THE GOVERNMENTS OF MALAYSIA AND THE STATE OF JOHOR

W.P. PIGS

WORKING PAPER

JOHOR TENGAH AND TANJONG PENGGERANG REGIONAL MASTER PLAN

1971

HUNTING TECHNICAL SERVICES LTD.

BINNIE & PARTNERS

OVERSEAS DEVELOPMENT GROUP
UNIVERSITY OF EAST ANGLIA

SHANKLAND COX OVERSEAS

Blue

1830 MALAYSIA Johor Tengah

W.P. PIGS

Working Paper

PIGS

CONTENTS

		PAGES
1.	MARKET	1
1.1	The Demand for Pork	1
1.2	The Johor Market	2
1.3	The Marketing System in Johor	4
2.	PRODUCTION	5
2.1	Breeding Policy	5
2.2	A Production Enterprise	7
2.2.1	Management system	7
2.2.2	Enterprise build-up	8
2.2.3	Housing requirements	8
2.2.4	Breeding stock requirements	9
2.2.5	Performance assumptions	9
2.2.6	Feeding requirements	9
2.2.7	Other requirements	10
2.2.8	Evaluation	10

TABLES

		PAGES
Table 1	Proportion Of Chinese Households Buying Pork And Median Expenditures Per Consumption Unit Income Group.	1
Table 2	Projection Of Per Capita Consumption Of Pork 1967 - 1990.	2
Table 3	Projection Of Consumption Of Pork 1967 - 1990.	2
Table 4	Johor - Estimated Supply And Demand For Pork By Region.	3
Table 5	Projection Of Pork Consumption In Johor	3
Table 6	Estimated Pork Consumption In Singapore 1970 - 1990.	4
Table 7	Costs, Sales And Net Cash Flow, 35 Low Pig Herd - Food Conversion Ratio 3:5:1 ($).	11
Table 8	Summary Of Financial Analysis.	13
Appendix A	Consumer Expenditure Survey - Pork	i
Table A1	Number Of Households By Frequency Of Pork Purchase Of Pork And Income Group - Chinese.	ii
Table A2	Number Of Households By Monthly Expenditure On Pork And On Consumption Per Household And Income Group - Chinese.	ii
Table A3	Number Of Households By Monthly Expenditure Per Consumption Unit On Pork And Income Group - Chinese.	ii

1. MARKET

1.1 The Demand for Pork

Pork is the major meat consumed by the Chinese section of the population. In 1967 some 950,000 pigs were slaughtered in W. Malaysia. Together with about 1.5 million pounds of imported pork or pork products the total available supplies were approximately 107 million pounds, equivalent to a per capita consumption of 12.14 pounds per annum.

The growth of demand for pork will depend on population growth and the extent to which individuals increase expenditure on pork as their income rises (measured as income elasticity of demand). F.A.O. in two studies has taken two estimates of income elasticity 0.8 and 1.0. The first of these would mean a less than proportionate increase in expenditure with increased income. An expenditure survey carried out by the Consultants in South Johor found proportions of households buying pork and median expenditures as shown in Table 1.

TABLE 1 PROPORTION OF CHINESE HOUSEHOLDS BUYING PORK AND MEDIAN EXPENDITURES PER CONSUMPTION UNIT BY INCOME GROUP

Income group	Proportion buying %	Median Expenditures ($)	
		Total population	Consumers only
Less than $100	90	2.25	2.75
$100-199	96	3.95	4.15
$200-299	93	4.73	4.98
$300-499	98	5.72	5.81
$500 & over	99	8.44	8.48

This seems to suggest that the lower of the two income elasticity estimates would be more appropriate. Tables 2 and 3 show the increase of per capita and total consumption under the two income elasticity assumptions, and a population increase of 3 percent per annum.

TABLE 2 PROJECTION OF PER CAPITA CONSUMPTION OF PORK 1967-1990

Year	Per Capita Consumption (lb)	
	Inc. elast. = 0.8	Inc. elast. = 1.0
1967	12.139	12.139
1970	12.886	13.073
1975	14.260	14.791
1980	15.815	16.734
1985	17.574	18.933
1990	19.565	21.421

TABLE 3 PROJECTION OF CONSUMPTION OF PORK 1967-1990

Year	Total Consumption (million lb)	
	Inc. elast. = 0.8	Inc. elast. = 1.0
1967	106.67	106.67
1970	124.21	126.01
1975	158.74	164.64
1980	204.07	215.93
1985	262.89	283.21
1990	339.30	371.48

On the basis of these assumptions the industry will grow to about three times its present size by 1990.

Wholesale prices for live pigs are about $90-$100 per pikul. This is slightly above prices in the United States but about the same as in U.K. Considering feed prices are probably 5 to 10 percent lower in the U.S. & U.K. this present price level appears very reasonable. While feed prices may fall slightly if local supplies increase, labour costs will rise. Therefore the best price forecast is a continuation of the present level. There appears to be no reason why, in the absence of restriction of feed supplies, the industry should not expand steadily in line with demand at present prices.

1.2 The Johor Market

The production and consumption of pork in Johor is not known with accuracy. The Project survey indicated that consumption was more or less in line with national averages, i.e. about 30 pounds per Chinese per annum. Veterinary

Department estimates put the number of pigs in the State at 80,400. Splitting the State into three regions and assuming 1.6 pigs (average weight 110 lbs) can be slaughtered per year per animal counted at any point in time, the supply and demand situation is as shown in Table 4.

TABLE 4 JOHOR - ESTIMATED SUPPLY AND DEMAND FOR PORK BY REGION

Region	Estimated Demand (mn. lb)	Available Supply (mn. lb)	Deficit (mn. lb)
1. Johor Baharu, Pontian Kota Tinggi	6.247	6.334	-0.087
2. Batu Pahat, Kluang, Mersing	5.761	2.819	2.942
3. Muar, Segamat	6.428	5.002	1.426
Total	18.436	14.155	4.281

Overall the State appears to have a deficit of about 4 million pounds, the greater part of which is in the central zone of Batu Pahat and Kluang. Dealers report buying animals from Negri Sembilan and that area is probably the main source of additional supplies. The southern zone has a small surplus and this may be accounted for by shipments from Tanjong Penggerang to Singapore.

If the Johor market expands at the same rate as in the nation as a whole, total consumption will rise over the next 20 years as shown in Table 5, assuming an income elasticity of 0.8 and a population increase of 3 percent per annum.

TABLE 5 PROJECTION OF PORK CONSUMPTION IN JOHOR

Year	Consumption (mn. lb)
1970	18.4
1975	23.5
1980	30.2
1985	38.9
1990	50.2

To satisfy this demand by local production would require an industry three and a half times as big as at present. In addition, however, there is the question of demand from Singapore. At the moment Singapore produces almost all of its

requirements of about 49 million pounds per year. Assuming a growth rate of consumption of 5 percent per annum requirements will grow as shown in Table 6.

TABLE 6 ESTIMATED PORK CONSUMPTION IN SINGAPORE 1970-1990

Year	Consumption (Mil. lb)
1970	52.9
1975	67.5
1980	86.2
1985	110.0
1990	140.4

As urbanisation continues in the island there will be increasing pressure on all agricultural land uses both because of rising land values and also because of a desire, for public health reasons, to separate pig production from housing and recreational areas. The proportion of the total market which could be satisfied from Johor is impossible to predict. However, 10 percent of the 1990 market is equal to present estimated production in Johor. If Johor could capture 20 percent by 1990 it would mean that, to satisfy Johor requirements as well, the pig industry would have to expand to five and a half times its present size or at a rate of nine percent per year.

1.3 The Marketing System in Johor

The marketing of pork in Johor is influenced by a number of factors:-

(a) The main body of consumers, the Chinese, live in towns or medium size villages.

(b) They are regular pork eaters - averaging about 30 lbs per head per year. Over 60 percent of Chinese households interviewed in the Project survey said they bought pork daily, and 90 percent bought it once per week or more. Thus the market is steady and not subject to great seasonal fluctuations.

(c) Pigs are normally slaughtered at about 150 lbs. liveweight or about 110 lbs. dead weight. This will supply about 1300 people for one day (30 lbs./head/yr. = about 1 lb./day/12 people.

(d) Consumers are said to prefer fresh meat.

(e) Because of climatic conditions it is not possible to store unrefrigerated meat for long periods (or to transport it long distances) without deterioration.

Given these conditions the present marketing system appears to be a logical solution to the problem of distribution. There are very few wholesalers in the pork trade. Most retailers buy pigs either more or less fat or breed and rear them themselves, killing one or more every day depending upon normal market demand (occasionally one pig may be split among two retailers). This minimises transportation and storage of meat but does mean some wasterof offals and other waste products such as blood. The extent of this waste is not known.

There is therefore no wholesale market as such for pigs, nor any central slaughterhouse to which the output of any new producer could be sent. However, given the steady expansion of demand postulated earlier, there appears to be no real reason why a new producer in the Project Area should not be able to find an outlet for his animals either locally, assuming there will be a Chinese population at least in urban centres in the Project Area, or in the main urban centres of the State, especially Johor Baharu.

For further discussion of this problem see Agricultural Working Paper on "Meat Marketing in Johore".

2. PRODUCTION

2.1 Breeding Policy

Experience has indicated that pure-bred European breeds are less prolific under Malaysian than under temperate conditions, but crossing exotic breeds has given good results. The local Chinese pig though hardy and very prolific, grows very slowly and produces very fat pork. Based on available records productivity and economic data for pure bred and cross bred exotic and for the local Chinese appear to be

as follows:-

	Pure exotic	Cross-bred	Indigenous
piglet weand per litter (No)	6	9	12
litters per annum (No)	1.5	2	2
Weaning weight at 8 weeks (lb)	35	30	25
Average liveweight gain per day (lb)	1.0	1.0	0.5
Feed conversion (lb food per lb l.w. gain)	3.5	3.8	5.0
Overall mortality (%)	15	10	10
Average price per lb live-weight ($)	0.75	0.75	0.52

Using the above parameters cross-bred pigs are more profitable than pure bred exotics; the indigenous pigs are unprofitable to raise.

The Chinese community, which is the major consumer of pork, apparently demand a lean pig with red flesh and soft fat. These preferences are to some extent contradictory as younger, leaner pigs are likely to have lighter coloured flesh. As a consequence of these confused preferences producers and butchers are still seeking the type of pig most likely to be in demand. Most of the major exotic breeds have been imported and used for cross-breeding, and the offspring are slaughtered for pork over a wide liveweight range, (120-200 lb).

The most suitable breeding policy for pork production is likely to be the use of a triple cross-bred (all exotic blood). With some stratification of the industry first cross gilts could be sold by specialist breeders for sale to pork producers, who would for mating use a boar of a different breed from either parent of the crossbred. Present indication are that large white boars x Hampshire (or Berkshire) x Duroc females may be very suitable.

Local butchers appear to have a preference for Landrace crosses. However some of the Landrace families at present in Malaysia suffer from serious foot and leg joint troubles and low fertility, and the use of the existing Landrace stock in the triple cross-breed is not recommended at the present time.

As the indigenous South China breed is so prolific, every effort should be made to prevent its complete disappearance.

Government action will be required to ensure the preservation of a few herds.

A free artificial insemination service for the pig industry is operated in Johor, using untested Landrace and Large White boars obtained from the Federal Pig Research Station at Serdang. It was recommended by the FAO Livestock Mission that a boar performance testing programme should be started as early as possible. This recommendation is endorsed and it is further recommended that the programme should incorporate carcass evaluation.

2.2 A Production Enterprise

In the following sections a breeding and fattening enterprise is described and evaluated, based on a unit of 35 breeding females and two boars.

2.2.1 Management System

Breeding in this system would be aimed at having sows and gilts farrowing in bunches every two months. Allowing for misconceptions and mortalities it is assumed that 10 animals will farrow every two months.

In-pig females are put into farrowing pens of 60-80 square feet about one week before farrowing. One month after farrowing, four or five sows and their litters are moved into a communal pen of about 200 square feet, in order to economise on farrowing pens. A month later the piglets are weaned and the dry sows are run in a large pen of about 200-300 square feet. The boar may be run with them or kept in a separate pen nearby. The weaners remain in the communal pen for a further month, after which they are divided into two groups according to size and put in separate pens, providing 8 square feet per animal. After a further two months they are re-grouped into bunches of about ten for final fattening in pens giving 9-10 square feet per animal.

2.2.2 Enterprise build-up

The enterprise has been assumed to begin early in year 1 and to build up as follows:-

January	
February	
March	Purchase 2 boars and 12 gilts
April	
May	Purchase 12 gilts
June	
July	Purchase 11 gilts
August	First litters
September	
October	Second litters
November	
December	Third litters

The first batch of fat pigs would be sold in about February of year 2.

2.2.3 Housing requirements

For the 35 sow unit the following pens would be required [redacted]:-

16 farrowing type pens - 80 square feet	=	1,280 sq. ft.
3 weaner pen 200 - 220 square feet	=	660 sq. ft.
5 store pens 140 square feet		700
8 fattener pens, 100 square feet		800
2 dry sow pens 250 square feet		500
2 boar pen 80 square feet		160
		4,100

In addition a shed for storing feed would be required.

The cost of this housing will vary depending on the materials used from anywhere between $3 or less to $6 per square foot. It is assumed that pens will have a concrete floor, roughened to prevent slipping and with sufficient slope to allow it to be hosed easily and for water to drain away. Pen walls may be concrete or slatted (wood) or metal rails. Wood is less desirable because of cleaning difficulties. Solid walls are required for young animals. Roofing may be attap or corrugated sheets. Automatic drinkers are preferable and feeding could be wet or dry.

A figure of $4 per square foot has been taken for the various pens, making a total of $16,400, and the food store has been costed at $700.

2.2.4 Breeding stock requirements

Cross-bred (exotic) gilts are assumed to be purchased at 8 months old for $200 each, and to be mated at once with a pure bred exotic boar. The gilts are expected to produce their first litter at one year old, and, on average, a further 7 litters before being sold for meat at 50 cents per lb live-weight. The purchase price of the boars is assumed to be $400 each at 12 months, their herd life to be five years and their sale price to be 50 cents a lb liveweight for meat.

2.2.5 Performance assumptions

The following assumptions have been made:-

	Piglets weaned per litter	= 8
	Weight at weaning	= 30 lb
	Age at weaning	= 8 weeks
	Mortality between weaning and slaughter	= 2 percent
	Weight at slaughter	= 150 lbs.
(i)	Food conversion ratio	= 3.8
	Average gain/day, weaning slaughter	= 1.01 lb.
	Age at slaughter	= 25 weeks
(ii)	Food conversion ratio	= 3.5
	Average gain/day	= 1.07 lb.
	Age at slaughter	24 weeks

2.2.6 Feeding requirements

Various manufactured pigs meals, suitable for breeding stock and young and fattening pigs available on the local market. Prices of these are assumed to be as follows ($ per pikul):

Creep feed	19
Fattening pigs, 8-14 weeks	18
Fattening pigs, 14-20 weeks	17
Fattening pigs, 20 weeks to slaughter	16
Sows and boars	17

At the above prices total annual costs of feeding are estimated to be ($):

	Food Conversion Ratio	
	3.8:1	3.5:1
2 boars @ 6 lb per head per day for 365 days	560	560
35 sows @ average 7¾ lb per head per day for 365 days	12,634	12,634
480 piglets @ 30 lb per head of creep feed	2,052	2,052
475 pigs (8–14 weeks) @ 105 lb per head	6,733	6,733
475 pigs (14–20 weeks) @ 168 lb per head	10,175	10,175
475 pigs (20 weeks to slaughter) @ 189 lb per head	10,773	-
475 pigs (20 weeks to slaughter) @ 147 lb per head	-	8,379
	42,927	40,533

It has been assumed that 10 pigs are lost during the fattening period. Food has been provided for half of them.

2.2.7 Other requirements

water: at 20 gallons per head per day, the daily requirement is 5500 gallons; at 50 cents per 1000 gallons this amounts to $1000 per year.

veterinary: at $2 per sow and boar and $0.5 per fattener per year the cost will be $312.

maintenance of buildings: this has been taken at 2½ percent per annum of the capital cost, all of which has been charged in the first year.

2.2.8 Evaluation

Table 7 shows the costs and returns for the enterprise, assuming a food conversion ratio of 3.5:1, and sale prices of $0.75 per lb liveweight for fatteners, and $0.50 per lb for cull sows and boars. The internal rate of return is 18 percent. Table 7 shows that cost of feed accounts for more than 80 percent of the total costs, so clearly profitability will be markedly affected by changes in the food conversion ratio, and in the price of feedstuffs.

Year	Land	House	Buildings	Stock	Feed	Water	Vet	Labour	Total Costs	Fat Pigs	Culls	Total Sales	Net Cash Flow
1	1,000	2,000	17,850	7,800	12,316	1,000	312	1,800	44,078	-	-	-	- 44,078
2	-	30	427	1,000	40,533	1,000	312	1,800	45,102	52,875	750	53,625	8,523
3	-	30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
4	-	30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
5		30	427	2,600	40,533	1,000	312	1,800	46,702	52,875	1,600	54,475	7,773
6		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
7		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
8		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
9		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
10		30	427	2,600	40,533	1,000	312	1,800	46,702	52,875	1,600	54,475	7,773
11		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
12		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
13		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
14		30	427	1,600	40,535	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
15		30	427	2,600	40,533	1,000	312	1,800	46,702	52,875	1,600	54,475	7,773
16		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
17		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
18		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54,075	8,373
19		30	427	1,600	40,533	1,000	312	1,800	45,702	52,875	1,200	54.075	8,373
20		30	427	2,600	40,533	1,000	312	1,800	46,702	52,875	1,600	54,475	7,773
N.P.V. at 15%	1,000	2,186	20,497	18,265	263,548	7,198	2,246	12,957	327,895				15% 7,310
Percentage of Total Cost	0.30	0.67	6.25	5.57	80.38	2.20	0.68	3.95					

Profits are also likely to be very sensitive to changes in product price, and other charges that could significantly influence the return are the costs of buildings and labour.

To test the sensitivity of the enterprise a series of calculations has been done using the following different assumptions on buildings, labour costs, feed costs and food conversion ratios, and product prices.

buildings: (a) at $4 per square foot and 2½ percent annual maintenance.

(b) at $2 per square foot and 5 percent annual maintenance.

Assumption (a) is the one used in the outlined enterprise. Alternative (b) provides for cheaper materials or self-building

labour: (a) $150 per month throughout

(b) $150 per month, rising by 3 percent per year

feed: (a) Food Conversion Ratio 3.5

(b) Food Conversion Ratio 3.8

(c) Cost as detailed paragraph (c) above.

(d) 10 percent higher cost i.e. appropriate for small lots.

(e) Lower cost falling at 0.5 percent per annum.

sale price: (a) $100 per pikul liveweight

(b) $ 90 per pikul liveweight

(c) $100 per pikul liveweight falling at 0.5 percent per annum throughout.

Twelve combinations of these assumptions have been calculated and the results are summarised in Table 8, which shows the Net Present Values at 15 percent and the Internal Rates of Return of all the combination. The first combination in Table 8 is that used in the enterprise already outlined.

It can be seen that the 10 percent rise in feed costs has had a considerable impact on the return, reducing it from 18 percent (run 1) to 6 percent (run 2).

TABLE 8 SUMMARY OF FINANCIAL ANALYSES

Run no.	Buildings	Conversion ratio	Feed cost	Labour cost	Sale price	N.P.V. at 15%	I.R.R.
1	Regular	3.5	Low	$150/month Constant	$100/pikul	6,940	18%
2	"	"	High	"	"	- 19,410	6%
3	"	3.8	Low	"	"	- 7,740	12%
4	"	"	"	"	$90/pikul	- 40,440.	negative
5	"	3.5	"	"	"	- 25,760	2%
6	"	"	High	"	"	- 52,100	negative
7	"	"	"	Rising at 3%	"	- 54,390	negative
8	"	"	"	"	$100/pikul	- 21,800	"
9	"	"	"	"	Falling at 0.5%	- 30,350	"
10	"	"	Low-falling at 0.5%	"	"	2,450	16%
11	Low cost	"	"	"	"	11,370	27%
12	"	"	"	"	$90/pikul	- 12,720	9%

Similarly the effectiveness with which the feed is utilized by the animal is important. Assuming low feed costs a fall in the feed conversion ratio from 3.5 to 3.8 per pound of weight gained has reduced I.R.R. from 18 percent to 11.5 percent (runs 1 and 3).

Returns are also extremely sensitive to changes in product price. A 10 percent fall in price to $90 per pikul has virtually eliminated profits on the above performance and cost assumptions (runs 1 and 5, 2 and 6, and 3 and 4).

Because capital costs are fairly low in relation to recurrent costs, reductions in them have had a significant effect upon rates of return. Comparing runs 10 and 11, the halving of building costs increases the I.R.R. from 16 to 27 percent. In run 12, returns are estimated at 9 percent even with a low product price of $90 per pikul.

The present situation for an individual producer is perhaps partly approximated by runs 3 & 4 with relatively low feed costs but a lower feed conversion ratio because of the use of some waste products in feeding, either waste from oil mills or vegetable waste from market gardens. Allied to low building costs a return near 10 percent is probably obtained. A small producer with 6 or 7 sows would receive a return over cash costs of about $12-$13 per sow per month or $75-$80. Given the ability to build up such an enterprise over a few years from a low initial capital cost this type of enterprise can be a useful sideline for a small man.

Appendix A

Consumer Expenditure Survey -- Pork

A survey was carried out in South Johor during April 1970 aimed at providing background information on expenditure of Malaysian consumer on food items, particularly meats, fish and dairy products which were being investigated as possible production activities in the project area. A total of 1,863 households were interviewed, 1,214 Malays, 529 Chinese and 120 Indian.

Consumption of pork is confined almost entirely to the Chinese section of the community. The results of the survey among Chinese households have been summarised in the body of the paper. The tables in this Appendix show the full results of the survey with respect of expenditure on pork and frequency of purchase.

TABLE A1 NUMBER OF HOUSEHOLDS BY FREQUENCY OF PURCHASE OF PORK AND INCOME GROUP - CHINESE

Frequency	Income Group				
	Less than $100	$100-199	$200-299	$300-499	$500 & over
Everyday	4	94	105	86	37
Twice or thrice per week	7	31	30	20	15
Weekly	5	11	12	5	9
Fortnightly	1	3	1	2	3
Monthly	1	1		2	2
Occasionally	1	12	4	2	
None	2	6	11	3	1

ABLE A 2 NUMBER OF HOUSEHOLDS BY MONTHLY EXPENDITURE ON PORK AND ON CONSUMPTION PER HOUSEHOLD AND INCOME GROUP - CHINESE

Household	Income Group				
	less than $100	$100-199	$200-299	$300-499	$500 & Over
- 2.49	2	6	1	1	2
- 4.99	1	10	6	1	1
- 9.99		16	17	6	6
) - 19.99		25	22	12	8
) - 39.99		53	61	41	14
) - 59.99		17	24	27	7
) - 79.99		10	12	20	14
) - 99.99	1	4	5	7	9
)0 or over					5
	2	6	11	3	1
- 0.99	2	11	4	2	

ABLE A3. NUMBER OF HOUSEHOLDS BY MONTHLY EXPENDITURE PER CONSUMPTION UNIT ON PORK AND INCOME GROUP - CHINESE

consumption	Income Group				
	less than $100	$100-199	$200-299	$300-499	$500 & Over
0 - 0.49	2	8	2	2	2
0 - 0.99	3	6	9	3	2
0 - 1.99	3	13	14	10	2
0 - 3.99	4	36	27	23	8
0 - 5.99	3	37	41	21	9
0 - 7.99	1	14	21	22	7
0 - 9.99	1	11	12	16	13
00 - 14.99	1	12	13	16	15
15.0		4	9	3	8
- 0.19	1	10	4	2	
	2	7	11	2	1

PIGS REFERENCES

1. Crotty R. "An Economic Survey of the Livestock Industry in W. Malaysia" Ministry of Agriculture, Kuala Lumpur 1967.

2. F.A.O. "Agricultural Commodities - Projections for 1975 and 1985" Rome 1967.

3. "Provisional Indicative World Plan for Agriculture" Rome 1969.

4. Ministry of Agriculture & Co-operatives - Statistical Digest. Kuala Lumpur, March 1969.

5. Williamson G. and Payne W.J.A. "An Introduction to Animal Husbandry in the Tropics" London 1965.