UNIVERSITI PUTRA MALAYSIA

AN EVALUATION OF A COMMERCIAL PIG FARM

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AN EVALUATION OF A COMMERCIAL PIG FARM

BY

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TO

ANDRINA,

MY FAMILY

AND

THE CARVALHOS.

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ABSTRACT

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20 JANUARY 1988

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FACULTY : FACULTY OF VETERINARY MEDICINE AND ANIMAL SCIENCE

A farm evaluation was carried out on a commercial pig farm with a 360-sow breeding and production operation. The Farm Resources and the Farm Processes were evaluated.The Herd Reproductive Performance for a 10-month period from 1 Jan 1987 till 31 Oct 1987 was analysed with PigCHAMP , a computer software program designed to monitor swine herd performance

Evaluation of the farm showed an overall satisfactory production efficiency and reproductive performance. However, a prolonged weaning to service interval by 13 and 15.7 days respectively was seen in two sow groups and a low farrowing rate was seen for each of the three sow groups - 74.7% , 80% and 58.6% . Parity 2 and 3 sows

from two sow groups showed a decrease in the number of piglets born live/litter compared to their respective parity 1 counterparts. Investigation into the nutrient levels and feed intake of the lactation feed is indicated. Boar underusage was also noted. The highest boar:sow ratio was 1:22.5 while the target is 1:30. The cost of production per kg liveweight porker was estimated to be $ 2.31.

The breeding management, labour management, record keeping, regular monitor of the herd performance and updating of the production targets with reference to current performance levels and waste disposal management were identified as areas for improvement.

ABSTRAK

Satu penilaian ladang telah dijalankan ke atas satu ladang babi yang mempunyai 360 ekor babi betina. Penilaian telah dibuat ke atas aspek Sumber dan Proses Ladang. Prestasi Pembiakan bagi satu tempoh 10 bulan dari 1 Jan 87 hingga 31 Oct 87 telah dianalisakan dengan PIGCHAMP iaitu satu satu program komputer yang direka untuk mengawasi prestasi pembiakan babi.

Penilaian ladang ini menunjukkan satu prestasi pembiakan dan kecekapan produksi yang keseluruhannya memuaskan. Walaubagaimanapun, dua kumpulan babi betina menunjukkan selang masa cerai-susu ke mengawan yang lebih panjang dengan nilai 13 dan 15.7 hari masing-masing. Kadar kelahiran juga didapati menurun - 74.8%, 80% dan 58.6% untuk tiga kumpulan babi betina. Babi betina pariti 2 dan 3 daripada dua kumpulan babi betina menunjukkan penurunan dalam bilangan anak yang dilahir pada tiap kelahiran berbanding dengan babi betina pariti 1. Makanan laktasi perlu disiasat untuk menentukan kandungan nutriennya serta jumlah yang dimakan. Babi jantan didapati kurang digunakan. Kadar jantan : betina yang tertinggi dicapai ialah 1:22.5 sedangkan sasaran adalah 1:30. Kos pengeluaran satu kilogram berat hidup dianggarkan sebanyak $2.31.

Pengurusan pembiakan, pengurusan pekerja pengurusan rekod, pengawasan prestasi ternakan yang berterusan, pengemaskini sasaran produksi berdasarkan taraf prestasi terbaru serta pengurusan sisa ladang telah dikenalpasti sebagai aspek-aspek pengurusan yang perlu diperbaiki.

INTRODUCTION

A commercial pig farm, like any other business venture, operates with the ultimate objective of optimising profitability. To achieve maximum profitability, the cost of production must be kept as low as possible. In order to achieve this, regular checks on the herd performance is essential especially in intensive commercial piggeries. In many , if not most pig farms, few attempts are made to analyse the herd performance. Consequently, most pig farmers are unaware of the production performance of their herds. As a result, farmers either do not set performance targets or set targets based on best-guess estimates of current performance parameters. While constant monitoring of herd performance should be an important part of the routine farm practice, evaluation of all aspects of the farming enterprise should be conducted on a regular basis.

A farm evaluation has four objectives:

1. To determine the current performance
2. To determine if the production targets are met
3. To identify problems which interfere with production
4. To identify corrective measures where necessary

In this study, an evaluation of a commercial piggery was undertaken with the abovementioned objectives.

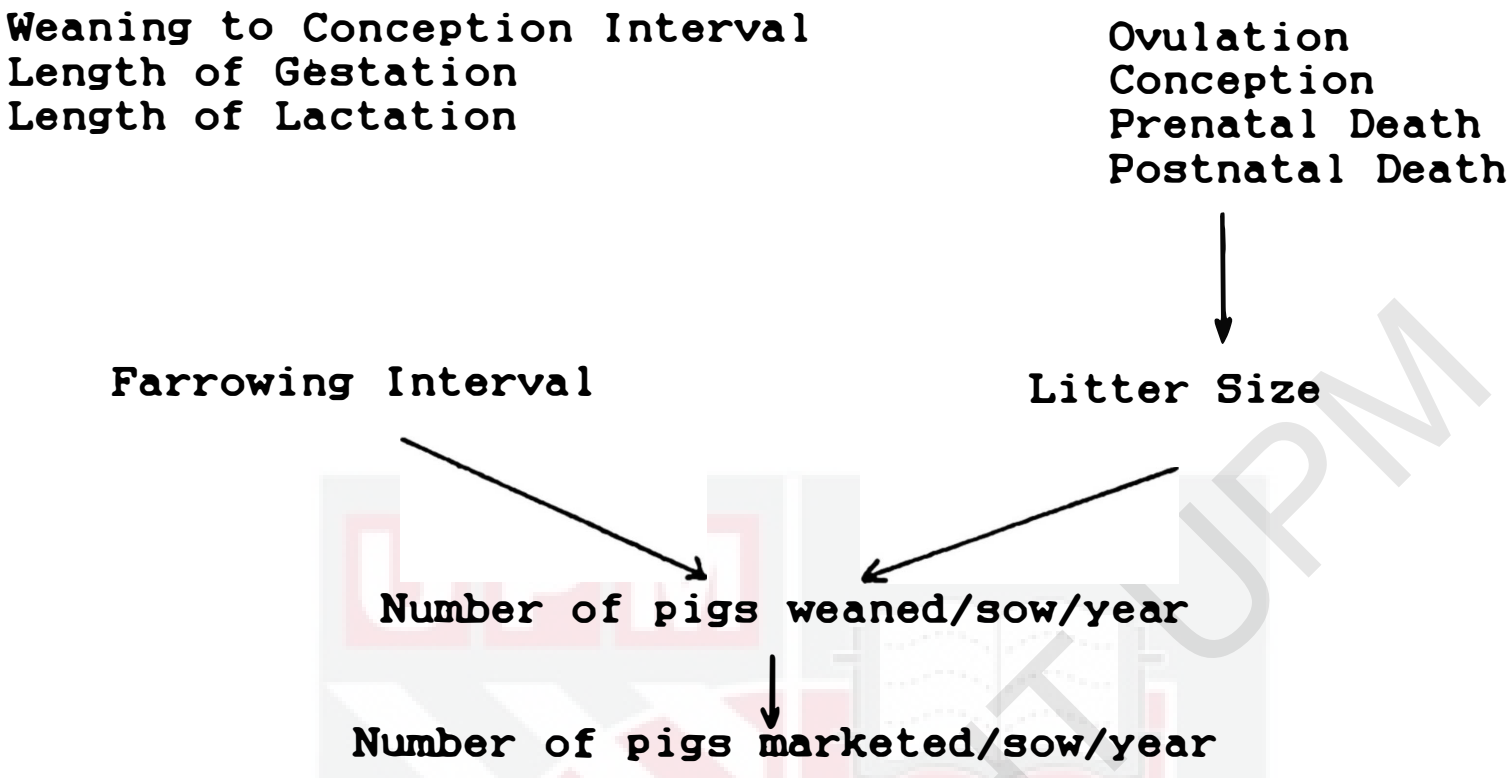
LITERATURE REVIEW

1. Swine Production

One of the main constraints of the local pig industry is the high cost of production (Ahmad Mustaffa et al, 1983; Low Kan, 1987). Besides improvement in the marketing system, pricing and opportunity, the increase in production efficiency will help determine development of the industry (Cheong & Lee, 1986).

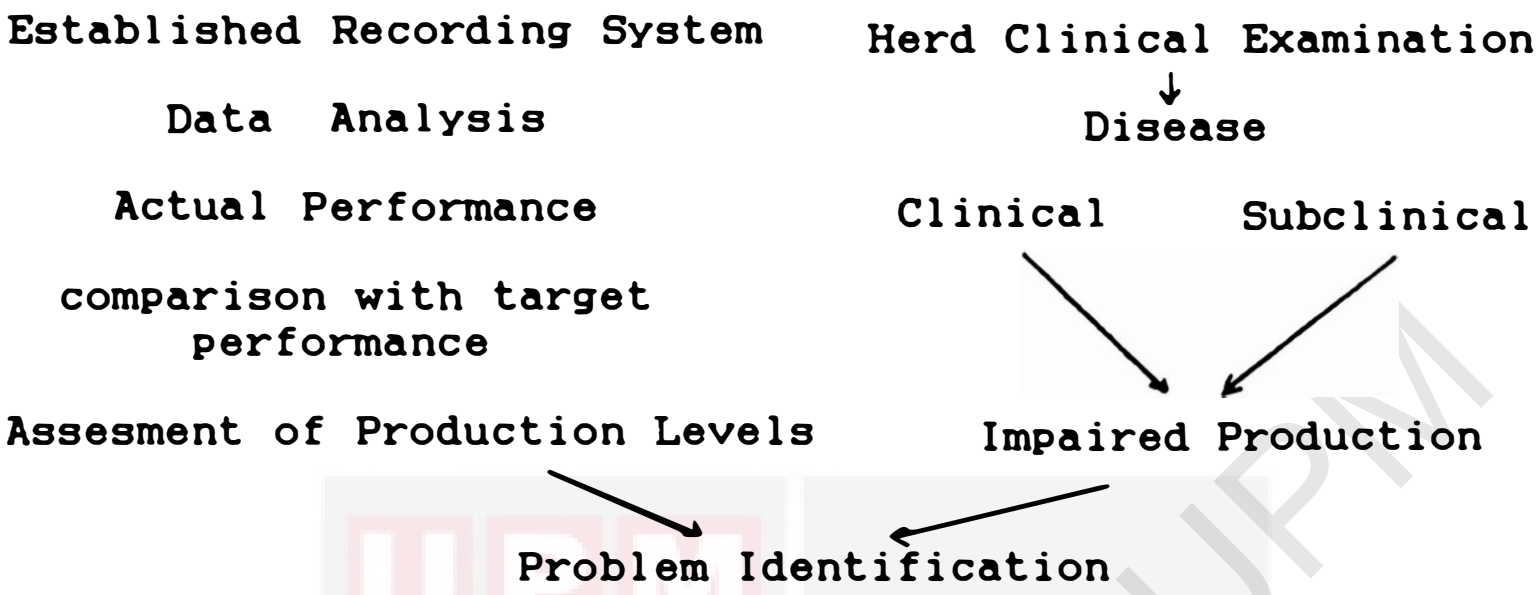
In order to maintain financial viability, the pig farm must achieve certain production targets. The most critical and vulnerable points that affect the number of pigs produced/sow/year and in turn cause major economic losses are 1. the reproductive performance, 2. neonatal mortality, 3. pigs weaned/litter, 4. feed efficiency from weaning to market and 5. specific infectious diseases. (Blood & Radostits, 1985).

The flow chart of factors influencing the number of pigs /sow/year is given by Nielsen & Danielsen (1979).



The ultimate measure of efficiency is profit which is maximised by reducing cost and/or increasing output. Feeding and piglet production are identified as the highest costing areas. Controls at the following points of the sequence of farm operation is vital : 1. feed ingredient 2. diet formulation 3. feed preparation 4. ration control 5. genetics control 6. breeding 7. growth and 8. carcass quality (Ong et al, 1986).

The pathways for the identification of failure to achieve targets of performance using records and a regular herd clinical examination are as follows (Muirhead, 1980)



2. Recording System

An efficient recording system is vital to obtain adequate and accurate data for a reliable herd performance and evaluation (Muirhead, 1976; Wrathall, 1977; Tan , 1986; Ong et al, 1986; Too , 1987). The herd inventory check is a vital component of recording and is to be carried out regularly (Wrathall, 1977).

A deficiency in proper recording still exist among local pig farmers (Tan , 1986). In Malaysian farms, records are either inadequate or nonexistent. The lack of any recording system presents an insurmountable obstacle to an investigator as it prevents a quantitative assessment of a problem in the farm. An inefficient recording system is however often better than none (Too , 1987).

Weaver (1971) discussed a recording system for commercial pig units. Pepper (1977a, 1977b , 1985) advocated the use of computers to monitor the performance of sows and boars.

3. Performance Standards

There is a relative shortage of published information on the level of productivity in Malaysian commercial herds (Tan , 1986). To date, there are no established production standards in Malaysia (Too 1987).

Tan (1986) quoted Singapore's achievable targets (App F). Ahmad Mustaffa et al (1983) quoted some production performance of 5 countries in which the Malaysian `average' was compared (App.F). Muirhead (1978) gave a list of standard targets and recommended interference levels for dry sows, farrowing sows, boars and the fattening herd (App.G). A similar list on the reproductive performance of gilts and sows was given by Wrathall (1977). The same author also gave a list of overall reproductive performance to be expected from an efficient herd (App.H).

In evaluating the herd performance , Too (1987) suggested that the comparison between the previous and the current records of the same farm is better than that of comparing with foreign standards. Estimates of the cost of production per kg liveweight ranged from $2.50 to $2.91 (Ahmad Mustaffa et al, 1983; Chua, 1986) (App.I).

MATERIALS AND METHODS

THE FARM

The study was conducted in a commercial pig farm which runs a 360-sow breeding and production operation. Although housed within the same physical facility, three functionally distinct breeding herds could be identified. They are as follows:

1. GP (Grand Parent or Multiplier) line of a Commercial Hybrid
2. PS (Parent Stock or Weaner Producer) line - derived from the same Commercial Hybrid GP line
3. 3WC (Three Way Crosses) - comprises Duroc, Landrace and Yorkshire.

METHODOLOGY OF FARM EVALUATION

A flow chart of the methodology is depicted in Figure 1. Information required for evaluation were derived primarily from:

a. examination of farm records
b. interviews with farm personnel
c. personal observations

Data from Sow cards and litter performance cards dated from 1 January 1987 till 31 October 1987 were extracted and computerised using a computer software program PigCHAMP (Pig Computerised Health and Management Program developed by University of Minnesota).

Information collected via interviews with farm personnel or derived through personal observations were broadly classed into two areas - Resources and Processes. Farm resources were identified as the farm physical structures, land use, housing and labour. Information and data pertaining to farm processes include herd health program, waste disposal, record keeping, feeding and breeding. Data pertaining to the various costs of production were also obtained.

Evaluation of the analysed and interpreted information and data were based upon : Categorization, Calculation and Comparison.

The Farm Resources and Processes were evaluated by categorizing each individual area. The categories used are given in Appendix A. The categorization of the Farm Processes was based on commonly accepted management and husbandry practices. Evaluation through categorization was mainly subjective.

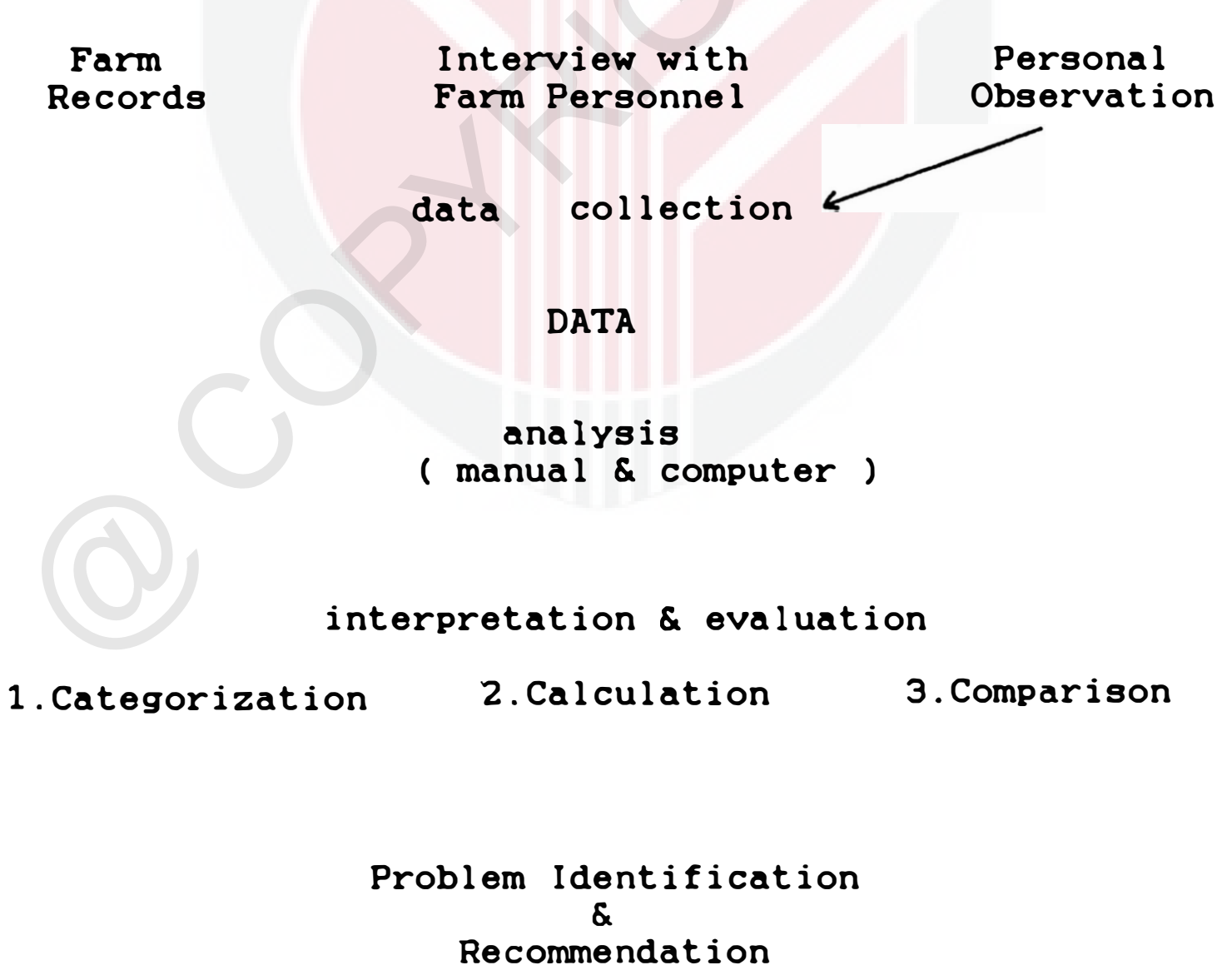
Calculation was used as a method of evaluation on available or estimated figures pertaining primarily to reproductive performance and cost of production. The calculation of the herd performance was done mainly by computer. The cost of production per kilogram live weight was calculated from the sum of the following

costs: Feed, Wages, Depreciaton of Houses, Water, Maintenance, Veterinary Costs and Stock Replacement.

Evaluation of the interpreted herd performance from the PigCHAMP analysis was made by comparison to the predetermined farm production targets. (Table 2)

Following the abovementioned evaluation processes, problems interfering with production were then identified and corrective measures were recommended.

FIGURE 1 Flow Chart on Methodology of the Farm Evaluation



RESULTS AND DISCUSSION

A.Farm Resources

1. Farm Physical Structure

The farm is suitably located in an isolated area .There is no nearby pig farm. The farm layout is well planned with good security features such as having only one entrance/exit and pig houses that are located far away from the gate. The availability of a vehicle and people disinfection facillity is a plus feature of the farm. Figure 2 depicts the Farm Layout (not to scale).

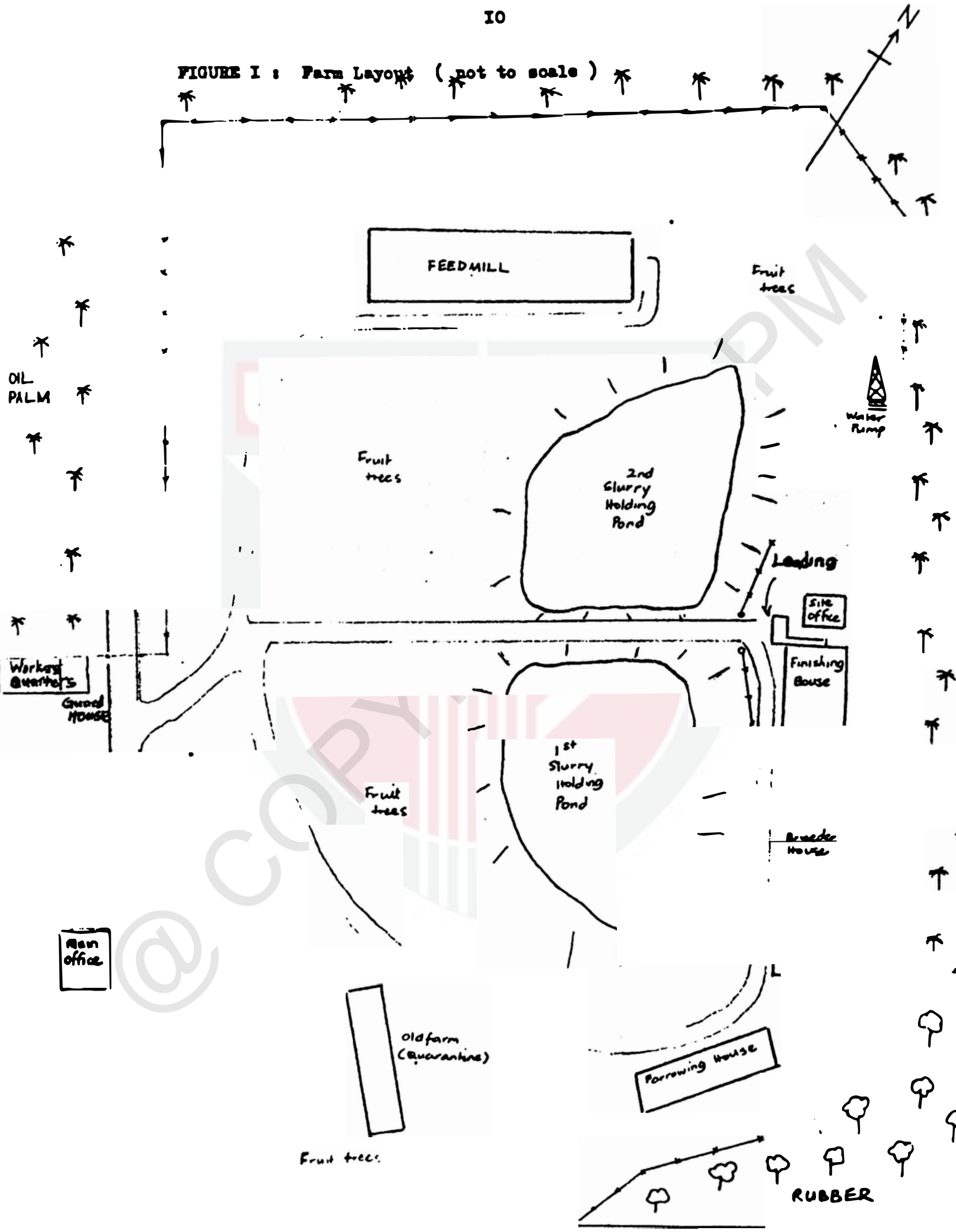
2.Land Use

The use of land in the farm was efficient. In view of the topography, the four pig houses, the two slurry holding ponds and the feedmill are well-placed. Vacant areas in the farm are planted with fruit trees. The rearing of a small number of cattle and goats indicated a good attempt to make full use of the available land.

3.Housing

Housing for pigs was satisfactory. The shelter function is met in all kinds of weather. Ventilation was adequate and the use of fans in the relatively older and lower-roofed farrowing house was commendable.The flooring was

FIGURE I : Farm Layout (not to scale)



neither slippery nor abrasive and very few carpal sores were seen in the younger or older pigs. Feed troughs, bowls and bins were adequate. The drain-like troughs that link one breeder stall to another allow unconsumed feed of one sow to be eaten by another down the line. The use of drinking nipples enabled minimum wastage of water and no unnecessary wetting of the floor. Drainage was good as water flowed well without stagnation or overflows. Marketing facilities were available and were well placed in the finishing house. Raceways connected pens to the weighing machine and the availability of a loading ramp facilitates the loading of pigs onto the buyers' lorries.

4.Feedmill

The feedmill was profitable to the farm as the self mixing of feed helps to reduce the cost of feed purchases. The mill operation was efficient and the output was adequate. A three-day reserve was kept at any one time. The mill also mixed feed for another pig farm and two poultry farms.

5.Labour

The manpower in the farm was adequate with a ratio of 1 worker to 450 pigs. All work were completed on time.

Supervision of workers was satisfactory but there is a need to check on the supervisors. Morale among the workers was low and there was a general attitude of `getting a job done as soon as possible for the sake of completing it'. There was little motivation among the workers . The management should provide incentives on a worker-productivity basis to boost morale and to increase productivity. The management can consider bonus for hard working workers.

B.Farm Processes

1.Health

The farm herd health was well maintained. No epidemic of infectious disease occur for the last two years. Occurence of disease was sporadic and isolated. Restricted entry to outsiders, disinfection of buyers'lorries and quarantine of newly introduced stock were effective in that no transmissible diseases were brought into the farm via these modes. The use of Ivermectin as an anthelmintic and acaricide has negated the use of in-feed anthelmintic and laborious acaricide sprays. Despite these advantages, it is desirable if the management could determine the cost-effectiveness of the

use of Ivermectin. As the herd is isolated geographically, the possible introduction of mange or worms can be controlled at quarantine. Coupled with the eradication of mange and worms in the herd proper,it is therefore possible to achieve a mange and worm free herd. When this status is achieved, the use of Ivermectin can be discontinued. However, a regular and efficient monitor for such parasites will be imperative. It is also recommended that a suitable room be provided for post mortem work .

2.Waste Disposal

The waste disposal system of the farm which consist of only two slurry holding ponds was inadequate. The management is suggested into look into ways of improving the pig waste disposal. Evacuation of the first slurry pond may be necessary and treatment of the farm effluent may be indicated.

3.Recording System

Farms records were up to date but were only fairly accurate. Areas where errors or inadequacy were found are: 1. Absence of Herd Inventory

2. Sows with no Cards

3. Cards with no Sows
4. Inadequate entries (of events)
5. Duplication of one set of history to two sows – either mythical or real sows
6. Inadequate records of culled sows and boars.

The stock count is not regularly done; the last count was in March 1987 and existing records showed many sows or boars unaccounted for. There was a low efficiency in record keeping. Records were kept in triplicates – one at the pen, one at the site office and one at the main office. Recording therefore involve much labour and the probability of making an erroneous entry increased with each consecutive recording of the same data. Records had not been used for a reliable herd performance monitor, let alone evaluation of the herd performance due to the massive amount of data. However it is commendable that the farm management has introduced the PigCHAMP computerised recording system in November 1987.

The management is recommended to improve the farm recording efficiency and accuracy. With the introduction of PigCHAMP , only two sets of data need to be kept –one at the pen and another in PigCHAMP. This will reduce labour as well as error. Training of the supervisors and

workers to make accurate and adequate recording is essential. Table 1 gives a list of entries to be made for the sow. The stock count and the herd inventory must be carried out regularly. Utilisation of records for the purpose of monitoring herd performance must be carried out.

Table 1 Details of events to be recorded for the sow

Sow I.D. Breed
Date of entry Sow Boar
Date of entry
Mating : Date Boar no.
Farrowing: Date, No.born alive, No.born dead, Litter wt.
Foster Date, No.fostered on/off
Nurse : Date, No.nursed on/off
Weaning · Date, No.weaned, Weaning wt.
Removal · Date, Cull or Dead, Reason
Others : Date, Events

4.Feeding

Feeding of pigs was satisfactory. The feed formulation and allocation, according to the feeding program follow the recommendation of the Hybrid Breeder Company. However in implementing the program, proper records of the actual amount of feed consummed by the fattener pigs (from weaning to market) were lacking. Therefore, the accurate Feed Conversion Efficiency could not be calculated. The observation of the pigs in the farm showed that thin pigs were a scarcity. This indicates

that the pigs were generally well-fed. Feed usage was efficient as very little feed was wasted. While the feed formulation is commendable, the management is recommended to use a least-cost feed formulation computer software program. The cost of feeding accounted for 76% of the total cost of porker production (See Table 4) ; a least-cost feed formulation will be able to reduce this figure.

5.Breeding

The breeding program follows the Hybrid Breeder Company recommendation (where GP and PS are concerned) and the principles of crossbreeding for heterosis (where the 3WC is concerned). However, the implementation of the breeding policy needs to be looked into, especially in areas of

1. (Mis)use of boars.

   Records showed that some GP boars were mated with PS sows and some PS boars with sows meant for three way crosses. The latter group of sows should be crossed with Landrace or Yorkshire or Duroc boars as depicted in Appendix K.

2. Twice mating per service to the same boar.

   Sows should be mated twice to the same boar at each estrus. This is to enable a meaningful

interpretation of the boar performance .

3. Handling of gilts and sows before, during and after mating. Observation showed unnecessary stress to the females as a result of poor handling. Breeding sows or gilts were excessively pushed, beaten and kicked.

Reproductive Performance

Table 2 shows the reproductive performance of the three groups of pigs. Generally the herd performance met the farm predetermined production targets. However three problem areas were identified :

1. Weaning to first service interval

GP and PS sows showed a prolonged interval each by 13 and 15.7 days respectively. Reasons for the increased interval could have been due to :

a. failure to detect post weaning estrus
b. true anestrus due to lack of nutrition
c. lack of boar presence

It is recommended therefore that heat detection be improved and an investigation be carried out to determine the nutrient content and availability in the

lactation feed as well as the actual feed intake of lactating sows. This is indicated because there could be error at the process of feed mixing proper or at giving out feed to lactating sows resulting in a decrease nutrient content of the feed or a lower ration fed to the sows. The placing of GP and PS dry sows in the breeder house ought to be checked to determine if boar presence is lacking.

2. Low Farrowing Rate

All three groups showed farrowng rates lower than the targets (Table 2). The main causes could be due to :

a. early embryonic deaths
b. abortion
c. inaccurate pregnancy diagnosis.

No apparent abortion had been observed. But early embryonic mortality and early abortion may not be detected. This results in a regular and delayed return to estrus. If detection for the return to estrus had not been careful or frequent, many mated sows could have been passed off as pregnant. Thus the conception rate, which is calculated from the return to estrus rate may not be as high as in Table 2. The most probable cause of the high failure-to-farrow rate was due to the

inaccuracy in detecting (return to) estrus. As such, the heat detection technique is to be done with greater care, efficiency and with a twice a day frequency every day.

3. Outdated Production Targets

The following production targets were found to be lower than the current achievable performance (Table 2):

a. Conception Rates for PS and 3WC

b. Average live pigs / litter for GP and PS

c. Pigs weaned / litter for GP

The reason for the low production targets was probably due to the fact that the management being unaware of the current herd performance as records had not been utilized for performance evaluation for a long time. Upgrading of production targets is essential for the constant improvement in production and efficiency.

For the GP sows , the percentage of Repeat Services was 23.1% or 13.1% higher than the farm predetermined interference level. (The corresponding Conception Rate was 76.9% or 8.1% lower than the interference level). It is questionable however if this figure can be

meaningfully interpreted since the 10-month average is derived from a total of only 52 services (App.C 1). A more meaningful interpretation can only be made after a period of time when the total number of services has increased to at least 200.

Table 2 Reproductive Performance of the 3 sow groups.

	3WC	PS	GP
Breeding Performance			
1.Conception Rate (%)	91.5 (85-90)	91.7 (85-90)	76.9 (85-90)
2.Repeat Services (%)	8.5 (7-10)	8.3 (6-10)	23.1 (6-10
3.Wean-Service (days)	10.2 (8-12)	23.0 (7-10)	25.7 (7-10
4.Tot. no.of services	247	264	52
Farrowing Performance			
1.Tot. sow farrowed	246	187	39
2.Av.tot.pigs/litter	9.3 (8-10)	9.6 (10)	9.4 (10)
3.Av.tot.live pigs/lit	9.1 (9-10)	9.4 (8-9)	9.2 (8)
4.Farrowing Rate (%)	74.7 (80-87)	80.0 (80-87)	58.6 (80-87)
5.Fail-to-farrow (%)	16.8 (5)	11.7 (5)	18.3 (5)
6.Farr.Interval (days)	149	157	153
7.Av.piglet wt.(kg)	1.5 (1.4-1.5)	1.3(1.4-1.8)	1.6(1.5-1.7
Weaning Performance			
1.Pigs weaned/litter	8.4 (8-9)	8.5 (8-9)	9.2 (8)
2.Preweaning Mort. (%)	12.7 (16-20)	14.7 (15-20)	8.7 (15-20
3.Av.Wean.Wt. (kg)	4.8 (4.0-5.0)	4.8 (5.0-6.0)	5.2 (4.5-5.
4.Av.age at wean(days)	22.3	23.0	21.6

Note: Figures in bracket are the farm production targets.

Parity Distribution

The distribution of live pigs/litter with parity for PS and 3WC sows showed that a `run down' condition in sows with parity 2 to 3. (Figure 3) (App.D). This condition could be due to inadequate nutrition of lactating parity 1 and 2 sows . The management is suggested to investigate the nutrient levels of the lactation feed especially for its Metabolizable Energy level. This need is evident in view of the prolonged weaning to first service interval in GP and PS sows , which could be due to inadequate nutrition during lactation as mentioned earlier.

Boar Usage

There was a gross underusage of boars in the 3WC and PS groups.(Table 3).(App.E). Boar usage is to be increased and optimized. The current target boar:sow ratio of 1:30 is deemed too high for the farm to achieve. A boar:sow ratio of 1:20 is suggested for the 3WC and the PS groups. A 1:25 ratio is suggested for the GP group. Upon reaching this target, a 1:25 and 1:30 ratio can then be attempted. A mature boar (1 year or above) can be used for 4 to 5 times a week.

FIGURE 3

Fig. 3.1 Distribution of live pigs/litter in PS sows

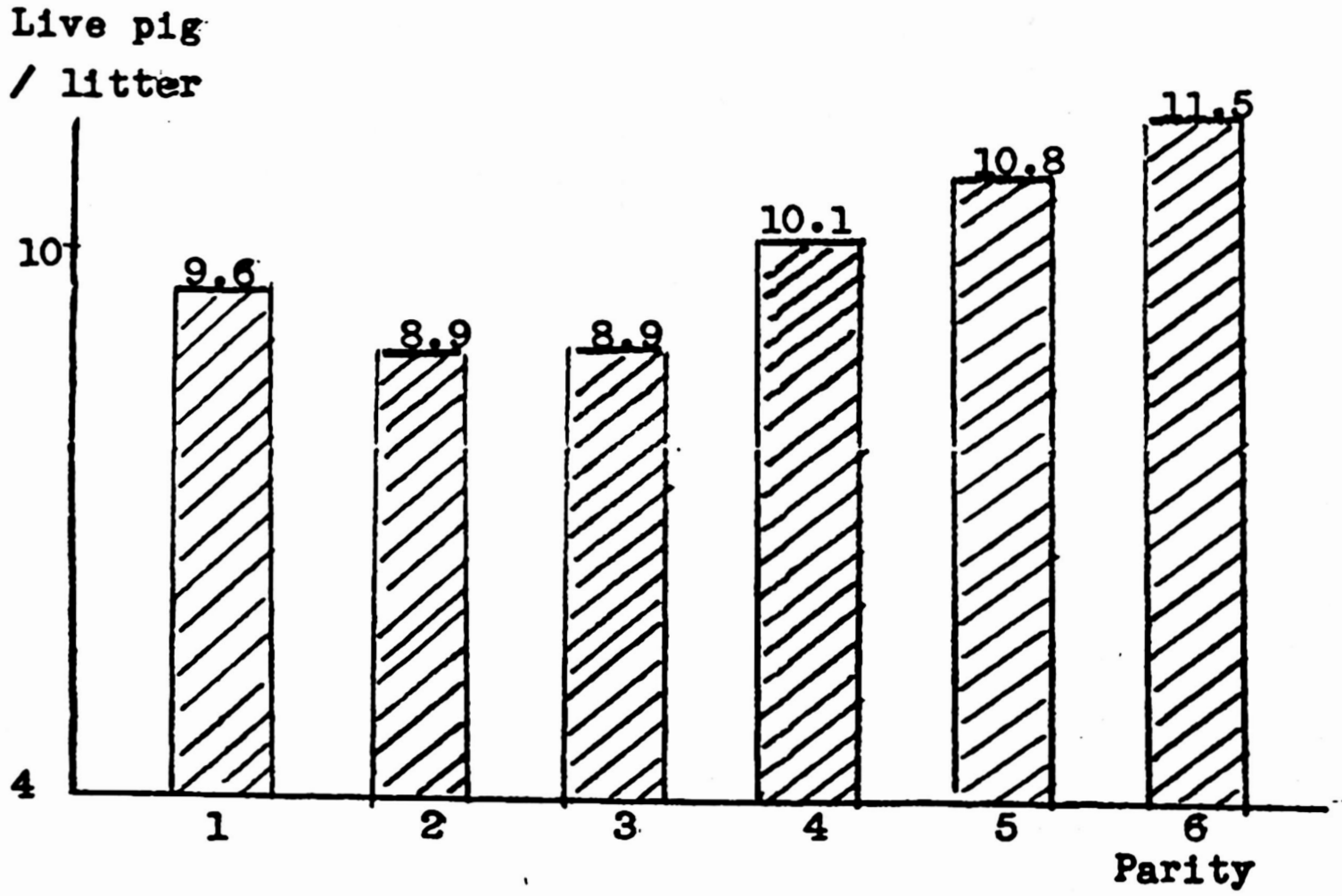


Fig. 3.2 Distribution of live pigs/litter in 3WC sow

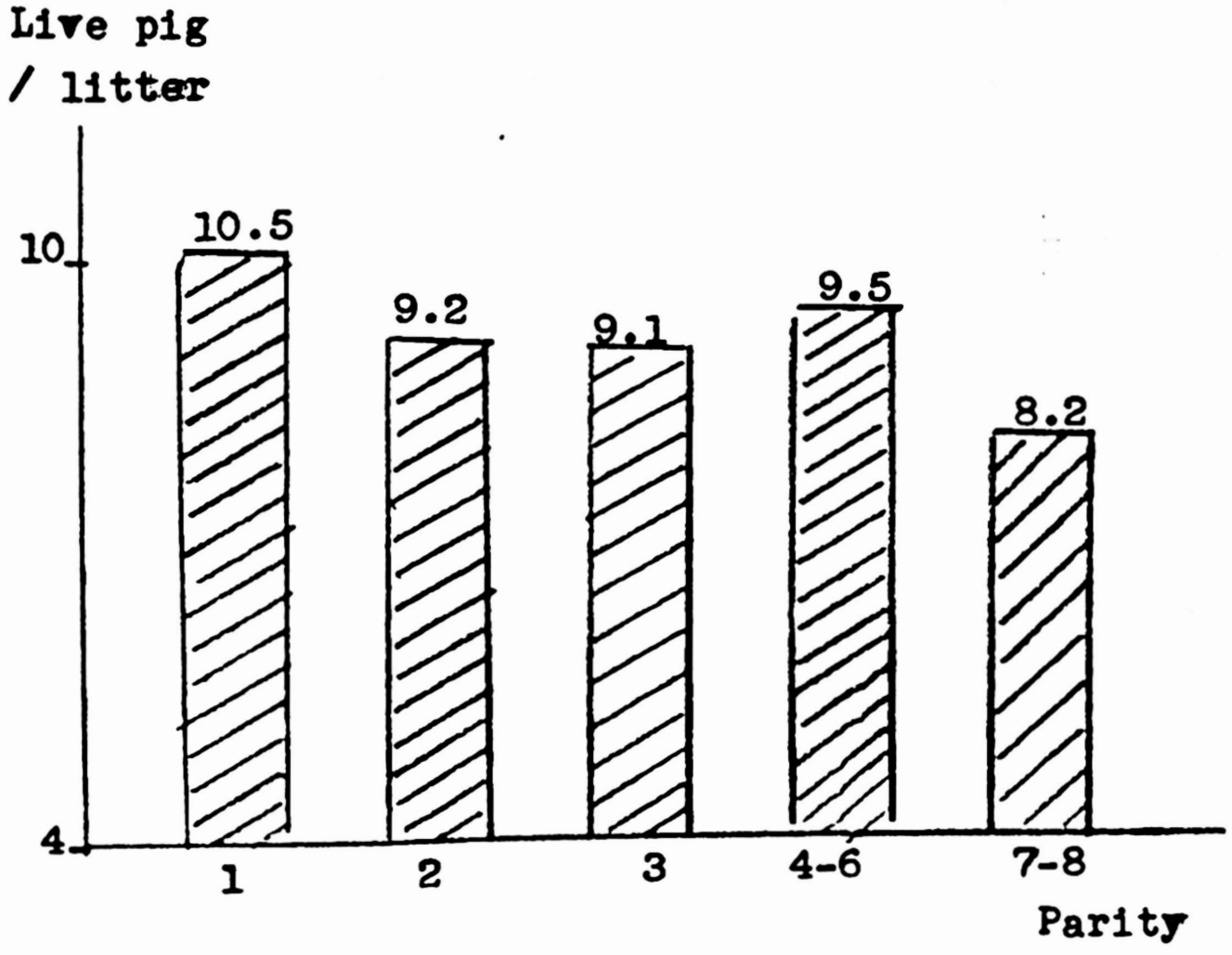


Table 3 Boar Usage from 1 Jan 87 - 31 Oct 87.

	3WC	PS	GP
Highest Boar · Sows Ratio	1:9.2	1:16.6	1:22.5
Farm Target	1:30	1:30	1:30

C.Cost of Production

The cost of production per kilogram liveweight was estimated at $2.31 (Table 4).

The following assumptions were made in the calculation :

1. The total number of pigs marketed was 1% less the total number weaned, i.e. assuming a 1% post weaning mortality.
2. The average weight of a 6 month old porker was 80 kg.
3. The cost of Land and Boar/Sow Depreciation were not taken into account.

Note: Assumption 1 is made because the total number of pigs marketed or the total weight sold were not available. The total number of pig weaned was taken from the Weaning List.

The evaluation of the cost of production was to be done by comparison with the national average. However,such a comparison is not possible as there is a lack of published reports on the cost of production per kg liveweight ,let alone a national average. Most farmers, however, are reported to give a figure of $1.40/kati. If this figure is correct , then the cost of porker for this farm can be considered as within the average range.

Table 4 Cost of Production per kg Liveweight

Production Costs from 1 Jan 87 - 31 Oct 87 :

			% total cost
1. Feed Cost		$ 592,581.25	76.3
2. Wages (1 worker: 450 pigs)		$ 50,400.00	6.5
3. Depreciation of houses		$ 46,667.00	6.0
4. Water/Electricity		$ 4,560.00	0.6
5. Maintenance		$ 2,500.00	0.3
6. Veterinary Tx,Drugs,Vaccines		$ 10,000.00	1.3
7. Replacement Cost			
	-Boars	$ 4,875.00	0.6
	-Sows	$ 65,000.00	8.4
Total		$ 776,583.25	100.0

Total number weaned (1 Jan - 31 Oct) = 4,240.0
With 1% mortality = 4,197.6

Total Weight marketed (80 kg/pig) = 335,808 kg

Cost per kg liveweight

$$= \frac{\$\ 776,583.25}{335,808}$$

= $2.31

= $1.38 / kati

D.General Remarks

In this study, important parameters such as Litter/sow/year, Pigs weaned/sow/year and the Extraction Rate based on Standing Sow Population could not, unfortunately, be obtained due to the adequacy of data.

CONCLUSION

The overall Herd Performance was satisfactory. However there are rooms for improvement in the farm management especially in the area of record keeping and improving workers morale and productivity.

Problem areas were identified and a summary of the recommendations are as follows :

1. Provide better incentive to workers.
2. Provide better training to workers especially in the area of recording and breeding mangement.
3. Investigate the nutrient levels esp. Metabolizable Energy of the lactation feed as well as feed intake of lactating sows.
4. Introduce a least-cost feed formulation computer program.
5. Calculate the feed conversion effiency of fatteners: need to record the weaning weight, market weight and actual amount of feed consumed by each batch.
6. Improve efficiency of record keeping and accuracy of data.
7. Check the herd inventory regularly.
8. Carry out regular herd performance monitor and evaluation.
9. Carry out regular updating of production targets in view of current performance.

10. Improve breeding management in :

    a) boar usage and boar:sow ratio

    b) detection of (return to) estrus

    c) handling of sows

11. Improve waste disposal management.

12. Economical evaluation on the use of Ivermectin.

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APPENDIX A

Categories used to evaluate Farm Resources and Farm Processes.

Poor	Mediocre	Good
None	Inadequate	Adequate Excess
Profitable	Breakeven	Loss
Unreliable	Partially reliable	Most reliable
Inefficient	Partially efficient	Efficient
Inadequate	Partially adequate	Adequate
Inappopriate	Semi appopriate	Appopriate
Unsuccessful	Partially successful	Successful
Unsatisfactory	Fair	Satisfactory

APPENDIX B

A. Various aspects of the Farm Resources evaluated are

1. Farm Physical Structure
   a. Location
   b. Layout
   c. Security

2. Land Use
   a. Wastage

3. Housing
   a. Shelter function
   b. Ventilation
   c. Flooring
   d. Drainage
   e. Feeding and Drinking Facillities
   f. Marketing facillities

4. Feedmill
   a. Operation efficiency

5. Labour
   a. Manpower
   b. Supervision
   c. Workers' morale and attitude

B. Various aspects of the Farm Processes evaluated are

1. Herd Health
   a. Herd Health Program
   b. Implementation and effectiveness
   c. Economics

2. Recording System
   a. Adequacy and Accuracy
   b. Computerisation and Efficiency

3. Waste Disposal
   a. Efficiency

4. Feeding
   a. Feed formulation and allocation
   b. Efficacy of feeding program esp effects on reproductive performance and feed conversion ratio.

5. Breeding
   a. Program and implementation
   b. Herd Performance - Breeding, Farrowing and Weaning and boar usage.

APPENDIX G

Some standard targets and recommended interference levels for dry sows, boar performance, farrowing sows and the fattening herd. (Muirhead 1978)

	Herd target	Rec. Interference level
1. Dry Sow		
Average no.in herd	as determined	97% of standard
Average age	2 yrs	3 yrs
Av.no maiden gilt:sows	1:15	
Service programme	as determined	10% variation
Av.wean.-serv.interval	7 dys	9 yrs
Normal Repeat Service	5%	9%
Abnormal Repeat Service	3%	4%
Abortions	1%	2.5%
Not-in-Pig	2%	5%
Sow deaths	2%	3%
Sow culled due to disease	2%	4%
Farrowing Rate	85-89%	80%
Litters/sow/year (5 week weaning)	2.25	2.0
2. Boar		
Average age	20 mo	30 mo
Boar:Sow Ratio	1:20	1:30
Matings/week	4	5
Litter size	9.8-10.8	Boar Comparison
Matings/sow	2	2.3
Mating interval	12 hrs but variable	
3. Farrowing Sow		
No.alive/litter	10.9	10
Born dead	5%	7%
Mummy	0.5%	1%
No.weaned/litter	9.6	9
Death to weaning	8.12	13
8 piglets or less	10%	18%

Piglet mortality		
-laid on	5%	7%
-congenital defects	0.5%	1.5%
-low viability	1.5%	3%
-starvation	1%	3%
-death due to scours	0.5%	2%
-miscellanous	3%	5%
Pigs reared/sow/yr	21	19

4. Fattening Herd

Wean.-Market Mortality	2.5%	3.5%
Feed Conversion		
-pork (60 kg)	2.7	2.9
-cutter (85 kg)	2.9	3.2
-bacon (90 kg)	2.9	3.2
-heavy (115kg)	3.6	3.8

APPENDIX H

Reproductive performance in the pig herd : overall production to be expected from an efficient . (Wrathall 1977)

Output per female	Reference Gilts	Sows	All female
1. Litters per year	1.84	2.24	2.14
2. Live piglets/litter	10.0	11.0	10.75
3. Live piglets/year	18.4	24.6	23.0
4. Live piglets/month	1.53	2.05	1.92

Note : Gilts are females of over 6 months but not yet having weaned a litter .

Normal reference data and decision boundary (interference level) in the pig herd. (Wrathall 1977)

	Reference Figure	Decison Boundary
1.Age at 1st service	225+10 dys	> 240 dys
2.Regular return (21+3d)	10%	≥ 20%
3.Conception rate(1st ser)	90%	≤ 80%
4.Irregular return (>24d)	3%	≥ 6%
5.Abortion	1%	≥ 2.5%
6.Failure to farrow	1%	≥ 2%
7.Farrowing rate	85%	≤ 80%
8.Pig born alive/litter(gilt)	9.5-10.0	≤ 9.0
9.Pig born alive/litter(sow)	10.5-11.0	≤ 10
10.Pig born dead (gilt)	4%	≥ 6%
11.Pig born dead (sow)	5%	≥ 7.5%
12.Pig born malformed	1.5%	≥ 3%
13.Pig weaned/litter (gilt)	9.0-9.5	≤ 8.5%
14.Pig weaned/litter (sow)	9.5-10.0	≤ 9.0
15.Wean-service interval	6-9 dys	≥ 10 dys

APPENDIX I

Cost of porker production as quoted by various workers

Source	Cost/kg LW	Remark
1. Ahmad Mustaffa et al (1983)	$ 2.65	Self-mixed feed. Depreciation of boar & sows accounted for.
	$ 2.91	Commercial feed. Depreciation of boar & sows accounted for.
2. Chua KL (1986)	$ 2.50	Depreciation of boar & sow accounted for.
3. Too HL (1987)	$ 2.34	This figure is often quoted by many farmers verbally.
4. Findings from this study	$ 2.31	Boar/sow depreciation not accounted for.

In all the figures quoted above , the cost of land is not included.

APPENDIX J

The Farm Feeding Program

Group	Feed	Allocation (kg)	Duration
Boar	Gestation	2.5-3.0	throughout life
Suckler	Creep	ad lib	1-2 wks
Weaner	Prestarter	ad lib	3-4 wks
Grower	Grower	ad lib (1.5-2.5)	3-3.5 mo
Finisher	Finisher	2.0-2.5	1.5-2.0 mo
Gilts	Grower / Gestation	2.0-2.5	until service
Sow	---------- as below ----------		

Feed Allocation (kg)

4.5 Gest. 10 d

4

4-5 Lact. 3-4 wk

3-3.5 Lact. 3 wk

2.2 - 2.5

Gestation 13 wk

↑ Farrowing ↑ Weaning

Weaning

APPENDIX K

Flowchart of the farm Breeding & Production operation.