b}	273^{b}	2.88

Means in a row with different superscript are significantly different ($P<0.05$)

Summary – Lactation:

Sows fed BioAktiv ate 16% more feed.
Sows fed BioAktiv lost 18% less weight than the controls.
Piglets from sows fed BioAktiv grew 6% faster than controls.
Piglets from sows fed BioAktiv had a lower incidence of scours than the controls (4.8% vs 20%)

Study 2.

Climatic Conditions: During the weaner phase climatic conditions were mild. Temperature ranged from 19 ^{o} to 26 ^{o}.

Health Status – Weaner Pigs: A total of five pigs died during the weaner phase, one from the BioAktiv group and four from the control group. Post mortem examination was carried out on all pigs that died. The cause of death in the BioAktiv group was not determined. The three deaths that occurred in the control group were due to post weaning scours. Post weaning scours were only seen in the control group, with 15% of the control group being treated with antibiotics. No antibiotics were used in pigs fed the diet with BioAktiv.

Weight Gain: Total weight gain by the end of the weaner phase was not significantly affected by treatment (Table 2). The control pigs gained on average 30g/d more weight than the BioAktiv pigs during the weaner phase. However, mean pig weights at the end of this phase were similar at 18.0

and 18.1 kg respectively for the BioAktiv group and control group.

Feed Usage: Total feed usage was slightly higher (273 kg more) for the control group.

FCR : One of the major determinants of profitability is FCR. Although the feed consumed during this phase of growth is minor in comparison to the total feed usage during the grower/finisher phase, any improvement in feed to gain will improve profitability. The FCR was 7.6 % lower for the BioAktiv fed pigs compared to the control group.

Table 2. The total weigh gain (kg) for each treatment, the average weight gain per pig (kg), ADG (g/d), feed usage (kg), FCR and mortality (%) for weaner pigs over a 39 d period.

Treatment	Number Of Pigs[A]	Weight Gain (kg)	Weight gain/pig	ADG (g/d)	Feed usage(kg)	FCR	Mortality %
BioAktiv	99	980	9.89	251	2998	3.06:1	1.0
Control	96	979	10.19	261	3271	3.31:1	4.0

[A] One BioAktiv pig and four control pigs died.

Summary – Weaner Pigs:

BioAktiv fed pigs grew more efficiently (7.6% better FCR) than the control pigs
BioAktiv fed pigs were healthier – no scours

Study 3.

Climatic Conditons: During the grower ' finisher phase climatic conditions were mild to cold. Temperature ranged from 12^{o} C To 32^{o} C . Conditions during most of the grower finisher phase were mild. However, for approximately 2 weeks temperatures exceeded 30^{o} C with little night cooling on at least 5 days. However, this only had a slight impact on feed intake.

Health Status: One pig from the BioAktiv group was removed from the study due to injury (head caught in fence). The pig recovered but did not return to the study. No other BioActive pigs were removed or treated for ill health during the grower finisher phase. Four control pigs were removed due to ill health, and a further four were treated for ill thrift. Two of the four pigs removed due to ill health were diagnosed with Campylobacter.

ADG: The male pigs fed the BioActive diets had a better mean ADG (approximately 30.5 g/d) than the control pigs over the 91-day grower finisher period (Table 1 & Figure 1).

FCR: The pigs fed the diets containing BioActive had significantly lower (P = 0.01) FCR than the control pigs. **The feed to gain ratio was approximately 7% better in the BioActive fed pigs.** If this result was consistently encountered substantial savings in feed costs could be envisaged. (Table 1 & Figure 2).

Age at Sale: The mean age at sale was 140 days of age. There were no differences in age at sale between treatments.

Table 3. Number of male and female pigs per treatment , mean starting weight (kg), mean weight (kg) at day 56 of the study, mean weight (kg) at day 91 of the study, mean weight gain (kg), ADG (g/d), average feed intake per pig (kg), FCR, HSCW (kg), and backfat depth (mm) at slaughter for male and female pigs over 91-days.

Parameter	BioActive		Control	
	Male	Female	Male	Female
Number	49	50	47	46
Weight at start (kg)	14.8	14.6	14.6	14.5
Weight at day 56 (kg)	65.6	65.4	66.8	65.2
Weight at day 91 (kg)	97.7	94.l7	94.7	94.1
Weight gain over 91 d (kg)	82.9	80.1	80.1	79.6
ADG (g/d)	911.8	880.1	880.3	874.5

Average Feed Intake (kg)	188	187	200	197
FCR	2.26	2.34	2.49	2.47
HSCW (kg)	76.2	73.8	71.9	73.9
Backfat Depth (mm)	12.8	13.0	12.8	12.5

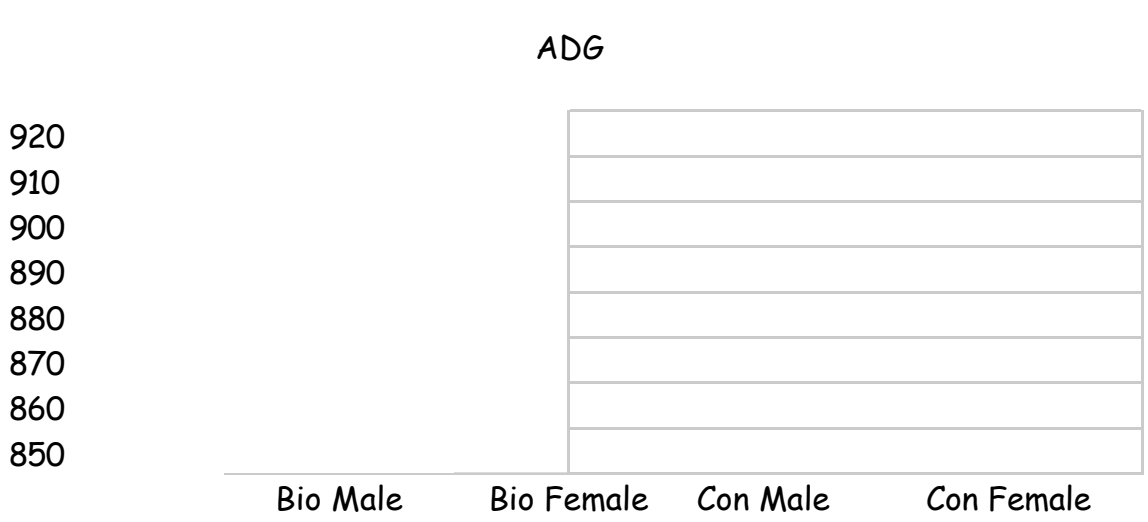

Figure 1. Average daily gain 14 kg LW to 95 kg LW.

Bio Male Bio Female Con Male Con Female

Figure 2. FCR for pigs growing from 14 kg to 95 kg LW (91-day period)

Sex Effects: The major impact of BioActive was seen in the male pigs. The male pigs fed BioActive grew 31.5 g day faster than the control males. The growth performance between the female pigs fed BioActive had similar performance to the contr4ol males and control females. The FCR was 9.24% lower for the BioActive fed males compared to the control males.

General Observations: It was evident throughout the grower phase that the pigs fed BioActive were quieter to easier to handle than the control pigs. The BioActive fed pigs were also cleaner.

Summary – Grower/Finisher Pigs:

FCR was 9% better in the pigs fed BioActive.
Male pigs fed BioActive grew 31.5 g/d faster than the controls.
The health status of the BioActive fed pigs was better than the controls.

Conclusion

The addition of BioActive to the diet improved the health status of the pigs.

There was a significant improvement in piglet growth performance when lactating sow and creep diets contained BioActive.

Weaner **FCR was improved** with the addition of BioActive to weaner feeds.

Grower and finisher pig FCR **was improved significantly (7%)** by the addition of BioActive to the diet.

Recommendations

Need to examine thoroughly the science behind the results – so as to understand the great improvement in feed to gain. Why does BioActive work?

Strongly recommend that the feeding study be replicated. We suggest we carry out further studies to show that the results can be replicated.

Need to know the ideal dose rate for BioActive – recommend that a dose response study be undertaken. In the current study 300[1] g/t was used. What is the effect if 200g/t or 800g/t is used? Maximum inclusion levels need to be known. Is there a point where too much BioActive could cause a negative effect?

The sex effect should be further investigated, especially an investigation of the effect on castrates. One of the problems with castrates is that they are not as good at converting feed to muscle, as are entire males. As castrate animals are required to meet export requirements the effect of BioActive on castrates should be studied.

The effect of BioActive on meat quality (eg. Meat and fat colour, eating quality) should be investigated.

The effect of BioActive on health status needs to be investigated. Current on farm data has shown that BioActive has a role to play in this area. If BioActive can be used to reduce the use of anti-biotics the image on Australia as a producer of "clean" pigs will be enhanced.

BioActive Technologies P/L advise that their suggested optimum rate for pigs is 300 g/t and that if a dosage rate higher than this amount is to be used it should be done under consultation with BioActive Technologies P/L.

APPENDIX 1.

Dietary Specifications:

Parameter	Creep	Weaner	Grower	Finisher -Boar	Finisher – Gift	Lac Sow
Protein (%)	21 – 24	20 – 22	18.5 – 20	16 – 18	15 – 17	18 – 19
Fibre (%)	1.0 – 2.5	2 – 4	3 – 5	3.5 – 7	3.5 – 8	4 – 6
DE (MJ/kg)	15	14.75	14	13.2	12.8	14
Av. Lys:DE (g/kg) min	0.85	0.79	0.72	0.56	0.54	0.6
Ca (%)	0.9 – 1.2	0.9 – 1.0	0.9 – 1.0	0.8 – 1.0	0.8 – 1.0	0.5 – 0.6
Av. P (%)	0.6 – 0.8	0.45 – 0.7	0.4 – 0.6	0.35 – 0.6	0.35 – 0.6	0.5 – 0.6

Ingredients used:

Lactating Sow: Wheat, barley, millrun, soybean meal, meat meal, fishmeal choline chloride, salt, L-lysine, limestone, vitamin & mineral premix.

Creep & Weaner: Wheat, soybean meal, blood meal, milk powder, weaner flavour, maize, tallow, soybean full fat, fishmeal, choline chloride, copper sulphate, salt, L-lysine, methianine, vitamin & mineral premix.

Grower: Barley, sorghum, wheat, millrun, cottonseed meal, tallow, soybean meal, meat meal, limestone, salt, L-lysine, methionine, vitamin & mineral premix.

Finisher-Boar & Finisher-Gilt: Wheat, sorghum, mung bean, meat meal, sunflower meal, millrun, molasses, limestone, biophos, salt, choline chloride, L-lysine, methionine, threonine, copper sulphate, vitamin & mineral premix.

Note: Full dietary specifications are Commercial in Confidence. Please contact the author if more details are required.

APPENDIX 2.

Drug and Treatment Costs:

Stock	BioActive	Control
Total Cost Lactating Sows ($)	Nil	Nil
Total Cost Piglets ($)	18.20	72.80
Total Cost Weaners ($)	30.70	96.00
Total Cost Grower/ Finishers ($)	Nil	200.00
Total Cost for Trial ($)	48.90	368.80
Total Cost per Pig ($)	0.49	3.87
Health Cost Advantage ($)	3.38	-
Cost per 100 Pigs Sold ($)	49.00	387.00

Note: (i) No anti-biotics were used in the BioActive fed pigs during the weaner or grower finisher phase. The health cost does not include disposal of pigs or the extra labour component in treating sick animals nor does it include veterinary surgeon costs.

(ii) Health costs are based on the following:
Piglets – 101 in each treatment – cost BioActive treatment = $0.18/pig:
Control = $0.72/pig.
Weaners – 99 in BioActive group = $0.31/pig: Control = $1.00/pig.
Grower/finisher – 99 in BioActive group = $0.00/pig: Control = $2.15/pig.

APPENDIX 3.

Feed costs per pig over the weaner phase.

Parameter	BioActive	Control
No. of Pigs	99	96
Total Feed Intake (kg)	2998	3271
Feed Cost ($/t)	674	665
Total Feed Cost ($)	2020.65	2175.22
Feed Cost Advantage ($)	+154.57	-
Feed Cost/pig ($)	20.41	22.65
Advantage per pig ($)	2.24	-

Note: The costs of the BioActive diets have been calculated on the cost of the control diet plus BioActive additive. BioActive has been costed at $30/kg, therefore at 300g/t inclusion the diet will increase in cost by $9/t.

APPENDIX 4.

Feed costs over the grower/finisher phase.

Parameter	BioActive	Control
No. of Pigs	99	93
Total Feed Intake (kg)	18.712	18.462
Feed Cost ($/t)	319	310
Total Feed Cost ($)	5,969	5,723
Feed Cost/pig ($)	60.29	61.53
Advantage/pig ($) – in this study	1.25	-
Feed Cost/kg Weight Gain ($)	0.74	0.77
Cost per 80kg Weight Gain ($)	59.20	61.60

Corrected Advantage/pig ($)	2.4	-

Note: The advantage per pig for this study is based on the number of pigs actually finishing the study. Because the control pigs finished with fewer pigs in the study it would be expected that total feed intake and total feed cost would be lower. To correct this, the feed cost per kg weight gain has been calculated (based on FCR). This value has been multiplied by the expected weight gain (80kg) to give the corrected advantage per pig.

APPENDIX 5.

Total costs (health and feed costs only) per 100 pigs sold.

	BioActive	Control
Health Costs ($)	49.00	387.00
Weaner Feed ($)	2041.00	2265.00
Grower/Finisher Feed ($)	5920.00	6160.00
Total Cost per 100 Pigs Sold ($)	8010	8812

Advantage of BioActive inclusion per 100 pigs sold = $802 (or $8.02/ pig).

ADG

FCR