

HIGH POWERED COMMITTEE

ON

PIG FARMING ACTIVITIES

IN

MAURITIUS AND RODRIGUES

FINAL REPORT

VOLUME 2

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Annex I: Local Pig Production and Consumption 1995-2000

Year	1995	1996	1997	1998	1999	2000
Number of heads slaughtered at MMA	15419	15925	13892	11209	10042	12140
Equivalent carcass wt. (t)	1038	1112	948	758	678	890
Imported frozen porc meat (t) (as raw materials in processing plants)	105	201	280	377	450	347
Imported transformed products(t)	708	874	1118	1435	1299	1303
Total consumption (t)	1851	2187	2346	2570	2420	2540

Annex(II)

List of site visits effected

Site visited	Date of visit	Visiting team	People met
Bassin Requin – Pig Farm	16.07.01	HPC members, Officers from Ministry of Cooperatives and Prof. G.Chan	The president (Mr. David) and members of Cooperative Society.
St. Martin Pig -Farm	17.07.01	HPC members, Officers from Ministry of Cooperatives and Prof. G.Chan	The president (Mr. Pachmootoo) and members of Cooperative Society.
Roche Bois/ Terre Rouge	17.07.01	HPC members, Officers from Ministry of Cooperatives and Prof. G.Chan	Messrs. Bergicourt, Raya, Ah Fock, Khodabaccus and Chan Fook
Union Ducray Farm	03.08.01	HPC members and Prof. G.Chan	Mr. P. Ducray and others
Mauritius Meat Authority	14.09.01	HPC members	General Manager and Officer in Charge (Porc)
Bois Pignolet**	14.09.01	HPC member and Officer from Forestry Services	

** This visit was effected in connection with identification of potential sites for the relocation of Roche Bois pig farmers.

Annex III

List of stakeholders convened

ORGANISATION / MINISTRY	PERSONS CONVENED	FUNCTION OCCUPIED
Ministry of Commerce & Cooperative	Mr. A. Phokeer Mr. D. Jhuboo	Secretary for Cooperative Development Engineer- Project Coordinator
Ministry of Health	Dr. Issack Mr. Patten	Specialist Pathologist Deputy Chief Health Inspector
Ministry of Housing and Lands	Mrs Y.R. Lam Mr. V. Seebun Mr. M.Jhowry	Senior Planner Principal Surveyor Principal Surveyor
Ministry of Economic, Development F.S & C.A.	Prof. G.Chan	Adviser
Ministry of Agriculture, F.T. & N.R	Mr. J.P. Yee Tong Wah	Senior Research and Development Officer
Forestry Services	Mr. Y. Roussety Mr. R. Soobratty	Divisional Forest Assistant Deputy Forest Ranger
Waste Water Management Authority	Mr. H. Chuttooree	Engineer
Ministry of Finance	Mr. J.M. Desvaux	Adviser
Plaisance Pig Marketing and Credit Society	Mr. R. Pachamootoo	Secretary
Central Information Services Division	Mr. O.Panchooree	Computer Analyst
University of Mauritius	Dr. Mrs R. Mohee	Senior Lecturer

Annex (IV)

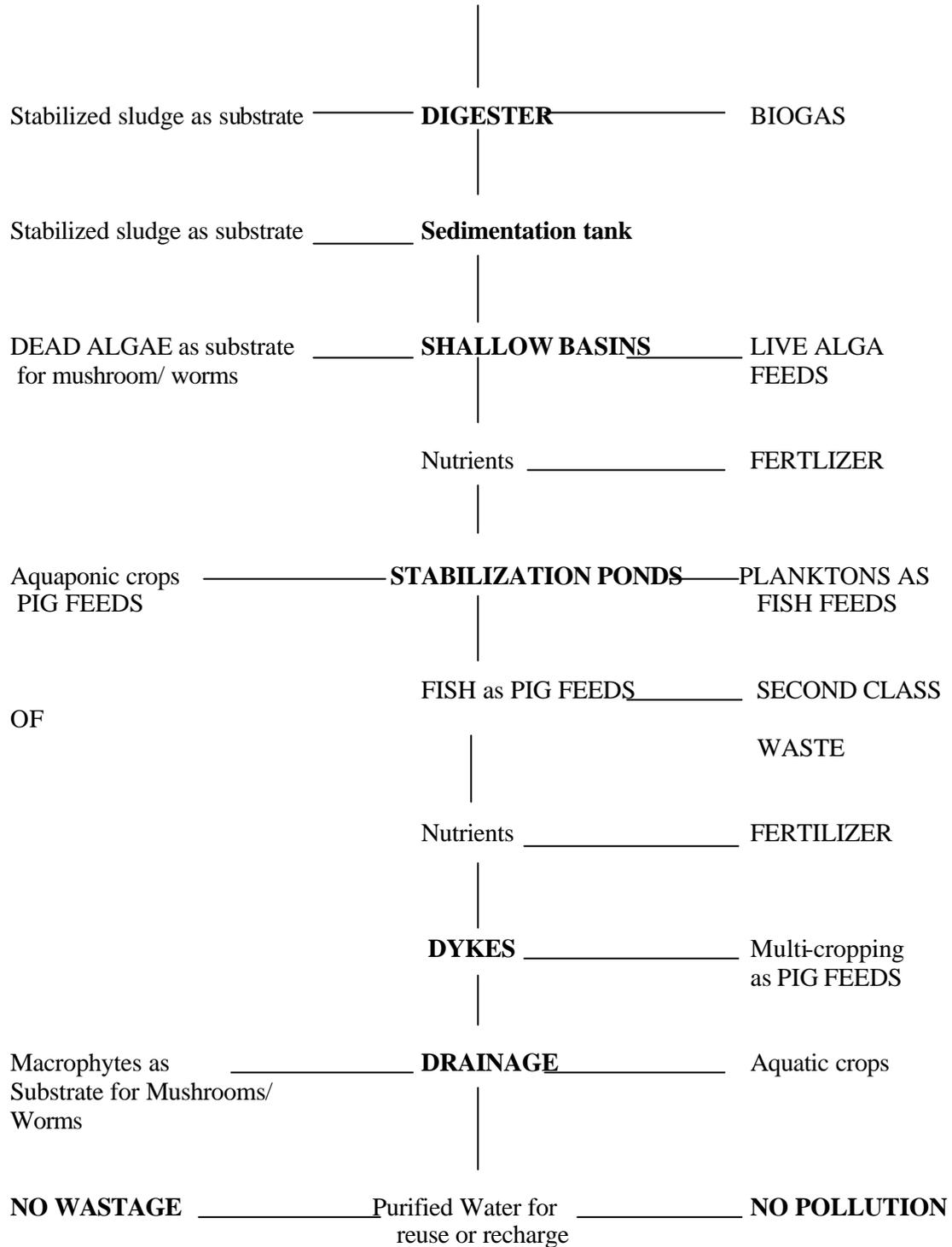
Cost of Treatment plant at Bassin Requin Remedial Project

A.	Preliminary and General Costs	350,000
B.	(i) Site Works (Clearing, Site preparation)	50,000
	(ii) Reduce level, excavation	40,000
C.	(i) Digesters (4)	860,000
	(ii) Sedimentation tanks (4)	400,000
	(iii) Shallow basins (4)	500,000
	(iv) Trenches (bedding, pipe, backfilling)	650,000
	(v) Manholes (complete)	350,000
	(vi) Testing of pipes	50,000
D.	Landscaping	100,000
		<hr/>
		3,350,000
	VAT	335,000
	Contingencies	200,000
		<hr/>
	Total	3,885,000
		=====

ANNEX V

INTEGRATED FARMING SYSTEM-FLOW CHART

Wastes



Annex (VI)

Report on preliminary trial conducted to assess composting potential of pig wastes

Aim

Assess composting as a suitable treatment method for dry portion of pig wastes

Introduction

Dumping of raw pig wastes can pose a direct threat to the environment because of the presence of larvae and pathogens, objectionable odors and direct contamination of groundwater. It is well known that uncovered manure piles allow rain to saturate the pile resulting in the formation of leachate, which have the potential to pollute any watercourses.

Composting pig wastes would convert them into a safe material, which can be used as a soil conditioner. In this context, a study has been initiated to study the composting potential of the dry portion of pig wastes generated in Mauritius and Rodrigues.

In Rodrigues as well as in some places in Mauritius, the typical management of pig wastes generated on the farm consists in separating the dry solids from the effluents in view of its utilization as manure. This is a practice, which is different from general pig farming practices whereby all wastes including solids and effluents remain together and are anaerobically digested as they are in slurry form.

In the present case, the wastes already being segregated, the dry portion of the pig wastes can easily be composted. This study consisted of conducting lab scale trials to study

1. Characteristics of pig wastes
2. Find suitable amendment if necessary
3. Monitor composting temperatures, dry and volatile solids

Methodology

Samples of pig wastes were taken from the Palmar Breeding station in Mauritius. The samples have been tested for moisture content, volatile solids, bulk density and pH. The characteristics of the pig wastes were as follows: Moisture content : 71.6 %ww , Volatile solids : 82.66 % dw, pH:7.03 and bulk density of 650 kg/m³.

Based on the bulk density and the C/N ratio of pig wastes from literature (range 9-15), it was found out that an amendment providing both structure and carbonaceous material would be necessary. In that context, bagasse was used.

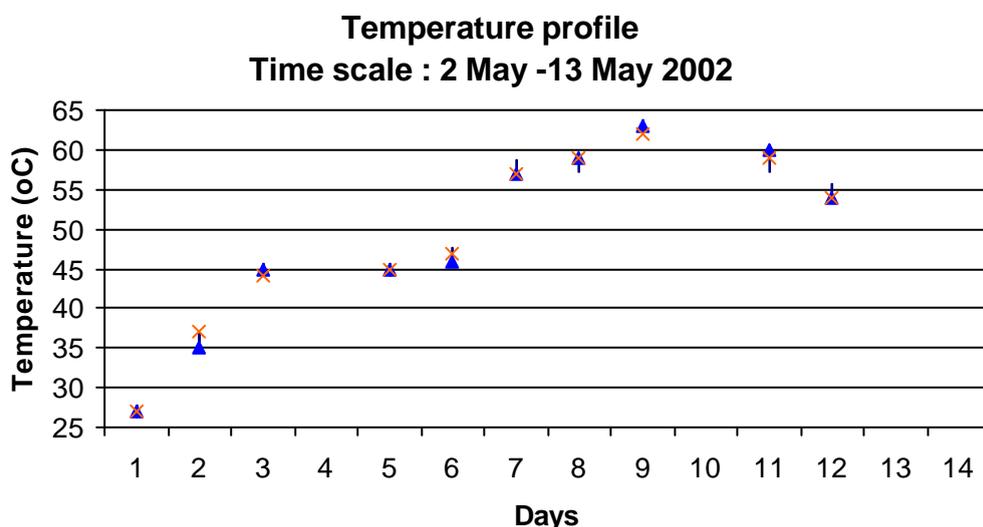
Around 92 kg of pig wastes (wet weight basis) and 30.5 kg of bagasse have been placed into the rotary composter (figure 1 in annex) and left to compost. The pig wastes had a ball like structure and had to be roughly crushed. The bagasse had moisture content of around 16%. The characteristics of the input material can be found in the table below:

	Mixture (Pig wastes and bagasse)
Effective Weight	122.5 kg
Moisture % ww	66.7
Dry Solids %ww	33.3
Volatile Solids %dw	72.6
Bulk Density, kg/m ³	600

The rotary composter was turned once every 4 to 5 days. Temperatures were monitored on a daily basis. Weekly samples were drawn to determine moisture content and volatile solids. The final composts would be analyzed for pH, stability and NPK value.

Findings

Temperature Evolution



Temperatures of 45°C were reached during the early days of composting. This showed that degradation was occurring at mesophilic temperatures. Since the mixture had tendency to compact itself, it was thought that enough air was not getting inside. Thus at day 7, the materials were mixed again in the composter and the latter was turned around 5 times to ensure proper

mixing and aeration. The following day, the temperature shot to 57°C and increased to 63°C on day 8. An average value higher than 55°C was maintained up till now(day 12).

Change in volatile solids after two weeks

On a fixed ash basis, the net change in volatile solids in 12 days of composting was found to be around 34%.

Comments

- The temperatures of 45°C reached during the early days show that degradation at mesophilic temperatures was taking place. However, after turning and remixing the wastes, the temperature rose to 63°C and remained higher than 55°C for at least 5 days. According to the United States Environmental Protection Act (USEPA), a temperature higher than 55°C for a minimum of 5 days is enough to destroy pathogens inside the wastes.
- The net change in volatile solids for the first 12 days is of the order of 34%. However, it is to be noted that the degradation process would last for about 4 weeks and that the net degradation over the whole process has to be taken under consideration.
- A large amount of larvae, which later developed into flies and insects, was noticed during the composting process. The high amount of larvae originally present in the fresh manure developed into flies/insects during the first days of composting. Mitigating measures will have to be taken to minimize the generation of flies.
- No leachate was observed during the composting process.
- Odors were present on day 1 with the pig wastes and bedding material. However, once the process started, no odors could be discerned after two to three days. It has to be noted that the composting process occurred in a closed reactor.
- The characteristics of the final compost, namely the solvita index, pH and NPK value have to be determined with respect to the utilization of the compost.

Conclusion

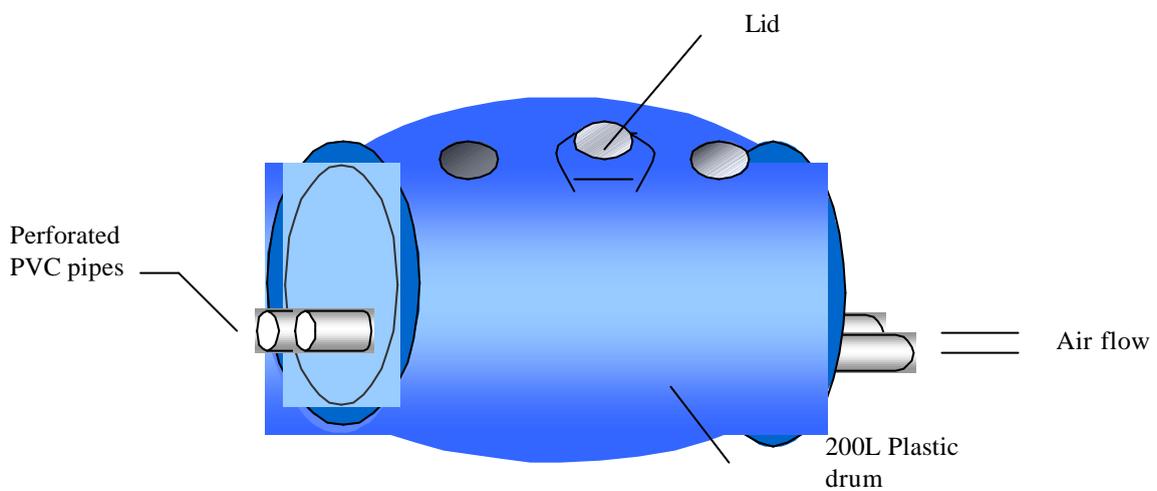
1.0 These trials have shown that pig wastes with suitable amendment can compost well. Although the final characteristics have not yet been determined, the temperature profile and the change in volatile solids show that effective degradation was taking place. Similar to all other animal wastes, special precautions will have to be taken while composting to ensure the following:

- At least 5 to 7 days composting at temperatures greater than 55°C.
- Uniform temperature distribution through adequate management of pile
- Larvae destruction
- Minimization of odors at the beginning of the process

2.0 The final stabilized composts can then be used as soil conditioner to increase the organic matter of the soil, boost agricultural yields or as material to combat soil erosion.

3.0 This technology of rotary composter is already being used in the agricultural valley of Riviere Banane in Rodrigues and at the National Federation of Young Farmers in Mauritius. The experiences gained in these projects can easily be transferred to people wishing to compost pig wastes.

Drum composter



Cost of composter:

The approximate cost of the composter will be around Rs 1400 as detailed below.

	Rs
Drum	300
Pipes	200
Labour (contracted)	700
Others	200
Total	Rs 1400

Annex(VII)

Passively Aerated Composting of Straw -Rich Pig Manure: Effect of Compost Bed Porosity

**Adrie Veeken, Vinnie de Wilde and Bert Hamelers
Department of Environmental Technology, Wageningen
University, Wageningen, The Netherland.**

Straw rich manure from organic pig farming system can be composted in passively aerated systems as the high application of straw results in a compost bed with good structure and porosity. The passively aerated composting process was simulated in one- dimensional reactors of 2 m³ for straw-rich manure with compost bed densities of 1100,700 and 560 kg per m³. Temperature profiles over the reactor was monitored online and ammonia emissions were measured periodically. The composition of the compost over the reactor head was determined at the end of the composting process. The composting process strongly depends on the density of the compost bed. At a density of 1100 kg per m³, the porosity of the bed is too low to initiate natural convection, and aerobic degradation fails and anaerobic conditions may lead to emissions of methane and odorous compounds. At a density of 560 kg per m³, the porosity of the bed is high and the high rate of natural convection will keep the temperature low thereby preventing the removal of pathogens and weeds. Best results were observed at a density of 700 kg per m³ for which aerobic degradation and drying were adequate and temperatures were high enough to kill pathogens and weeds. On basis of the Ergun equation, which describes the airflow in porous media with internal heat generation, this corresponds to a compost bed permeability of 7 x 10 m². It was also shown that it is possible to compost animal manures with a low C:N ratio without significant emissions of ammonia. This can be established by trapping the initial ammonia emissions in a straw filter, which is placed on top of the compost bed. Ammonia absorbed in the straw filter and in the compost bed were removed by nitrification and denitrification. The passively aerated composting system results in a compost bed which is highly heterogeneous with respect to temperature, oxygen level and its composition. It is proposed that in this way a highly diverse microbial community in the compost bed is established which can perform various microbial conversions. The extensive composting system is most promising for on farm production of an organic fertilizer from straw rich manure, since the cost of the process and the levels of ammonia emissions are low.

Annex(VIII)

COST OF PRODUCTION OF ONE WEANER PIGLET

Calculation is based on the following Assumptions:

1. A 20-sow unit is considered
2. Each sow will farrow 2 times a year (mise-bas) giving 2 litters/year
20sows-- 20 x 2 litters/year
3. No. of piglets per litter= 8 weaned piglets/litter
NB Piglet is normally weaned at 56-60 days (weaning-- severage)
4. FEED CONSUMPTION
1 sow-- 1400 kg sow feed / year
1 boar-- 1400 kg boar feed/year
1 litter 200 kg creep feed/year (i.e 8 piglets)
Boar : sow ratio---- 1:20(i.e 1 boar is needed to breed the 20 sow)

5. FEED COSTS:

		Rs
Sows---	20 x 1400 x Rs 5.80/kg--	162,400.00
Boar---	1 x 1400 x Rs 5.80/kg	8,120.00
Piglets	40 x 200 x Rs 6.50kg	52,000.00
		<u>Rs 222,520.00</u>

6. LABOUR MANAGEMENT

one manager	Rs10000.00 x 13months
one stockman	Rs 5000.00 x 13 months
	Total <u>Rs 195000.00</u>

7. Electricity + water: Rs 600 x 12months Rs 8000.00

8. Drugs etc. Rs 10000.00

9. Calculated costs in building and equipment Rs 20000.00

TOTAL COST Rs 455520.00

10. Salvage value of 8 culled sows/ year: Rs 4000 x 8 Rs 32000.00

(i.e 8 sows are culled /year because unfit for reproduction)

ESTIMATED COST OF PRODUCTION OF ONE WEANER PIGLET=

455520- (32000/20 x 2 x 8) = 423520 = Rs 1323.50

40x8

Annex(IX)

ESTIMATED COST OF PRODUCTION FOR ONE FATTENED PIG

ASSUMPTION

Starting weight:	15kg
Finishing weight:	90kg
Average daily gain:	416 g
Fattening period:	6 months
Mortality rate:	4%
Feed concentrate requirements:	
100kg started feed @ Rs 6.20/kg (or Rs 4.70/kg at subsidised rate)	
200 kg grower feed @ Rs 5.80 /kg (or Rs 4.30/kg at subsidised rate)	

FEED COST: Rs 1,780.00(or 1,330.00 at subsidised rate)

	Per head
COST OF PIGLET :	Rs 1,000.00
LABOUR & MANAGEMENT	Rs 300.00
ELECTRICITY AND WATER	Rs 100.00
DRUGS	Rs 50.00
TRANSPORT:	Rs 50.00
CALCULATED COSTS	Rs 200.00

(i.e depreciation, interest and maintenance costs on building and equipment)

ESTIMATED COST OF PRODUCTION OF ONE PIG:

i.e without feed subsidy	Rs 3,480.00
i.e with feed subsidy	Rs 3,030.00

ESTIMATED REVENUE (assuming 4% mortality rate)

i.e at Rs 40.00/kg liveweight = $0.96 \times 90 \text{ kg} \times \text{Rs } 40.00/\text{kg} = \text{Rs } 3,456.00$

or at Rs 30.00/kg liveweight = $0.96 \times 90 \text{ kg} \times \text{Rs } 30.00/\text{kg} = \text{Rs } 2,592.00$

Annex(X)

COMPARATIVE COSTS/BENEFITS OF DIFFERENT SCENARIOS

ITEMS 2 x 3000 PIGS/year	ONE PEN X 3000 PIGS in one area	2(5 PENS X 300) PIGS in 2 areas	6(2 PENS X 250) PIGS in 6 areas	4 Individuals x 50 PIGS in 15 areas	2 Individuals x 50 PIGS in 30 areas (Partially Integrated)	1 Individual x 50 PIGS in 60 areas (Integrated Farming)
Digester-Settling tank- Oxidation basin -Channels	8 such Treatment Plants for ONE big building	2x5 such Plants in 2 separate areas	6x4 such Plants in 6 separate areas	15x2 such Plants in 15separate areas	30xone such Plant, each with 2 ponds x 3000m ²	60xone such Plant, each with 2 ponds x 3000m ²
Capital Investment for Constructions (LOAN)	22 540 000 From TABLES	22 430 000	23 970 000	25 062 000	43 062 000	74 562 000
Repayment/half-year (10% int./20 years)	1 323 107 (on 3000 pigs)	1306 859	1 407 040	1 460 359	2 529 000	4 377 000
Debt Servicing/PIG	1323 107/3 000= 441	436	469	487	843	1 459
Total Production Costs/year	11 523 000 From TABLES	11 508 000	11 607 000	11 661 000	12 729 000	14 577 000
Production Costs/Pig(90kg in 6 months)	11 523 000/3000= 3841	3836	3869	3887	4243	4859
a. <u>Income/pig@40/kg</u>	a.3600	a. 3600	a. 3600	a. 3600	a. 3600	a. 3600
b. <u>Income/pig@50/kg</u>	b. 4500	b.4500	b 4500	b. 4500	b. 4500	b. 4500
LOSS/pig	-241a	-236a	-269a	-267a		
PROFIT/LOSS/pig	4500-3841=... +659b	+664b	+631b	+631b	-643a +257b	-1259a -359b
Additional Capital Investments	None	None	None	None	18 000 000 (for 60 ponds)	36 000 000 (for 120 ponds)
Biogas energy savings	{6000	{6000	6000	6000	{6000	{6000
Fish-feed formulation	{9000	{9000	9000	9000	{90000	{180000
Crop-feed formulation	24000x16- =384000 {6000	24000x20- =480000 {6000	6000	6000	171000x- { 30=5130000 {60000	336000 x -{ 60=20160000 {120000
Scavenging Ducks	<u>{3000</u>	<u>{3000</u>	<u>3000</u>	<u>3000</u>	<u>{15000</u>	<u>{ 30000</u>
Additional Benefits	(16 T. Plants) 384000	(20) 480000	(24) 576.000	(30) 720.000	(30) 5130000	(60) 20160000
Benefits/PIG	384000/6000 = 64	80	96	120	855	3 360
Total Income/PIG	4500+ 32 = 4564	4580	4596	4620	5355	7 860
PROFIT per PIG	@ R50/kg = 723	4580 - 3836 = 744	727	733	1112	7 860 - 4859 = 3001
% of Production	723/3841 = 19%	744/3836 = 19%	727/3869 = 19%	733/3887 = 19%	1112/4243 = 26%	3001/4859 = 62%
% of CAP.Debt SV	723/441 = 164%	704/436 = 171%	727/469 = 156%	733/487 = 151%	1112/843 = 132%	3001/1459 = 205%

Profits can also be increased with Mushroom, Earthworms, Shellfish, Flowers, Fruits (strawberry), which have already been produced in the IFS.

ANNEX (XIII)
EXISTING LEGISLATIONS ON PIG FARMING IN MAURITIUS

Existing & Proposed Legislation	Type of Provision	Section	Details of Provisions	Enforcing Agency	Offence/ Penalties	Recommendation of Policy Paper
Pig Regulations 1921 & 1927	<ul style="list-style-type: none"> • General Housing conditions & husbandry practices • Enforcement 	Section 193 1 (19) PART XV		Sanitary Authority	Subsection 9	As at Annex V of National Policy paper on pig farming
Environment Protection Act 1991	<ul style="list-style-type: none"> • Environment Impact Assessment (EIA) • National Environment Standards • Enforcement 	Part IV Section 13 First Schedule Section 2 Section 34, Part VI, 35, 38, 40 Part X Section 57 Section 58 Section 59 Fourth Schedule Section 64 Section 66	Pig farming at Commercial/ industrial level is an undertaking requiring an EIA Issue of Notices Programme Approval Enforcement Prohibition Enforcing Agencies and parameters, to be enforced odour, air, water, solid wastes, effluents Power of entry Compliance monitoring	Fourth Schedule Environment Public Utilities Health Local Government Local Authorities	Section 67	Definition of Scale of Activity: 1 pig as a pet 2 to 19 pigs as small scale production 20-99 pigs as medium scale production 100 and above 100 pigs as industrial scale production Pig farmers shall be grouped in co-operatives and operate at an industrial scale after obtention of an EIA licence Any person who wants to keep one pig as pet shall obtain a health clearance.

Existing & Proposed Legislation	Type of Provision	Section	Details of Provisions	Enforcing Agency	Offence/ Penalties	Recommendation of Policy Paper
Trade & Classification Act, 1954	<ul style="list-style-type: none"> Licence for classified trade Enforcement 	Section 4(1) Schedule Class III Section 11	<ul style="list-style-type: none"> No person shall carry on any classified trade unless he is a holder of a licence Pigsties and piggeries is listed in the schedule of business Right of entry & control 	Local Authority M/Agriculture Environment M/Health Prosecution of Offence by M/Health Local Authority	Section 12, 15, 16	
	<ul style="list-style-type: none"> Siting of pigsty from a river, canal, stacking of manure dung or solid wastes from a river 	Section 26(1) 26(2) Section 70 Section 87(1)	<ul style="list-style-type: none"> No pigsty shall be erected within 100 feet of any river or stream, canal Where a pigsty or any quantity of manure, dung to accumulation of any kind, appears to the Supreme Court to be so situated that any water or matter from there can defile any river or stream, the occupier of the premises shall remove the water or matter or make arrangements to the satisfaction of the enforcing agency/ Supreme Court for preventing the defiling. Prevention of canals from defiling Throwing of dirty waters in river or canal that may pollute the water of such river or canal 	Ministry of Health	Section 26(3) Section 69(1) Section 69(3)	Pig farm shall be at a minimum distance from any water course as prescribed in existing legislations.

Waste Water Authority Act 1996	<ul style="list-style-type: none"> Treatment and Disposal of <u>effluent</u> <p>Definition: include contaminated water from other activities</p> <ul style="list-style-type: none"> Enforcement 	<p>Section 5 (1)(a) (b) (c) (2)(a)</p> <p>Section 6</p>	<p>Restriction on free disposal of effluent & water</p> <p>Notice of injurious effluent</p>	M/Public Utilities	19	<p>Waste water from the farm shall be treated and disposed of by the Integrated farming system(IFS)</p> <p>The effluent shall comply with standards for discharge. Existing farms shall comply to part of the IFS with a reduction of 90% BOD. The BOD shall not exceed 30 mg/l before release in the environment.</p>
Central Water Authority Act, 1971	<ul style="list-style-type: none"> Control, development and conservation of water resources 	<p>Part VIII 46A</p>	<p>Discharge of polluted water</p>		<p>46 A(2) 49 A</p>	<p>Pig farm shall be confined outside the caldera as on the map on annex II, river basins upstream of points of rivers at which water for potable water supply is abstracted. No pig farms shall be allowed within 200m of any borehole meant for potable water supply as decided by the Ministry responsible for the subject of water.</p>
Ground Water Act 1970	<ul style="list-style-type: none"> Prohibition of pollution To suspend or revoke licence 	<p>4, (1)(a)</p> <p>4, 2(b)</p>	<p>As per circulated document</p>	M/Public Utilities	Section 4(2)	<p>No pig farm shall be allowed within 200m from any borehole used for potable water</p>

						supply.
Police Act 1974	to enforce laws and order in relation to all activities	Section (9) (1) (c), (g)	<ul style="list-style-type: none"> Apprehending persons who have committed, or who are reasonably suspected of having committed offences. Assisting in implementing health, quarantine, customs and excise laws 	Police	Section 24	Enforcement by a comprehensive consolidated legislation
Forests and Reserves Act 1983	Protection of River reserve and conservation zone	Section (14) c	<ul style="list-style-type: none"> No person shall, without the written authority of the authorised officer build any structure on a mountain reserve or river reserve 	M/Agriculture, Fisheries and Natural Resources	14(2), 15	Pig farms shall be located outside Caldera and located at a minimum distance of 500m from the nearest limits of permitted development as defined in the approved outline schemes of the District Council Areas
Public Health Act (Draft) 1995)	<ul style="list-style-type: none"> Trade licence General housing conditions and husbandry practices 	Section 3 – 19	As per circulated document	Ministry of Health	Section 20	Annex V of National Policy paper on pig farming
Town & Country Planning Act, 1954	Development Permit to develop land	Section 7 Section 3	Where application is made to a local authority for permission to develop land, the local authority may grant permission either unconditionally or subject to such conditions as it thinks fit or may refuse permission	Local Authority	Section (8)	Pig farms shall be located at a minimum distance of 500m from the nearest limits of permitted development as defined in the approved outline schemes of the District Council Areas

Legislation	Offence	Types of Offences	Penalties on first Conviction	Penalties on second Conviction
PHA	Section 20	Failure to comply with General Housing Conditions and husbandry practices	Fine less than Rs 1000 Imprisonment less than 3 months	
River and Canal Act 1863	Section 26(1) 69(1) 69(3)	Failure to comply with control of activities near rivers, i.e. impairing quality of water	Be liable to a fine not exceeding 500 rupees for breach of section 26(1) and 200 rupees for breach of 69(1) For breach of Section 87(1), fine not exceeding Rs 1,000	
EPA		Failure to comply with a requirement or order or submission of false report/ information	Fine less than Rs 5000 Imprisonment less than 2 years	Fine less than Rs 10000 Imprisonment less than 8 years
EPA		Non compliance to notices and unlicensed activity under EPA	Rs 1000 < fine < Rs 25000 Imprisonment less than 4 years	Rs 50000 < fine < Rs 25000 Imprisonment not less than 6 years and not more than 12 years
Pig Regulations	Subsection 9		Fine not exceeding Rs 1000 and imprisonment not exceeding 6 months	
Town & Country Planning Act	Section 8		Breach of any condition attached to any such permit be liable to a fine not to a exceeding 1000 rupees	
	Section 12, 15, 16		Any person who carries on a classified trade without having a licence shall commit an offence and be liable to a fine not exceeding 500 rupees and imprisonment not exceeding 6 months	Fine not exceeding 1,000 rupees and imprisonment not exceeding 1 year.
Ground Water Act 1970	Section 4(2)		Be liable to a fine of not less than 250,000 rupees and to imprisonment for a term not exceeding 2 years.	On a second or subsequent conviction, to a fine of not less than 500,000 rupees together with imprisonment for a term of not less than 2 years.

ANNEX (XIV)

THE PUBLIC HEALTH ACT

Regulations made by the Minister under section 193 of the Public Health Act

1. These regulations may be cited as the Pig Rearing Regulations 2001.
2. In these regulations –
 - ‘Environment Impact Assessment Licence’ has the same meaning as given under the Environment Protection Act.
 - ‘Industrial basis’ means the rearing of more than 100 pigs at any one time in a piggery in a zone in respect of which a development permit by a local authority has been issued to authorise pig breeding;
 - ‘Permanent Secretary’ means the Permanent Secretary of the Ministry of Health and Quality of Life;
 - ‘Pig’ includes hog, piglet, sow, swine and boar;
 - ‘Piggery’ means a pig rearing farm and includes the pig sty, buildings, sheds and other structures found on the farm;
 - ‘Pigsty’ means an enclosure for the rearing of pigs in conformity with the requirements laid down in the First Schedule.
3. (1) No person shall rear pigs unless –
 - (a) the rearing of pigs is carried out on an industrial basis; and
 - (b) he is the holder of a permit issued by the Sanitary Authority.

(2) Any person who contravenes sub-regulation (1) shall commit an offence.
4. An application for a permit to rear pigs shall be made on a form to be approved by the Sanitary Authority and shall be submitted together with -

- (a) a detailed plan of the pigsty;
 - (b) documentary evidence that the treatment of all liquid wastes will be effected in compliance with the standards laid down in the Second Schedule;
 - © an Environment Impact Assessment Licence;
 - (d) a Development Permit issued by the appropriate Local Authority;
 - and
 - (e) any other document the Sanitary Authority may require to process the application.
5. (1) The Sanitary Authority shall issue a yearly permit to the applicant on being satisfied that the applicant has fulfilled the requirements under paragraph 4 of these regulations.
- (2) The Sanitary Authority shall issue the permit in the form specified in the Second Schedule and may attach terms and conditions it deems appropriate on issuing the permit but not in a manner inconsistent with the provisions of these regulations.
- (3) The Sanitary Authority shall renew the permit where it is satisfied that the applicant continues to meet the requirements for the issue of the permit.
- (4) An application for the renewal of the permit shall be made in writing on a form to the approved by the Authority.
6. The Sanitary Authority shall withdraw the permit issued to a permit holder where it is satisfied that the permit holder has failed to comply with any of the terms or conditions mentioned in the permit.
7. Any person aggrieved by the refusal of the Sanitary Authority to issue or renew a yearly permit may appeal within one month of such refusal to the Permanent Secretary.
8. The permit holder or the person in control of a piggery shall ensure that -
- (a) the disposal of pig dung is effected at least once daily;
 - (b) the pigs are kept in a clean, dry and disinfected sty;
 - (c) the feeding utensils are washed and cleaned regularly;

- (d) all animal feed containers once emptied are disposed of promptly;
 - (e) an average of 10 litres of water per pig is available daily to meet the requirements of the piggery;
 - (f) an isolated section is provided within the compounds of the piggery to isolate sick animals;
 - (g) rodent control is carried out every fortnight;
 - (h) animal feed is not cooked by using rubber, plastics or other similar materials;
 - (i) proper storage facilities are provided for animal feed;
 - (j) the store provided for animal feed is used solely for that purpose and shall be kept clean at all times;
 - (k) no pig slaughter is carried out at the piggery;
 - (l) a proper record of all the employees is kept and produced to the Sanitary Authority officer on demand;
 - (m) a refrigerator is available to store medicines; and
 - (n) the piggery is kept clean and tidy, and free from any nuisance.
9. (1) The employees of the piggery shall be provided with –
- (a) toilet and bath facilities and such other facilities as are necessary to enable them to keep and maintain bodily cleanliness; and
 - (b) protective equipments which shall include overalls, gloves, boots and caps.
10. The permit holder shall ensure that there exists on the premises of the piggery sufficient office space to be used by a veterinary surgeon.
11. The Sanitary Authority shall forthwith order the closing down of a piggery where -
- (a) the piggery is being operated without a permit
 - (b) *the piggery constitutes a persistent environmental nuisance*

- (c) the piggery constitutes an imminent health hazard;
 - (d) the pigs have been certified by the Principal Veterinary Officer of the Ministry of Agriculture as constituting an imminent health hazard.
12. (a) Where the Sanitary Authority decides to close down a piggery for breach of any of the conditions specified under paragraph 11, the Authority shall serve on the permit holder a closing down notice in the form specified in the Fourth Schedule;
- (b) Where a closing order has been served, the permit holder may be given a reasonable period to dispose of all the pigs belonging to the piggery, *failing which a Court order shall be sought for disposal of the animals by alternative means including public sale, the proceeds of which shall be retained by Government*
 - (c) The disposal of the pigs following an order issued by the Sanitary Authority shall be made under the supervision of a veterinary officer.
 - (d) The Chief Veterinary Officer shall order that the pigs be put to sleep immediately if he is of the opinion that there is no other course of action in view of the health hazard that the pigs represent.
 - (e) The Commissioner of Police shall provide necessary assistance to the Sanitary Authority where requested for the execution of a closing order.
13. (1) The Sanitary Authority or the Principal Veterinary Officer may at all reasonable times enter a piggery for the purpose of ascertaining whether there is or there has been on the premises any contravention of these Regulations.
- (2) the Sanitary Authority or any person authorised by it may in the discharge of its duty under the sub-paragraph (1) take -
- (a) a blood, tissue, urine or other biological sample or specimen from any pig that belongs to the piggery; and
 - (b) documents or records in relation to the state of health of the pigs.
14. Any person who -
- (a) fails to comply with any provision of these regulations;

- (b) obstructs, impedes, molests, assaults or interferes with an officer acting under the authority of the sanitary authority in the course of his duty to enforce these regulations;
 - (c) knowingly makes any false or misleading statement, either verbally or in writing to any authorized officer;
 - (d) fails to comply with a closing order issued under these regulations shall commit an offence.
15. Any person who commits an offence shall -
- (a) on first conviction be liable to a fine not exceeding 5,000 rupees and to imprisonment not exceeding 3 months;
 - (b) on second and subsequent convictions be liable to a fine not exceeding 10,000 rupees and to imprisonment for a term not exceeding 8 months.
16. Pigs Regulations 1921 and 1927 are repealed.
17. These regulations shall come into force on

Made by the Minister of on
.....

FIRST SCHEDULE

(regulation 2)

Part I

1. The piggery shall -
 - (a) have an enclosure of at least two metres high along the road alignment.
 - (b) have all its doors, windows and other openings fitted with strong flyproof wire gauze;
 - © have a suitable water storage tank at a convenient place on its premises to meet the daily requirements of the piggery;
 - (d) be situated at a distance of 200 metres from any borehole used for potable water;
 - (e) have all solid wastes disposed of in a manner approved by the Sanitary Authority;
 - (f) have all infrastructure in relation to the waste treatment plant situated inside the piggery at a distance of at least 16 metres from the boundary line of the piggery.

Part II

1. The sty shall be of such an area allowing one metre square of floor space per adult animal and 0.5 metre square floor space per piglet.
2. The external doors of the pig sty shall be fitted with self-closing device and made to open from outside.
3. The walls of the sty shall be -
 - (a) made of concrete blocks or reinforced concrete;
 - (b) plastered internally with cement mortar, finished with smooth surface;
 - (c) painted at least once yearly and at such other time, as the Sanitary Authority may order; and
 - (d) of a height not less than two metres from the floor level to the top of the wall;

4. The roof of the sty shall be of incombustible and impermeable material;
5. The floor shall be made -
 - (a) of concrete with a non-slippery surface which can be easily washed; and
 - (b) sloped to a half round channel running all along the walls, with a fall towards a properly trapped gully, fitted with a grid top, located outside the sty;
6. All corners of the sty shall be rounded off with cement.

SECOND SCHEDULE

(regulation 4 (b))

GUIDELINES FOR WASTE DISPOSAL

The waste shall be treated as flows –

Phase I

Anaerobic treatment of waste through digester and sedimentation tank. The raw waste together with the washing effluent from the pigsties is collected in a digester where anaerobic digestion will take place. A 60% reduction in BOD (Biochemical Oxygen Demand) is achieved. Biogas is generated and can be collected for use as cooking gas or electricity generation. There is overflow of the supernatant liquid from the digester to a sedimentation tank where there is further separation of the solid from the liquid.

The sludge from the sedimentation tank should be removed on a regular basis (once a month) and can be used as a soil conditioner.

Phase II

Aerobic Treatment

From the sedimentation tank, the liquid then flows into one or more shallow basins containing aquatic plants. Aerobic treatment takes place and free oxygen is produced by photosynthesis. A further 30% BOD reduction is achieved.

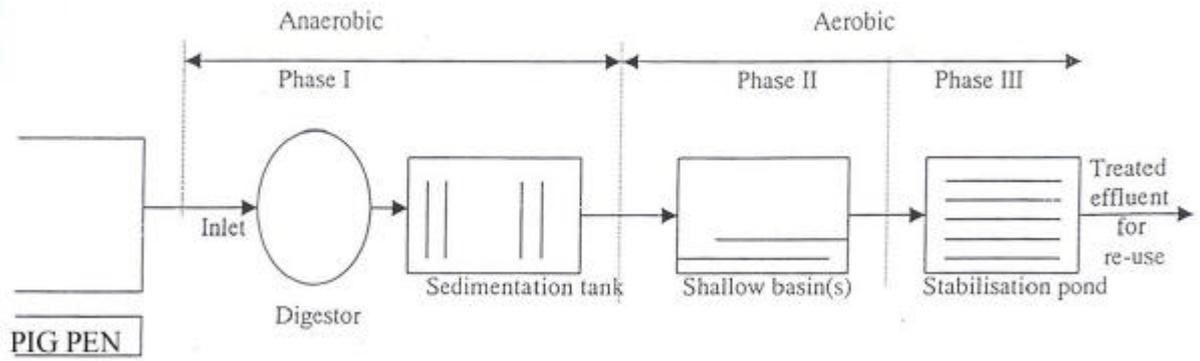
The final effluent shall comply with standards for discharge as recommended by the Ministry of Environment.

The effluent may be further treated by a third phase.

Phase III

Further treatment may be undertaken with the flow of the liquid into a stabilisation pond where plankton/fish may be cultivated for use as pig feed.

Flow Chart for Treatment of Liquid Waste



THIRD SCHEDULE
(regulation 5 (2))

PERMIT TO REAR PIGS

..... of

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is authorised to rearpigs on an industrial basis as

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..... in the District of

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on condition that –

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Sanitary Authority

* Delete as appropriate

**FOURTH SCHEDULE
(regulation)**

CLOSING ORDER

To:.....

.....

It has been found that you are operating a piggery at

.....

.....

...*

without being holder of a permit issued under regulations 4 or / and that the said piggery constitute an imminent hazard to health.

You are hereby ordered to dispose of all your animals within a delay of one month and
close down the said pigsty.

Date:

.....

Sanitary Authority

*Delete as appropriate

08.04.02

ANNEX (XV)

Comments on new draft pig breeding Regulations 2001

Provisions	Details	Findings
1. Scale, 3(a)	<ul style="list-style-type: none"> ▪ No persons shall rear pig unless it is on an industrial Scale 	<ul style="list-style-type: none"> ▪ No mention for small scale pig activity
2. Location		<ul style="list-style-type: none"> ▪ No mention of location of pigsties from the limits of permitted development
2. Permits, 3(b)	<ul style="list-style-type: none"> ▪ No person shall rear pig unless he is a holder of a permit from the Sanitary Authority as in the Third Schedule ▪ An application for a permit should be made on a form to be approved by the sanitary authority and shall be submitted together with (a) A detailed plan of the pig sty (b) Documentary evidence that the treatment of all liquid wastes shall be in compliance to the second Schedule © An EIA licence (d) A Development Permit from the appropriate local authority (e) Any other document required by the sanitary authority ▪ The sanitary authority shall issue a yearly permit to the applicant based on compliance to provisions of this legislation 	<ul style="list-style-type: none"> ▪ The application form should be included as a schedule ▪ The renewal form of the permit should also be included
3. Husbandry practices, (8a-n)	<ul style="list-style-type: none"> ▪ As in enclosed draft 	<p>Section 8 shall include:</p> <ul style="list-style-type: none"> ▪ Disposal of dead animals and carcasses ▪ Canalisation and treatment of liquid waste ▪ Visual impacts/screening of site and environment enhancement
4. Closing Order, (11)	<ul style="list-style-type: none"> ▪ Breach of any conditions to the regulation, (11) ▪ The Com. of Police shall assist the S. Authority for the execution of the closing order 	<p>Section 11 shall include:</p> <ul style="list-style-type: none"> ▪ the persistence of environment nuisances /unhygienic conditions ▪ disposal of

		animals by public sale in case of non-compliance of the closing order
5. Power of Entry	<ul style="list-style-type: none"> ▪ Sanitary Officer or any authorised officer 	
6. Offence	<ul style="list-style-type: none"> ▪ Fails to complied to Section (3), (14) 	
7. Power to Prosecute		<ul style="list-style-type: none"> ▪ No provision made
8. Pigsty infrastructure, First Schedule, Part II		<ul style="list-style-type: none"> ▪ Housing designs with drawing should also be given.

Annex (XVII)

List of stakeholders met and sites visited (Rodrigues):

ORGANISATION/ DEPARTMENT	PERSONS MET	FUNCTION OCCUPIED
Central Administration	Mr. J.C. Pierre Louis	Island Secretary
Environment	Mr. T. Genave	Environment Officer
Health and Sanitary	Mr. D. Gooljar	Health Inspector
Agriculture	Mr. Tolbize Miss. Alass Mr. Ramjee	Senior Agricultural Officer Research & Development Officer Veterinary Officer
Baie Topaze L.P.U*	Mr. R.Tolbize	Senior Technical Officer
St. Gabriel L.P.U	Mr. D. Ravanne	Senior Technical Assistant
Frere Remy School	Mrs. V. St . Pierre Mrs. M.C. Tolbize	Instructor Senior Instructor
FACER**	Mr.Jean Louis	Secretary
Cooperative	Mr. Prudence	Senior Cooperative Officer
Water Division	Mr. D. Hee Hong Wye	Resident Engineer
Planning Office	Mr. M. Jeetoo	Planing Officer

* Livestock Production Unit

** Federation des Association Cooperatives d'eleveurs Rodrigais

Other stakeholders met: Peermamode, Mootien and Dundee (Breeders), S.Clair (M.L.A) and B. Jolicoeur.

Site visits: (1) Baie Topaze L.P.U, (2) St. Gabriel L.P.U, (3) Fond La Bonte School and IFS Project, (5) Port Mathurin Slaughter House, (6) FACER-Citronelle.

Annex (XVIII)

ESTIMATED COST OF PRODUCTION FOR ONE FATTENED PIG (Rodrigues)

ASSUMPTION

Starting weight:	15 kg
Finishing weight:	90 kg
Average daily gain:	416 g
Fattening period:	6 months
Mortality rate:	4%
Feed concentrate requirements:	
100 kg starter feed @ Rs329/50kg (or Rs 215 / 50 kg at subsidized rate)	
200 kg grower feed @ Rs 329/50 kg (or Rs215/50kg at subsidized rate)	

FEED COST: Rs 1,974.00 (or 1,290.00 at subsidised rate)

	Per head	
COST OF PIGLET :	Rs	500.00
ELECTRICITY AND WATER:	Rs	100.00
DRUGS:	Rs	50.00
TRANSPORT:	Rs	50.00

ESTIMATED COST OF PRODUCTION OF ONE PIG:

i.e without feed subsidy	Rs 2674.00
i.e with feed subsidy	Rs 1990.00

ESTIMATED REVENUE (assuming 4% mortality rate)

At Rs 30.00/kg liveweight = $0.96 \times 90 \text{ kg} \times \text{Rs } 30.00/\text{kg} = \text{Rs } 2592.00$
Or Rs 34.00/kg = $0.96 \times 90\text{kg} \times 34 = \text{Rs } 2937.60$

Annex (XIX)

Methodology of survey carried out in Rodrigues

Since the majority of the Rodriguan population is involved with pig farming, a complete survey would have been onerous and time consuming. In this context, a sample survey was conducted by the Department of Agriculture through a questionnaire.

The sampling was based on a subdivision of the island into seven geographical areas. One officer from the department was assigned to each geographical zone for on site interview of pig farmers and for an assessment of environmental and sanitary conditions. All the officers were properly briefed on the filling of the questionnaires with a view to standardising the survey, particularly, with respect to the subjective elements of the questionnaire. For each geographical region the interviewees were selected so as to be representative of all the categories of farmers.