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AGRICULTURAL RESEARCH IN SURINAME

Guillermo Villanueva

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ABBREVIATIONS

LVV	-	Ministry of Agriculture, Animal Husbandry and Fisheries
CELOS	-	Center of Agricultural Research in Suriname
STIPRIS	-	Foundation for Experimental Gardens in Suriname
POR	-	Practical Research Project on rice
SLM	-	Foundation for the Development of Mechanized Agriculture in Suriname
SEL	-	Foundation for Experimental Farms
SLOC	-	Foundation for Agricultural Development Plan for Commewijne

1. INTRODUCTION

The purpose of this report is to study the past and the current situation of the Agricultural Research Service in Suriname in order to provide the National Authorities with the tools for the formulation of policies and strategies at medium and long terms levels. It has been carried out as an activity of the project entitled "Improving the Agricultural Research and Extension System" of the Ministry of Agriculture, Animal Husbandry and Fisheries. A preliminary draft report was presented to the National Authorities in November 1984.

Given the importance of the human resources in the process of Generation and Transfer of Technology and for the Development of the National Economy, this study has focussed the changes occurred in a period of twenty eight (28) years and the effects of these changes in other participant resources of the research service.

The present report was prepared following the methodology recommended by E. Trigo, M. Piñeiro and J. Ardilla, in their book "ORGANIZACION DE LA INVESTIGACION AGROPECUARIA EN AMERICA LATINA".

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2. HISTORICAL BACKGROUND OF AGRICULTURAL RESEARCH IN SURINAME

During the first 45 years of its existency , the Experiment Station usually had a staff of 3 or 4 academically trained personnel, sometimes less, who had to perform many tasks in botany, zoology and related fields. Scientific expeditions to the interior sometimes kept them away from the Experiment Station during periods of several sucessive months.

There were few experimental fields, apart from collections, and experiments generally had to be carried out in commercial plantations. Little attention was paid to small farmers and their problems.

Period 1901/1902. Dr. F.A.F.C. Went, Professor of botany in Utrecht visited Suriname and advised the creation of a research service to give scientific advice to growers in plantation crops: coffee, cacao, coconut.

Period 1903/1909. December 4, 1903, is marked as the starting point of agricultural research in Suriname. Dr. C.C.J. van Hall was appointed as Inspector of Agriculture in the West Indies, and at the same time Director of the Agricultural Experiment Station. Also started to do research activities in the field of Soil Science, Agronomy and Plant Protection of cocoa, sugar cane, cotton, corn, rice, peanuts and other legumes, banana, citrus, coconut, spices, sorghum, tuber crops. These research activities were carried out for crops adaptation to Suriname conditions, and to control diseases.

Period 1910/1925. The Agricultural Experiment Station became an independent department of the Ministry of Agriculture in 1919. In 1925 acquired its own administrative section. In this stage the Agricultural Experiment Station started with research activities in the field in different crops.

Period 1926/1947. The Agricultural Experiment Station continue to do research in the field of soil science, entomologic, plant protection and agronomy in plantation and annual crops.

Period 1948/1953. During this period the research activities covered the crops like cocoa, coffee, citrus, cereals, and started with the field postures.

In 1949, a reorganization of the whole administration with regard to agriculture took place. The fusion of the departments of Agricultural Experiment Station and Economic Affairs resulted into the present Ministry of Agriculture, Animal Husbandry and Fisheries.

By 1963, the staff consisted of 10 technicians which have received their M.S. or higher university level and 21 with degrees at intermediate level. The Station was organized into 6 divisions:

a) soil science
b) crops
c) diseases and pests
d) plant protection
e) technology
f) nurseries and experimental fields

Period 1954/1978. During this period the Agricultural Experiment Station started to work with soil physic and hydrologic, food technology and nematologic, in several crops.
Several Experiment Stations started:

1) La Poule, 1954, with cacao, coffee, rubber.
2) Oryza, 1958, rice.
3) Brokobaka, 1959, citrus, coffee, cacao, coconut, rubber, oil palm.
4) Santo, 1961, fruits, banana.
5) Boma, 1964, fruits.

At the present the Agricultural Experiment Station is the oldest institute of research in Suriname but not the only one. Within the Ministry of Agriculture, the Divisions of Animal Husbandry and of Fisheries carry out their own programs. In the Ministry of Development there are Soil Survey Service and the Bureau of Rural Development.

On the other hand there are some foundations which carry out investigations, among those can be mentioned the Foundation for Mechanized Agriculture and the Foundation for Experimental Farms.

Technical Organization

It is remarkable that the administrative reorganizations within the Ministry of Agriculture have had little influence on the steady scientific progress of the Agricultural Experiment Station. There had been a horizontal growth (numbers of departments) as well as a vertical growth (staffing the departments). The horizontal growth was mainly concerned with the increase in the assortment of crops, whereas the vertical growth was especially evident in the attendant disciplines, i.e. Soil Science and Plant Diseases. The complexity of the many problems that had to be studied entailed, moreover, a process of differentiation and specialization within the departments covering the two mentioned disciplines. Whereas one expert in general plant diseases sufficed in 1910, in 1918 two researchers applied themselves to study diseases and plagues of agricultural and horticultural crops. The quantative progress of the plant disease section has been even greater, between 1914 and 1948, since Prof. Dr. Gerold Stahel, an expert in various plant diseases, has been with the Agricultural Experiment Station during that period.

After this time a necessary specialization took place, which was reflected in the establishment of a section to deal with the aspects of Mycology and Bacteriology.

When the Hoja Blanca, white leaf disease broke out in various rice-cultivating countries of South and Central America, virological research was started at the Agricultural Experiment Station. In 1959 the virologist Dr. H.A. van Hoof was specially employed to do the necessary research.

Research on nematodes started in 1964 meant another extension in the field of looking for solutions to plant diseases. In addition to the named research sections, the Agricultural Experiment Station has two other services that keep contact with the producers and other types of public and carry out the process of diffusion of the experimental results, namely the Crop Protection and Planting Material Departments; and the Public Relations and Extension Department.

3. NATIONAL RESEARCH SYSTEM. DESCRIPTION AND COMPOSITION.

The generation and transfer of technology system of Suriname is led by the Agricultural Experiment Station under the Ministry of Agriculture, Animal Husbandry, Fisheries and Forestry and it is integrated by some parastatal institutions and State University. In table 1, can be observed the different institutions and their character or functioning scope.

Tables 2 and 3 show clearly the functions carried out by the different organisms which integrate the system of generation and transfer of technology. The Agricultural Experiment Station, as the leader institution, develops different aspects or areas of research while the rest carry out specific functions according to their own purposes.
CELOS, for example, is an appendix of the University of Suriname and is involved in basic, applied and complementary research, agricultural training and statistics. Some others are doing marketing and technical assistance besides the applied and basic research.

Looking at tables 4 and 5 it will be observed that the institutions which integrate the generation of technology system have specific functions as carrying out research, technical assistance and marketing for specific products. Examples of that situation are the parastatal institutions VICTORIA N.V., SEL, SURLAND, SML and the regional project POR which works in Oil Palm, Livestock, Banana. Rice is the main working area for the last two.

All the institutions, except SLOC, carry out their research activities in the Central and West regions of the country. (See tables 6, 7 and 8).

TABLE 1. Institutions that integrate the generation and transfer of technology national system (*). 1983

Characteristic / Institution	Publics		Universities		Mixed	Parastatal
	National	Regional	Publics	Privates		
Agricultural Experiment Station (LVV&B)	X					
Practical Research on Rice (POR)		X				
Center for Agricultural Research in Suriname (CELOS)				X		
Foundation for Experimental Gardens in Suriname (STIPRIS)						X
Foundation for the Development of Mechanized Agriculture in Suriname (SML)						X
Foundation for Experimental Farms (SEL)						X
Foundation for Agricultural Development Plan Commewijne (SLOC)						X
Surland						X
Victoria						X

Source: Own tabulation

(*) Explanation of the Table: X - Executing Institutions

TABLE 3. Functions or activities developed according to the national laws.

Institutions / Function	Agricultural Experiment Station (LVV&B)	CELOS	VICTORIA	SEL	SML	SURLAND	SLOC	POR	STIPRIS
1. Basic Research	X	X	X		X	X			
2. Applied Research	X	X	X	X	X	X	X	X	
3. Complementary Research	X	X		X					
4. Extension	X		X						
5. Technical assistance	X		X	X	X			X	
6. Training agriculture	X	X		X			X		
7. Marketing	X		X		X	X			
8. Statistics	X	X							
9. Plant and Animal Health	X								

Source: Own tabulation

TABLE 3. Functions or activities developed according to the national laws.

Institutions / Function	Agricultural Experiment Station (LVV&B)	CELOS	VICTORIA	SEL	SML	SURLAND	SLOC	POR	STIPRIS
1. Basic Research	X	X	X		X	X			
2. Applied Research	X	X	X	X	X	X	X	X	
3. Complementary Research	X	X		X					
4. Extension	X		X						
5. Technical assistance	X		X	X	X			X	
6. Training agriculture	X	X		X			X		
7. Marketing	X		X		X	X			
8. Statistics	X	X							
9. Plant and Animal Health	X								

Source: Own tabulation

TABLE 4. Functions or activities developed by the different institutions by products line of production (*)

Products \ Institutions	Agricultural Experiment Station (LVV&B)	POR	CELOS	STIPRIS	SML	SEL	SLOC	SURLAND	VICTORIA
1. Banana	2-8							1-2-7-9	
2. Cassava			2-6						
3. Citrus	1-2-8-9								
4. Coconut	1-2-8-9								
5. Cowpea	2-8		2-6						
6. Fish	1-2-8							1-2	
7. Forestry			2-3-6						
8. Livestock(**)	2-5-8-9					2-3-5-6			
9. Maize	2-3-4		2-6						
10. Mungo bean			2-6						
11. Oil palm	1-2-8-9								1-2-4-5-7-9
12. Other crops (***)			2-6						
13. Peanut	2-8-9		2-6						
14. Rice	2-3-5-8-9	2-5-8-9			1-2-5-6		2-6		
15. Sorghum and Millets	2-8-9		2-6						
16. Soybean			2-6						
17. Sweet potato			2-6						
18. Vegetables crops	2-8-9								

Source: Own tabulation

(*) The numbers corresponding to each activity according with table 2.

(**) Including beef, milk and pasture.

(***) Including crops for production of mulch and cover crops.

TABLE 5 . Ordinal matrix of the functions or activities developed by the different institutions dealing with production by products line. (*).

Institutions / Products	Agricultural Experiment Station (LVV&B)	CELOS	VICTORIA	SEL	SML	SURLAND	SLOC	POR	STIPRIS
Banana	2					1-2-7			
Cassava		2-6							
Citrus	1-2								
Coconut	1-2								
Cowpea	2	2-6							
Fish	1-2					1-2			
Forestry		1-2-3 6							
Livestock	2-5			2-3 5-6					
Maize	2	2-6							
Mungo bean		2-6							
Oil palm	1-2		1-2-4 5-7						
Other crops		2-6							
Peanut	2	2-6							
Rice	2-3-5				1-2 5-7		2-6	2-5	
Sorghum and Millets	2	2-6							
Soybean		2-6							
Sweet potato		2-6							
Vegetables crops	2								

Source: Own tabulation

(*) This matrix is build up for transposition of the columns of table 4, reordinal in decrease order the number of activities developed in each product line.

TABLE 6. Functions or activities developed by the different institutions, by regions (*)

Institutions / Regions	Agricultural Experiment Station (LVV&B)	University of Suriname	CELOS	POR	SEL	SML	SLOC	VICTORIA	SURLAND
West	1-2-3			2-5		1-2 5-7			1-2-7
Central	1-2-3 5		1-2-3 6		2-3 5-6			1-2-4 5-7	
East							2-6		

Source: Own tabulation

(*) Numbers corresponding to each activity are according to Table 2.

TABLE 7. Ordinal matrix of the functions or activities developed by the different institutions, by regions.

Institutions / Regions	Agricultural Experiment Station (LVV&B)	CELOS	VICTORIA	SEL	SML	SURLAND	SLOC	POR	STIPRIS
West	1-2-3				1-2 5-7	1-2-7		2-5	
Central	1-2-3 5	1-2-3 6	1-2-4 5-7	2-3 5-6					
East							2-6		

Source: Own tabulation

TABLE 8. Products in which each institution develops activities, by regions (*)

Institutions / Regions	Agricultural Experiment Station (LVV&B)	POR	CELOS	STIPRIS	SML	SEL	SLOC	SURLAND	VICTORIA
West	4-11-14	14	-	-	14	-		1-2-7	-
East							14		
Central	1-3-4-5 6-8-9-11 13-15-18	-	2-5-7 9-10-12 13-15 16-17	-	-	8		1	11

Source: Own tabulation

(*) The numbers corresponding to each product are according to Table 4.

4. HUMAN RESOURCES. ANALYSIS OF INVENTORY AND MOVEMENT OF PERSONNEL.

By 1958 the Experiment Station had 11 postgraduates at the M.S. level. In 1959 the first graduate at Ph.D. level joined the personnel of LVV&B Experiment Station. During the years after the quantity of graduate increased slowly reaching 25 in 1975. (See Table 9).

In 1976 the amount of graduate started decreasing up to a point that at the end of period, 1958 - 1983 the final personnel inventory went down from 11 M.S. to 8 and there was only 1 Ph.D.

Observing Table 10 and Figure 1 it is found out the average growth of the personnel final inventory for chosen period according with the behaviour of such inventory through the years 1960 - 1983. At the end of the period there was a negative growth index for the postgraduates categories. Only during the period 1971 and 1974 there was a consistent and significant growth.

Table 11 and Figure 2 show the departed and actual personnel of the Agricultural Experiment Station according to the specialization fields.

The number of departed personnel with postgraduate during the period 1958 - 1983 was 73 and the number of the actual personnel was 9.

It is important to notice that the most significant departures affected the fields of Horticulture with 24.1% of the total departures, Agronomy with 20.5% and Soil Science with 16.4%.

It has to be mentioned that the number of departed specialists in some fields is not highly significant compared to the total of departures but it is very important if it is taken in consideration the fact that there was a total migration like in the cases of Soil Science, Entomology, Weed Control, Biometrics and Farming System.

TABLE 9. LVV&B, Suriname. Annual final inventory of the personnel with postgraduates, by academic level that belonged to the entity. Period 1958 - 1983. Grow indexes, base 1960.

YEARS	Final Inventory Postgraduates (*)	Final Inventory M.S. (**)	Final Inventory Ph.D. (***)	Relation M.S. Ph.D.	Indexes (1960=100 Total	M.S.	Ph.D.
1958	11	11	0	-	78.6	84.6	-
1959	13	12	1	12.0	85.7	92.3	100.0
1960	14	13	1	13.0	100.0	100.0	100.0
1961	14	12	2	6.0	100.0	92.3	200.0
1962	12	10	2	5.0	85.7	76.9	200.0
1963	11	9	2	4.5	78.6	69.2	200.0
1964	11	9	2	4.5	78.6	69.2	200.0
1965	13	12	1	12.0	92.9	92.3	100.0
1966	9	9	0	-	64.3	69.2	-
1967	11	11	0	-	78.6	84.6	-
1968	13	13	0	-	92.9	100.0	-
1969	16	16	0	-	114.3	123.1	-
1970	16	14	2	7.0	114.3	107.7	200.0
1971	17	15	2	7.5	121.4	115.4	200.0
1972	19	16	3	5.3	135.7	123.1	300.0
1973	23	20	3	6.6	164.3	153.8	300.0
1974	25	22	3	7.3	178.6	169.2	300.0
1975	25	23	2	11.5	178.6	176.9	200.0
1976	20	17	3	5.7	142.9	130.8	300.0
1977	24	20	4	5.0	171.4	153.8	400.0
1978	24	20	4	5.0	171.4	153.8	400.0
1979	18	15	3	5.0	128.7	115.4	300.0
1980	15	13	2	6.5	107.1	100.0	200.0
1981	17	15	2	7.5	121.4	115.4	200.0
1982	14	13	1	13.0	100.0	100.0	100.0
1983	9	8	1	8.0	64.3	61.5	100.0

Source: Own tabulation

(*) : MS and Ph.D. actual personnel and departures

(**) : Actual personnel and departures. Includes all graduates from universities in the Netherlands. (Ir. and Drs.)

(***) : Actual personnel and departures. Includes all graduates from universities in the Netherlands. (Dr.)

TABLE 10. LVV&B. Suriname. Average growth percentage of the final inventory of personnel, according with academic level (*). Base: 1960 - 100.

LEVEL	PERIOD (**)					TOTAL
	1960-1964	1965-1970	1971-1974	1975-1978	1979-1983	1960-1983
Total Postgraduate	- 15.7	5.9	16.1	1.8	- 21.4	- 1.9
M.S.	13.8	6.4	15.4	- 3.8	- 18.5	- 2.0
Ph.D.	40.0	-	25.0	25.0	- 60	-

Source: Own tabulation

(*) Having the growing index of the inventory based on 1960, the percentage variation for the corresponding period is calculated, and the results are divided by the number of years in the period.

(**) The periods were selected according with trends observed in the final inventories evolution.

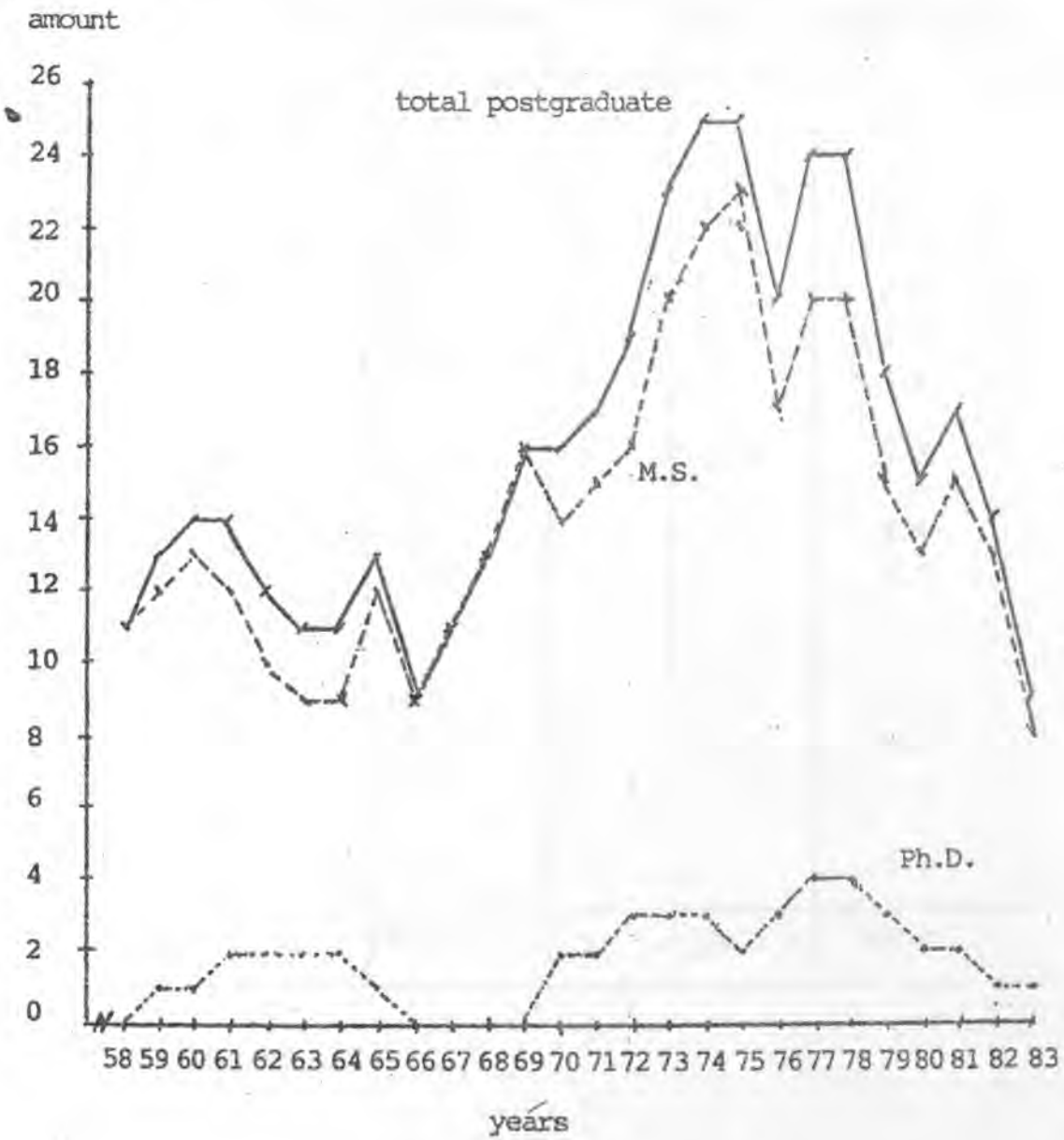


Fig. 1. LVV&B. Suriname. Composition of the annual final inventory of the personnel with postgraduates by academic level 1958-1983

TABLE 11. LVV&B, Suriname. Composition of the departed and actual personnel by the most important specialization fields. 1958 - 1983.

Specialization	Departures	Total departures (%)	Actual	Total actual (%)	Total postgraduate (%)
1. Soil science	12	16.4	-	-	14.6
2. Agr. Engineering	2	2.7	1	11.1	3.7
3. Agronomy	15	20.5	2	22.3	20.7
4. Entomology	3	4.1	-	-	3.7
5. Virology	3	4.1	1	11.1	4.9
6. Nematology	4	5.5	-	-	4.9
7. Mycology & Bacteriology	4	5.5	2	22.3	7.3
8. Plant pathology	2	2.7	-	-	2.4
9. Weed control	1	1.4	-	-	1.2
10. Grass & Anim. Prod.	2	2.7	1	11.1	3.7
11. Horticulture	18	24.7	1	11.1	23.2
12. Technology	4	5.5	1	11.1	6.1
13. Biometrics	1	1.4	-	-	1.2
14. Farming system	1	1.4	-	-	1.2
TOTAL	73	100.0	9	100.0	100.0

Source: Own tabulation.

1. Soil science
2. Agr. Engineering
3. Agronomy
4. Entomology
5. Virology
6. Nematology
7. Mycology & Bacteriology
8. Plant pathology
9. Weed control
10. Grass & Animal production
11. Horticulture
12. Technology
13. Biometrics
14. Farming system

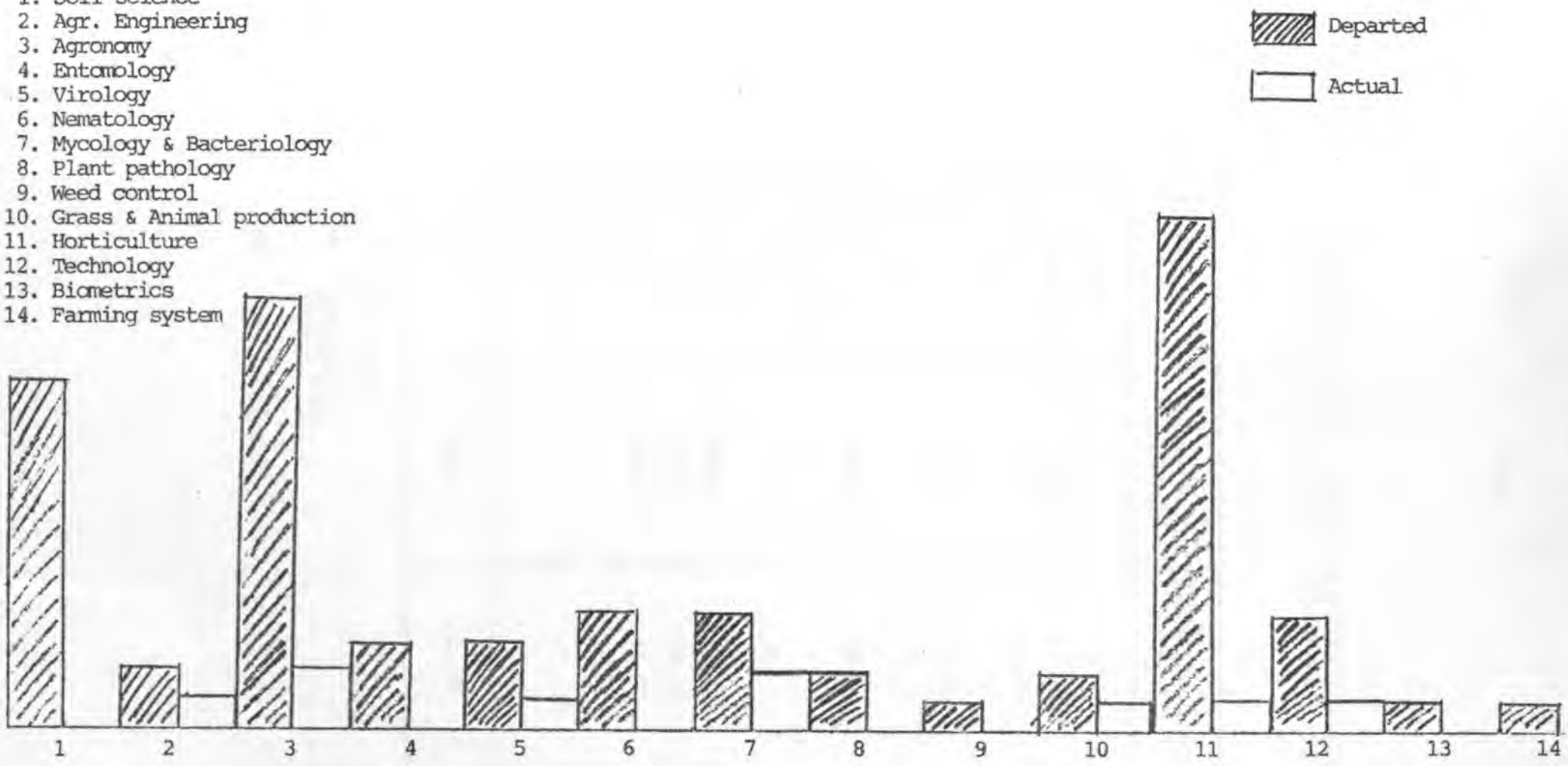


Fig. 2. LVV&B. Suriname. Departed and actual personnel by the most important field of specialization. 1958-1983

TABLE 12. LVV&B, Suriname. Gross and ponderable migration of postgraduate personnel. 1958-1983

SPECIALIZATION	GROSS (*) MIGRATION	PONDERABLE (**) MIGRATION
1. Soil science	-	-
2. Agr. Engineering	200.0	22.20
3. Agronomy	750.0	167.25
4. Entomology	-	-
5. Virology	300.0	33.30
6. Nematology	-	-
7. Mycology & Bacteriology	200.0	44.40
8. Plant pathology	-	-
9. Weed control	-	-
10. Grass & Animal Production	200.0	22.20
11. Horticulture	1800.0	199.80
12. Technology	400.0	44.40
13. Biometrics	-	-
14. Farming system	-	-
15. Meteorology	-	-
TOTAL	811.0	811.00

Source: Own tabulation

(*) $GM = \frac{\text{Departed P.}}{\text{Actual P.}}$

(**) PM = (MG) (% actual)

Table 13 lists the participation of the different specializations in the composition of the total number of postgraduate.

The total postgraduate is 82. Among them 71 are M.S. level and 11 at Ph.D. level (See Table 14).

The highest participants specializations at M.S. levels are Plant Protection with 17 M.S. or 23.9% of the total, Agronomy has 16 M.S. or 22.5% of the total, Horticulture with 15 and a corresponding 21.1% and Soil Science with 12 which constitutes 16.9% of the total M.S. Farming System is the only field with no specialist at M.S. level.

At Ph.D. level only 8 of the 15 specialization areas have graduates. Except for Horticulture, each specialization accounts 1 graduate which constitutes 9.1% of the total Ph.D. graduates. Horticulture has the highest participation with a 36.3%.

It is important to notice that Farming System is the only field with participation in the total Ph.D. graduates which has no participation at M.S. level (See Table 14 and Figure 3).

Pondering the total gross migration with the participation of each area of specialization in the inventory of postgraduate personnel it is obtained the pondered migration. According to the indexes resulting and observing table 15 and Fig. 5, the level of migration is extremely high in general, being Horticulture, Agronomy and Plant Protection the highest in order of appearance. The migration problem in Suriname constitutes a real serious problem.

During the period 1958 - 1983 the Experimental Station incorporated to its staff 33 technicians at M.S. and Ph.D. level but there were 35 departures. From those departures, only one individual left the institution to go to work for a Ph.D., the rest were definite departures.

TABLE 13. LVV&B, Suriname. Participation of the most important specializations in the total postgraduate personnel according with the specialization levels (*) 1958-1983.

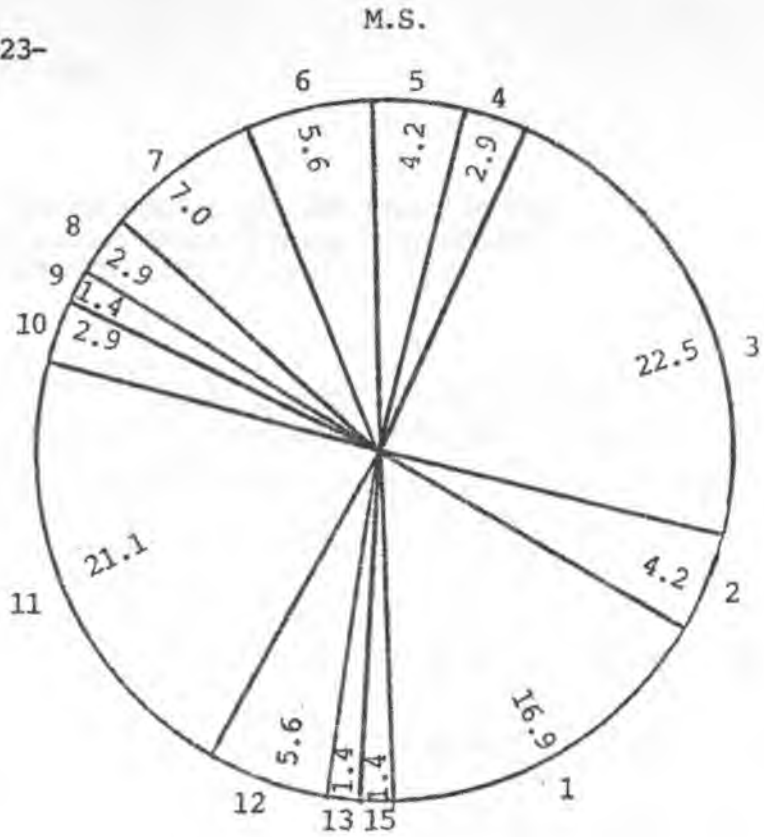
SPECIALIZATION	M.S.	% OF TOTAL M.S.	Ph.D.	% OF TOTAL Ph.D.	M.S./ Ph.D.
1. Soil Science	12	16.9	-	-	(**)
2. Agr. Engineering	3	4.2	-	-	(**)
3. Agronomy	16	22.5	1	9.1	16.0
4. Entomology	2	2.9	1	9.1	2.0
5. Virology	3	4.2	1	9.1	3.0
6. Nematology	4	5.6	-	-	(**)
7. Mycology & Bacteriology	5	7.0	1	9.1	5.0
8. Plant Pathology	2	2.9	-	-	(**)
9. Weed control	1	1.4	-	-	(**)
10. Grass & Animal Prod.	2	2.9	1	9.1	2.0
11. Horticulture	15	21.1	4	36.3	3.8
12. Technology	4	5.6	1	9.1	5.0
13. Biometrics	1	1.4	-	-	(**)
14. Farming system	-	-	1	9.1	(***)
15. Meteorology	1	1.4	-		(**)
TOTAL	71	100.0	11	100.0	6.5

Source: Own tabulation

(*) "Most importants" because the role in the research activities

(**) Only counting M.S.

(***) Only counting Ph.D.



1. Soil Science
2. Agr. Engineering
3. Agronomy
4. Entomology
5. Virology
6. Nematology
7. Mycology & Bacteriology
8. Plant Pathology
9. Weed control
10. Grass & Animal Prod.
11. Horticulture
12. Technology
13. Biometrics
14. Farming system
15. Meteorology

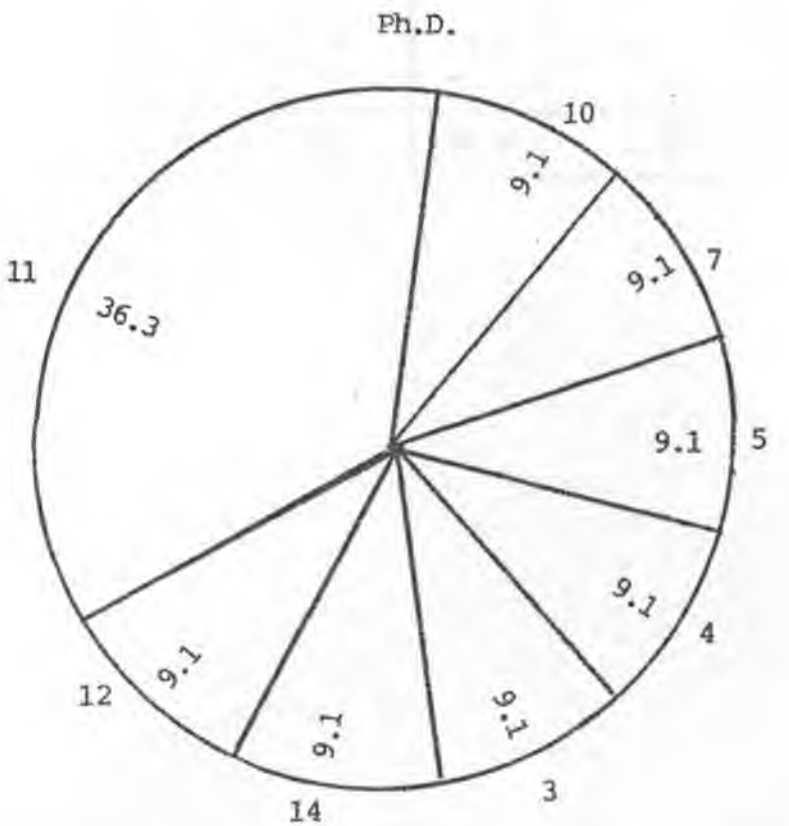


Fig. 3. LVV&B, Suriname. Participation of the most important specializations in the total postgraduate personnel according with the specialization levels (percentages) 1958-1983.

TABLE 14. LVV&B, Suriname. Participation of each field in the composition of the postgraduate personnel according to specialization levels. 1958 - 1983.

AREAS	M.S.	TOTAL M.S. (%)	Ph.D.	TOTAL Ph.D. (%)	TOTAL AREA	TOTAL POSTG. (%)	M.S. Ph.D. (*)
1. Soil Science	12	16.9	-	-	12	14.6	-
2. Agricultural Engineering	3	4.3	-	-	3	3.7	-
3. Agronomy	16	22.5	1	9.1	17	20.7	16.00
4. Plant Protection	17	23.9	3	27.3	20	24.4	5.67
5. Animal Science	2	2.8	1	9.1	3	3.7	2.00
6. Horticulture	15	21.1	4	36.3	19	23.2	3.75
7. Technology	4	5.7	1	9.1	5	6.1	4.00
8. Biometrics	1	1.4	-	-	1	1.2	-
9. Meteorology	1	1.4	-	-	1	1.2	-
10. Farming system	-	-	1	9.1	1	1.2	-
TOTAL	71	100.0	11	100.0	82	100.0	6.45

Source: Own tabulation

(*) Amount of M.S. per each Ph.D.

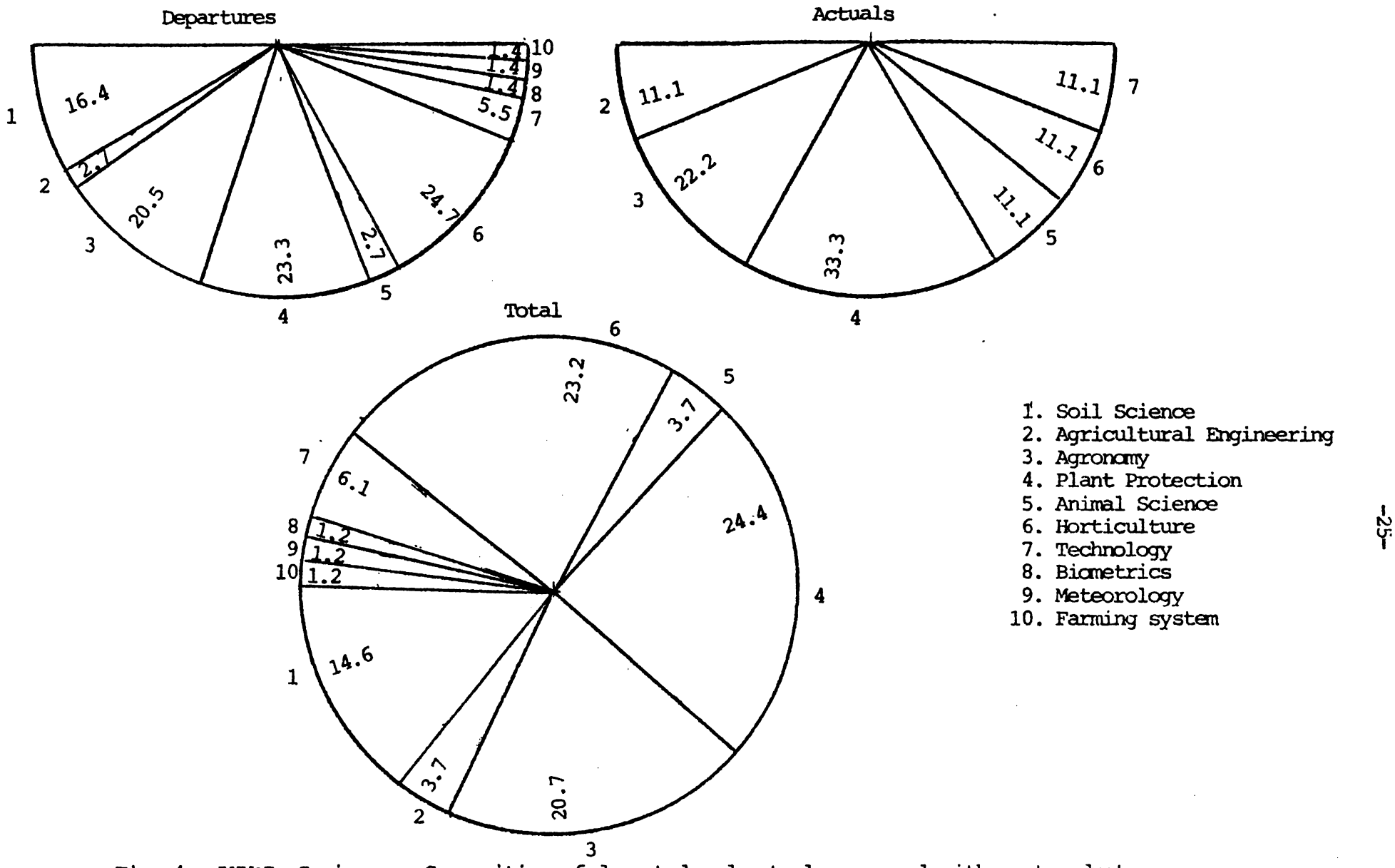


Fig. 4. LVV&B, Suriname. Composition of departed and actual personnel with postgraduate per specialization fields (percentages) 1958-1983.

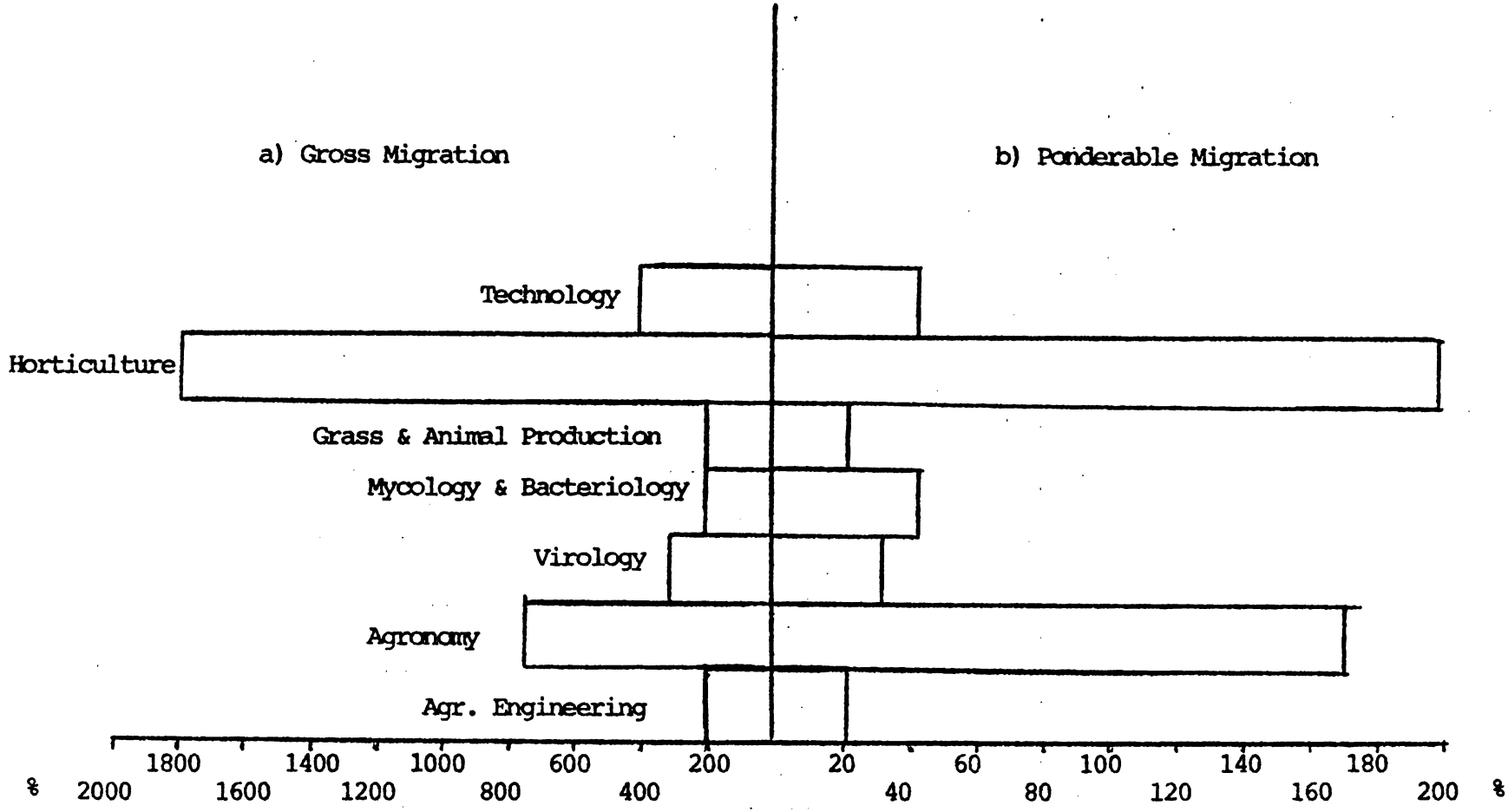
TABLE 15. LVV&B, Suriname. Gross migration and ponderable migration of postgraduate personnel per specialization fields. 1958-1983.

AREAS	Gross(*) Migration	Ponderable(**) Migration
1. Soil Science	-	-
2. Agr. Engineering	200.0	22.20
3. Agronomy	750.0	167.25
4. Plant Protection	566.7	188.71
5. Animal Science	200.0	22.20
6. Horticulture	1800.0	199.80
7. Technology	400.0	44.40
8. Biometrics	-	-
9. Meteorology	-	-
10. Farming System	-	-
TOTAL	811.1	811.1

Source: Own tabulation

(*) GM = $\frac{\text{Depart. P.}}{\text{Actual P.}}$

(**) PM = (GM) (% Actual)



Definitions:
Total Gross Migration (GM) : $\frac{\text{N°. of departed personnel}}{\text{N°. of actual personnel}}$

Total ponderable migration (PM): GM (actual personnel)

Fig. 5. LVV&B, Suriname. Gross and ponderable migration of the personnel with postgraduate per specialization. 1958-1983

TABLE 16. LVV&B, Suriname. Composition of departed and actual personnel with postgraduate per specialization fields. 1958-1983.

AREAS	Departures	Total departures (%)	actuals	Total actual (%)	total area	Area in total Postgra. (%)
1. Soil Science	12	16.4	-	-	12	14.6
2. Agricultural Engineering	2	2.7	1	11.1	3	3.7
3. Agronomy	15	20.5	2	22.2	17	20.7
4. Plant Protection	17	23.3	3	33.3	20	24.4
5. Animal Science	2	2.7	1	11.1	3	3.7
6. Horticulture	18	24.7	1	11.1	19	23.2
7. Technology	4	5.5	1	11.1	5	6.1
8. Biometrics	1	1.4	-	-	1	1.2
9. Meteorology	1	1.4	-	-	1	1.2
10. Farming system	1	1.4	-	-	1	1.2
TOTAL	73	100.0	9	100.0	82	100.0

Source: Own tabulation

During the period 1958 - 1983 the technical personnel, M.S. level, was 11 at the first year of the period, while at the last year it was 9. From these 9 graduate technicians, 8 were M.S. and 1 was Ph.D. For the M.S. the income was 38 and the departures were 30, only one was for the Ph.D. The final inventory at Ph.D. level was 1 resulting from the difference between 7 incorporations and 6 departures. The migration has been taken place continously and there are no direct relations between incorporations and departures. In 1966 there was no incorporation but departures represented about 1/3 of the final inventory of the previous year. In 1979 and the years after, except for 1981, the same situation was faced: massive departures and no incorporations. (See Table 17, 18 and 19).

TABLE 17. LVV&B. Annual inventory of the personnel with postgraduate that belonged to the entity. Period 1958-1983.

YEARS	Initial inventory	Incor-porations	Total income	Post-graduate Ph.D.	Definite departure	TOTALS	Final Inventory
1958	11	-	11	-	-	-	11
1959	11	2	13	-	-	-	13
1960	13	1	14	-	-	-	14
1961	14	-	14	-	-	-	14
1962	14	-	14	-	2	2	12
1963	12	-	12	-	1	1	11
1964	11	-	11	-	-	-	11
1965	11	2	13	-	-	-	13
1966	13	-	13	-	4	4	9
1967	9	2	11	-	-	-	11
1968	11	2	13	-	-	-	13
1969	13	5	18	1	1	2	16
1970	16	2	18	-	2	2	16
1971	16	1	17	-	-	-	17
1972	17	2	19	-	-	-	19
1973	19	4	23	-	-	-	23
1974	23	2	25	-	-	-	25
1975	25	1	26	-	1	-	25
1976	25	1	26	-	6	6	20
1977	20	4	24	-	-	-	24
1978	24	-	-	-	-	-	24
1979	24	-	24	-	6	6	18
1980	18	-	18	-	3	3	15
1981	15	2	17	-	-	-	17
1982	17	-	17	-	3	3	14
1983	14	-	14	-	5	5	9

Source: Own tabulation

TABLE 18 LVV&B, Suriname. Annual inventory of the personnel with M.S. that belonged to the entity. 1958-1983

YEARS	Initial Inventory	Incorpo-ration	Total Income	DEPARTURE			Final Inventory
				For Ph.D.	Definite	Totals	
1958	11	-	11	-	-	-	11
1959	11	1	12	-	-	-	12
1960	12	1	13	-	-	-	13
1961	13	-	13	-	1	1	12
1962	12	-	12	-	2	2	10
1963	10	-	10	-	1	1	9
1964	9	-	9	-	-	-	9
1965	9	3	12	-	-	-	12
1966	12	-	12	-	3	3	9
1967	9	2	11	-	-	-	11
1968	11	2	13	-	-	-	13
1969	13	4	17	1	-	1	16
1970	16	-	16	-	2	2	14
1971	14	1	15	-	-	-	15
1972	15	1	16	-	-	-	16
1973	16	4	20	-	-	-	20
1974	20	2	22	-	-	-	22
1975	22	1	23	-	-	-	23
1976	23	-	23	-	6	6	17
1977	17	3	20	-	-	-	20
1978	20	-	20	-	-	-	20
1979	20	-	20	-	5	5	15
1980	15	-	15	-	2	2	13
1981	13	2	15	-	-	-	15
1982	15	-	15	-	2	2	13
1983	13	-	13	-	5	5	8

Source: Own tabulation

TABLE 19. LVV&B, Suriname. Annual inventory of the personnel with Ph.D. that belonged to the entity. 1958-1983

YEARS	Initial Inventory	Incorpo-rations	Total Income	Departure	Final Inventory
1958	-	-	-	-	-
1959	-	1	1	-	-
1960	1	-	1	-	1
1961	1	1	2	-	2
1962	2	-	2	-	2
1963	2	-	2	-	2
1964	2	-	2	-	2
1965	2	-	2	1	1
1966	1	-	1	1	0
1967	-	-	-	-	-
1968	-	-	-	-	-
1969	-	-	-	-	-
1970	-	2	2	-	2
1971	2	-	2	-	2
1972	2	1	3	-	3
1973	3	-	3	-	3
1974	3	-	3	-	3
1975	3	-	3	1	2
1976	2	1	3	-	3
1977	3	1	4	-	4
1978	4	-	4	-	4
1979	4	-	4	1	3
1980	3	-	3	1	2
1981	2	-	2	-	2
1982	2	-	2	1	1
1983	1	-	1	-	1

Source: Own tabulation.

5. THE ANNUAL BUDGET OF THE AGRICULTURAL EXPERIMENT STATION

The allocation of resources to the Agricultural Experiment Station had been made strictly from the national budget up to 1979; from that year on there also have been funds from donations, although they were not very significant.

The budget had been increased gradually year after year, going from 1.5 million in 1974 to 5.1. in 1983. This represents more than 200% increment during the 10 years period (See table 20).

The migration of specialists highly affected the behaviour of the budget; while the budget had being increased, the number of technicians have been reduced though the average budget per technician was unproportionally increasing. Table 22 and Fig. 6 show the effect of personnel migration on the annual budget.

In 1974 there were 25 technicians and there was an average budget of Sf 60 thousand per worker. In 1978 (the middle of the period) it reached Sf 154.2 thousand, being the numbers of graduates 24, and in 1983 with the numbers of technicians reduced to 9 the average budget reached the amount of Sf 588.9 thousand.

Table 21 reflects that the investment in the technical personnel had been increased throughout the period 1980 - 1983, following an opposite direction with what had been happening with the number of graduates which had been decreasing considerably during the same period.

The allocation for operation had been kept the same even though there is being and increasement in the budget so there is no correlation between the allocation of funds for personnel, operation and the total budget.

TABLE 20. LVV&B, Suriname. Composition of the budget according source of financing. 1974-1983* (million Suriname guilders)

Origin / Years	National budget	%	Donations International Resources	%	Total (100%)
1974	1.5	100	-	-	1.5
1975	1.7	100	-	-	1.7
1976	1.7	100	-	-	1.7
1977	2.9	100	-	-	2.9
1978	3.7	100	-	-	3.7
1979	4.0	100	-	-	4.0
1980	4.0	97.6	0.1	2.4	4.1
1981	4.7	95.9	0.2	4.1	4.9
1982	5.1	92.7	0.4	7.3	5.5
1983	5.1	96.7	0.2	3.8	5.3

Source: Ministry of Agriculture Program Budget

(*) Previous years data not available

TABLE 21. LVV&B, Suriname. Destination of the budget resources by object of expenditure. 1980 - 1983*
(million Suriname guilders)

Object of Expenditure / Years	Personnel		Operating		General Services		Equipment, furniture and investment.		TOTAL (100%)
	$	%	$	%	$	%	$	%	
1980	3.3	80.5	.5	12.2	.2	4.9	.1	2.4	4.1
1981	3.8	77.5	.5	10.2	.2	4.1	.4	8.2	4.9
1982	4.3	78.2	.5	9.1	.1	1.8	.6	10.9	5.5
1983	4.4	83.0	.5	9.4	.1	1.9	.3	5.7	5.3

Source: Agricultural Experiment Station, Ministry of Agriculture
(*) Previous years data not available

TABLE 22. LVV&B, Suriname. Animal quantity of technicians with post-graduate and average budget per technician in Suriname Guilders 1974 - 1983*

YEARS	Quantity of technician	Index-1978 - 100	Average budget per technician (thousands of Guilders)	Index 1978 - 100
1974	25	104.2	60.0	38.9
1975	25	104.2	68.0	44.1
1976	20	83.3	85.0	55.1
1977	24	100.0	120.8	78.3
1978	24	100.0	154.2	100.0
1979	18	75.0	222.2	144.1
1980	15	62.5	273.3	177.2
1981	17	70.8	288.2	186.9
1982	14	58.3	392.9	254.8
1983	9	37.5	588.9	381.9

Source: Own tabulation
(*) Previous years data not available

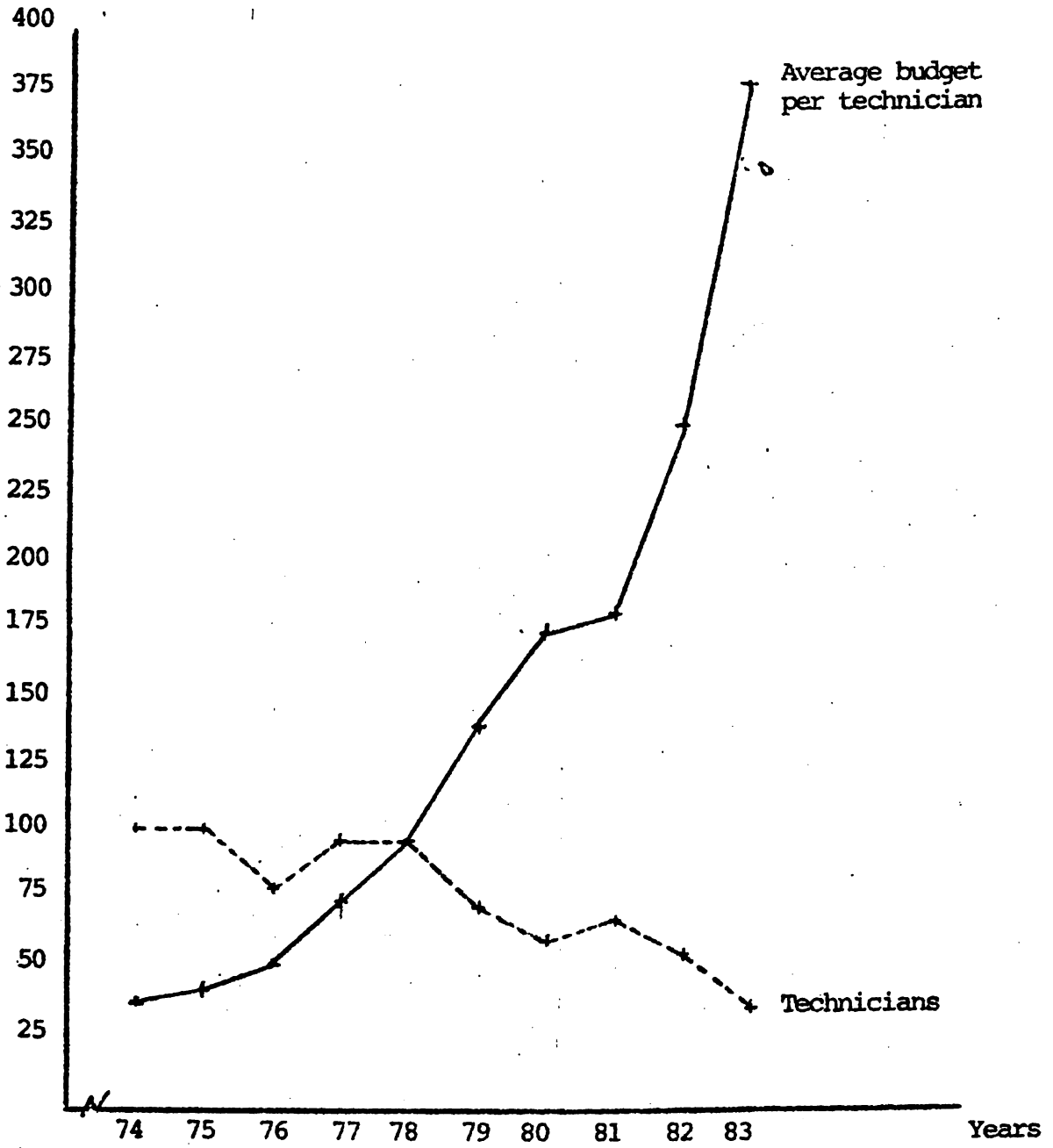


Fig. 6. LVV&B, Suriname. Variation indexes of the average budget per technician and the number of technicians. Base year 1978. Constant prices 1978.

6. CONCLUSIONS AND COMMENTS

The migration of postgraduate personnel in the agricultural research area is the main handicap for carrying out a proper and effective research work in Suriname. This migration process disminish capabilities due to the draining of the team of the Agricultural Experiment Station. The coordination and harmonization of the existing human resources in the different organizations would affect positively the generation and transfer of technology system in Suriname. It is suggested that an operational mechanisms linking public, semi-public and private components be established.

One of the most effective ways to help to obtain the above mentioned coordination and harmonization between all the components of the generation and transfer of technology system is the creation of a National Agricultural Research Committee. The proposed functions and responsibilities can be found in Annex 2.

The National Agricultural Research Committee should follow a National Agricultural Research Plan. A proposal for that plan is presented in Annex 3.

In addition, it should be very important to design, establish and implement a training program considering the needs and priorities of the different agricultural research areas.

The matter of trained personnel, not only in research but also in extension, is the key to technological development for the Suriname Agriculture. Since the 80's, and surely in the 90's the comparative advantages will be much more linked with techno-

logical patterns than with the natural resources of the countries. That, in part, is demonstrated by the change of the European countries agriculture in the last two decades, which became agricultural production exporters in competition with traditional exporter countries (like Uruguay and Argentina) whose economies were based in the potential of their natural resources. Some traditionally importer Asian countries are now exporting agricultural production (food and fiber) making also clear that the development path for agriculture outh to be technological.

In the case of Suriname the promotion of production for export should be supported by a well balanced package of policies, apart from the establishment of a clear agricultural development strategy. The last should be a matter of analysis and evaluation, considering the possibilities for diversifying production, as it is knowledged at present. Here is again another important task for research: analyzing new potential production, with new technology in Surinames environment.

The technology development for the country must be realistic. It has to be settled between technologies highly dependent (via specialized inputs) from other countries and technology for which Suriname's possibility are exausted, because there are no resources at all. Here again comes out the convenience of training, up to the higher levels, Surinamese technicians, providing them with secure and well payed careers within the country. No question on the importance of developing a suitable system for technology transfer, considering that physical as well as financial resources are enough - by now - for research working.

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ANNEX N° 1

AGRICULTURAL EXPERIMENT STATION: COMPOSITION OF THE AREAS*

Areas	Specialization of components
1. Soil Science	Soil physics Soil chemistry Hydrology
2. Agriculture Engineering	Soil productivity Water management
3. Agronomy	Cereals: Rice, corn, sorghum and millets Legumes: Peanut
4. Plant protection	Entomology Virology Nematology Mycology-bacteriology Plant pathology Weed control
5. Animal Science	Grass Animal production Animal nutrition
6. Horticulture	Coffea Cocoa Citrus Banana Oil palm and Coconut Vegetables
7. Technology	Food technology
8. Biometrics	Biometrics
9. Meteorology	Meteorology
10. Farming system	Farming system

* Only for the purpose of this study

ANNEX N° 2

THE NATIONAL AGRICULTURAL RESEARCH COMMITTEE
(A Proposal)

1. Functions and responsibilities

1.1 To establish objectives and research priorities within the programs.

1.2 To study and evaluate the research projects of the different programs for approval, modification, postposition or elimination.

1.3 To recommend the elaboration of research projects according with the national priorities, problems and resources available for the different programs.

1.4 To discuss periodically the progress reports of the different research projects and make recommendations.

1.5 The committee needs to estabish its regulations and procedures.

2. To be composed of the following:

2.1 Permanent members

2.1.1 Director or Coordinator of the Agricultural Experiment Station, who will the the chairman

2.1.2 Director of CELOS

2.1.3 Dean of the Faculty of Technological Sciences

2.2 Occasional members:

2.2.1 Directors of the field stations

2.2.2 Leader of research programs and or projects

2.2.3 Parastatal institutions

2.2.4 Persons that could act as advisors from the Ministry of Agriculture or other related institutions; they need to be called for the chairman of the committee.

ANNEX N° 3

A PROPOSAL FOR

NATIONAL AGRICULTURAL RESEARCH PLAN

1. INTRODUCTION TO THE PLAN

1.1 Historical information of agricultural research in Suriname (brief)

1.2 Purpose of the plan

2. BACKGROUND INFORMATION

2.1 Agricultural sector problem (national)
2.1.1 Definition
2.1.1.1 In relation to the national economy
2.1.1.2 Evolution of the agricultural production
2.1.1.3 Income of rural population

2.1.2 Main causes
2.1.2.1 External
2.1.2.1.1 Exportation products in relation with international prices
2.1.2.1.2 Others

2.1.2.2 Internal
2.1.2.2.1 Size of the production unit
2.1.2.2.2 None appropriate technology
2.1.2.2.3 Post harvesting losses
2.1.2.2.4 Lower productivity of crops and cattle
2.1.2.2.5 Low rentability of crops and cattle
2.1.2.2.6 Land policy structure
2.1.2.2.7 Agroindustry development
2.1.2.2.8 Others

2.2 NATIONAL ACTION

2.2.1 Principal Action

The Agricultural Development Plan and its objectives.

2.2.2 Concurrent Action

2.2.2.1 The Government Development Polices to improve the prices, credits in favor of small farmers (specially), including incentive prices or subsidies for several agricultural products.

2.2.2.2 The Government improvement Agroindustry development in the rural sector.

2.3 INSTITUTIONAL ORGANIZATION OF THE ACTION

2.3.1 L.V.V.

2.3.1.1 Agricultural Experiment Station

2.3.1.1.1 Programs

2.3.1.2 Other Dept. (ex: Extension service)

2.3.2 Public and private organisms involved in research in coordination with L.V.V.

2.3.3 Universities and other centers for research and training

2.3.4 Foreing Institutional Assistance and International Cooperation in Agricultural Research.

2.3.4.1 IICA

2.3.4.2 FAO

2.3.4.3 IFAD

2.3.4.4 IDB

2.3.4.5 CIMMYT

2.3.4.6 CIAT

2.3.4.7 IRRI

2.3.4.8 ICRISAT

2.3.4.9 CIP

2.3.4.10 Republic of Korea
2.3.4.11 Republic of Brazil
2.3.4.12 EEC
2.3.4.13 OAS

2.4 Problem of the Agricultural Research at National Level
2.4.1 Planning and Programming
2.4.2 National Coordination of Research
2.4.3 Generation of Technology
2.4.4 Transfer of Technology

3. NATIONAL AGRICULTURAL RESEARCH PLAN OBJECTIVES

3.1 General Objective

3.1.1 Definition
Improvement of the efficacy of the institutional system of Agricultural Research.

3.1.2 Relation of the general objective with the country problem.
We can consider that with a plan of national research program adjusted to demand and capacity of farmers, the Agricultural Experiment Station will contibute to increase the agricultural production and productivity, if the Government decided:

3.1.2.1 Improve the price system incentives for the farmes;

3.1.2.2 Make possible sufficient loan, in quantity and time, for farmers;

3.1.2.3 Develop the infrastructure for marketing and other basic services;

3.1.2.4 Improve the water resource policy and irrigation system management

3.2 Specific Objectives
3.2.1 Definition
The specific objectives in the Four Lines of Action of the Agricultural Experiment are:

3.2.1.1 Planning and Programming
To give logical and realistic order to the plan, programs and projects of the Agricultural Experiment Station and to establish the mechanism of coordination with other organisms or institutions at national or international level in order to support the Ministry of Agriculture, to increase the productivity of agricultural products.

3.2.1.2 Coordinating research resources.

3.2.1.2.1 National Coordination of Research
To establish an efficient institutional coordination system:

3.2.1.2.2 Focuss research on priority problems of agricultural production in order to satisfy the internal demand of food and to increase the exports volume.

3.2.1.2.3 Improvement of the technical-managerial capacity of the professional personnel that is working in research program.

3.2.1.2 Regionional Coordination of Research
Balances the focussing of research priorities at national and regional levels, as well as the sharing of the research resources.

3.2.1.3 Generation of Technology

3.2.1.3.1 To find different alternatives to improve the farming system production according with the resources and capacity of farmers.

3.2.1.3.2 To select genetic material (vegetal and animal) adequate to the farming system production.

3.2.1.4 Transfer of Technology
Contribute to the improvement of the transfer technology process to farmers.

3.2.2 Relation between the General and the Specific Objectives.
Obtaining those objectives the Agricultural Experiment Station will contribute to increase the efficiency and efficy of the national agricultural research system due to the following facts.

3.2.2.1 The realistic and logical order of the action of the Agricultural Experiment Station will permit to generate technology according with the agricultural development goals of the country.

3.2.2.2 The coordination at national level will conducted to the program integration and better utilization of resources for all research activities.

3.2.2.3 The transfer of technology to farmers will accelerate the adoption of technology and the feedback process for research.

3.2.2.4 The evaluation of the indicators of goal achievements of the Agricultural Experiment Station will permit a better research focussing and adjustment to new problems and facts.

4. OPERATIONALIZATION OF THE AGRICULTURAL EXPERIMENT STATION

4.1 Definition of the Goals

The goals of the Agricultural Experiment Station should be set for the medium and long range. It is important to review, according with the evolution of the national agricultural problem. During the first year we expect at least the following:

4.1.1 Planning and Programming

To have a plan and an annual program for the orientation of the national agricultural research.

4.1.2 National Coordination of Research

To have completed the institutional analysis of all organisms that participate in generation and transfer technology process..

4.1.2.1 To have prepared and discussed with all organisms involveld in agricultural research, the coordination system model.

4.1.2.2 To put in operation the Central Coordination System.

4.1.3 Generation of Technology

4.1.3.1 To have a diagnosis about the priorities in the agricultural production in different regions.

4.1.3.2 To have evaluated the technical-managerial capacity of the hierarchy structure responsible for the research.

4.1.3.3 To be doing research in physical, biological and socio-economic aspect, at least 60% of the agricultural products priorities that are included in the agriculture development plan.

4.1.3.4 To have contributed to generate useful technology for different farming production systems, for immediate benefit of producers, specially small and medium ones.

4.1.4 Transfer of Technology

4.1.4.1 To have defined and organized a process of contribution of transfer of technology to farmers.

4.1.4.2 To have contributed to increase in at least 20% the proportioning of farmers which have adopted the new or improved technology.

4.2 Strategy and Instruments

4.2.1 Planning and Programming at National Level

4.2.1.1 To define in a multi-disciplinary group the specific problem of production and its main causes, separating those related directly to the agricultural research action from those which don't, in order to set a research program concept.

4.2.1.2 Establish the research line for each program on base of agriculture diagnosis and other sources of information. This will result in the formulation of project profiles. The project profiles will include at least: titles, background information, objectives and activities.

4.2.1.3 The Agricultural Experiment Station can request the cooperation of international or regional institutions for planning, programming and execution of research.

4.2.2 National Coordination of Research

4.2.2.1 The model and process of coordination will be discussed in meetings with the participation of the professional staff at national and regional level.

4.2.2.2 The coordination system will involve all organisms that participate in the agricultural research plan.

4.2.3 Generation of Technology

4.2.3.1 The diagnosis of the agricultural production problem will be prepared in coordination with the private sector that is working in research. On base of the Agricultural Experiment Station model.

4.2.3.2 The agricultural research program of the Agricultural Experiment Station will be developed on base of the following criteria:

4.2.3.2.1 Multi-discipline model

4.2.3.2.2 Generation of technology adequate to farming system production

4.2.3.2.3 Increase of the technical and practical knowledge in short, medium and long term.

4.2.3.2.4 To serve as model or propose the basic methodology in order to improve the orientation, efficacy and efficiency of the research carried out in all organisms which participate in the national agricultural research system.

4.2.4 Transfer of Technology

4.2.4.1 The transfer of technology process will be carried out in coordination with the Extension Service Department.

4.2.4.1.1 Comprobation and evaluation of agricultural research results at farmers level.

4.2.4.1.2 Field days

4.2.4.1.3 Diffusion of the technical information

4.3 Programs and Projects

4.3.1 Planning and Programming
In the last quarter of the year all activities in planning and programming will be reviewed on base:

4.3.1.1 The evaluation of results obtained.

4.3.1.2 Diagnosis and other sources of information in relation with the agricultural production problem.

4.3.1.3 The mandate of the Ministry of Agriculture in relation with the national agricultural development policies.

4.3.2 National Coordination of Research
At the end of the working year, the Director of the Agricultural Experiment Station, with the support of the national Agricultural Research Committee, which is integrated at least for one representative of each component of the agricultural research system, will present all research program proposals for the preparation of the plan.

4.3.3 Generation of Technology

4.3.3.1 Technical Programs
The programs are the following:

4.3.3.1.1 Crops

4.3.3.1.1.1 Rice

4.3.3.1.1.2 Corn, sorghum and millets

4.3.3.1.1.3 Musa (banana & plantain)

4.3.3.1.1.4 Legumes (bean, peanut, cowpea)

4.3.3.1.1.5 Oil palm and coconut

4.3.3.1.1.6 Fruits (citrus, mango, etc.)

4.3.3.1.1.7 Roots and tubers (cassava, yams)

4.3.3.1.1.8 Vegetables (tomato, cabbage, cucumber, lettuce, others)

4.3.3.1.2 Animal Production

4.3.3.1.2.1 Pasture, animal nutrition and forrages

4.3.3.1.2.2 Beef production

4.3.3.1.2.3 Cattle dairy production

4.3.3.1.2.4 Pork production

4.3.3.1.2.5 Sheep and goat

4.3.3.1.2.6 Poultry

4.3.3.1.3 Potential Resources

The objective of this program is the development of some research activities in order to preserve or evaluate some potential resources or products for future use.

4.3.3.2 Projects

According with information in relation with the agricultural production problem, a project area could be:

4.3.3.2.1 Farming Production System

4.3.3.2.1.1 Diagnosis

4.3.3.2.1.2 Test and Design

4.3.3.2.2 Genetics

4.3.3.2.2.1 Breeding

4.3.3.2.3 Physical environment

4.3.3.2.3.1 Ecofisiology

4.3.3.2.3.2 Soil physics (irrigation, conservation)

4.3.3.2.3.3 Soil chemistry (fertility, microbiology)

4.3.3.2.4.1 Pathology and Nematology

4.3.3.2.4.2 Entomology

4.3.3.2.4.3 Parasitology

4.3.3.2.4.4 Weed control

4.3.3.2.4.5 Harvesting and post-harvesting losses

4.3.3.2.4.6 Storage

4.3.3.2.4.7 Socio-economics of the production

4.3.4 Transfer of Technology

The programs and projects will be prepared annually by the Director of the Extension Service.

4.4 Operative Program

The operative program which includes the Budget will be prepared annually according with the Ministry of Agriculture and the Agricultural Experiment Station procedures and rules.

ANNEX N° 4

CURRENT AGRICULTURAL RESEARCH IN SURINAME

The Agricultural Research in Suriname can be divided into the following categories:

1. Research carried out by the Ministry of Agriculture, Animal Husbandry and Fisheries (LVV).

2. Research undertaken at several autonomous agricultural states such as SML (rice), SEL (livestock), SURLAND (bananas), VICTORIA (oil palm).

3. Research at the University.

The Agricultural Research System of the Ministry of Agriculture consists of:

A) MAIN DIVISIONS:

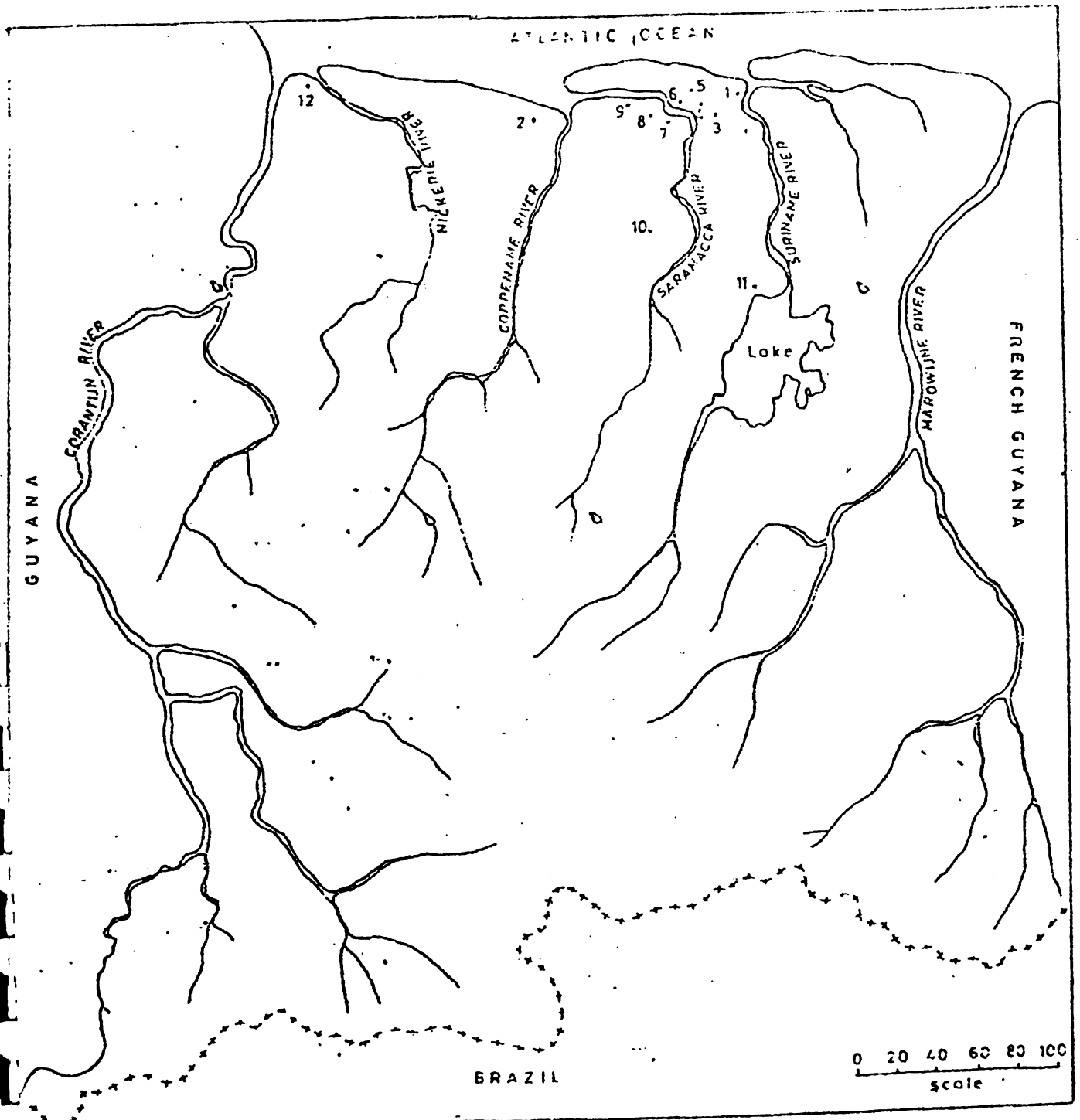
1. Agronomy and Horticulture.

2. Animal Husbandry.

3. Fisheries.

B) RESEARCH in the Divisions AGRONOMY and HORTICULTURE is carried out the Agricultural Experiment Station.
The main crop projects are:

(i) Rice Research Project
(ii) Citrus Research Project
(iii) Corn/Sorghum/Peanut Research Project
(iv) Coconut/Oil palm Research Project
(v) Other Crops Research Project



EXPERIMENTAL FARMS: CULTUURTUIN (1), JENNY (2), BOMA (3), ORYZA (4), A.H.O. JARIKABA (5), JARIKABA III (6), LA POULE (7), DIRKSHOOP (8), TIJGERKREEK-W (9), COEBITI (10), BROKOBAKA (11), EUROPOLDER (12).

Fig. 7 LVV, SURINAME. Present Agricultural Experiment Farms.
Source: Agricultural Experiment Station. 1986.

To carry out this research the following sub-divisions are at the Agricultural Experiment Station:

1. CROPS - grains, citrus, peanut, cocoonut/oil-palm, horticulture, pomology.

2. PLANT PROTECTION - bacteriology, entomology, mycology, nematology, virology, weed control.

3. SOIL SCIENCE

4. AGRO-HIDROLOGY

5. FOOD TECHNOLOGY

6. AGRICULTURAL ENGINEERING

C) The following sub-stations or experimental farms are part of the Ministry of Agriculture Research System, in different regions of the country. (See Table 23 and Figure 7).

1. The coastal Plain (young and old), which about 40 km. wide in the east and 120 km. in the west, is almost flat and consists mainly of heavy textured, marine clay deposits locally with swamps and sand or shell ridges. Its elevation varies from about 0 in the north to about 10 m in the south.

   a) <u>The Central Area</u>

   - The Cultuurtuin Experiment Station which concentrates in Observation Trials on postures, corn, sorghum.

   - The Boma Experiment Station which concentrates in Observation Trials on citrus, passion fruit, cherries.

- The Oryza Experiment Station which is concerned with Agronomy of corn and on plant breeding of rice.

- The A.H.O., Jarikaba Experiment Station which concentrates on water table research of coconut, citrus, passion fruit, cherry, banana, papaya.

- The Jarikaba III Experiment Station which places emphasis on observation trials of bananas.

- La Poule Experiment Station which concentrates on citrus, coconut/oil palm, pineapple, spices, coffee, cacao.

- Dirkshoop Experiment Station which gives priorities to citrus, coconut/oil palm, spices, pineapple, passion fruit.

- Tijgerkreek-West Experiment Station which is concerned with observation trials and plant protection of cassava, peanut, pigeon peas, spices.

b) <u>The West Area</u>

- Europolder Experiment Station which gives priority to applied research in soils, agronomy and crop protection of rice.

- Jenny Experiment Station, which concentrates on plant protection and agronomy of coconut.

2. The Zanderij Belt, which is 5 - 10 km. wide in the east and 60 - 70 km. in the west, with elevations varying from about 10 m in the north to 50 m in the south, consists mainly of sandy to sandy loam soils.

   - Coebiti Experiment Station which concentrates on plant protection, observation trials and production of cassava, corn, sorghum, peanut, oil palm, citrus.

3. The interior uplands, which consits mainly of metamorphosed igneous and sedimentary rocks of Pre-Cambrian Age. It occupies more than 80% of the total area of Suriname, with elevations varying from 50 to about 1,280 m above sea level. It consists mainly of undulating to sheep land.

   - The Brokobaka Experiment Station, which emphasis on observation trials of coconut/oil palm, citrus, cashew.

International Institutions giving support to Agricultural Research:

CIAT - rice, legumes, pastures, cassava.
IRRI - genetic improvement of rice.
CIMMYT - genetic improvement of maize.
CIP - genetic improvement of patatoes (short term training).
IICA - institutional strenghtening and support to the oil palm and coconut research project.

In 1984 - 1985 (See table 24) from a total of 20 graduates of LVV 10 were B.Sc., 9 M.Sc. and 1 Ph.D., which compared with 1986 (See table 25) in which a drop of 4 was suffered being that from a total of 16, 9 were B.Sc. and 7 M.Sc. A reduction of 1 B.Sc., 2 M.Sc. and 1 Ph.D. was registered.

The field with highest participation 1984 - 1985 is Plant Protection with 8 graduates or 40.0% of the total, followed by Agronomy with 4 graduates or 20.0% and Horticulture with 3 which represents 15.0% of the total (See table 24) while in 1986 (See table 25) the ranking is the same with a slight variation due to the reduction registered in this year, Plant Protection with 7 graduates or 43.8% of the total, Agronomy with 3 graduates or 18.8% of the total and Horticulture with 2 or 12.5% of the total.

The Research Staff of the Ministry of Agriculture Research System includes a number of 43 scientific and technical personnel, of whom 16 are at graduate level and 7 professionals with postgraduate training, and 27 with technical degree.

The majority of the personnel is concentrated at the Agricultural Experiment Station in Paramaribo, having a number of 35 from a total of 43.

This 35 represents 81.4% of the total, the rest 8 in total are spreaded in some of the experimental fields (See table 26).

TABLE 23. LVV, SURINAME. Soil characteristics of some agricultural experiment fields.

EXPERIMENT FIELD	SOIL CHARACTERISTICS
CULTUURTUINLAAN	HIGH SAND* LOW SAND SHELL SAND
DIRKSHOOP	HIGH SAND* LOW SAND ORGANIC HEAVY SAND LOAM SANDY CLAY-HEAVY CLAY
LA POULE	HIGH SAND* LOW SAND ORGANIC SANDY LOAMY LOW RIVER CLAY* HIGH CLAY WITH REDDISH SPOT* MEDIUM HIGH TO LOW REDDISH SPOT CLAY
ORYZA	BADLY DRAINAGE CLAY WITH REDDISH SPOT WET CLAY WITH REDDISH SPOT BADLY DRAINAGE CLAY WITH YELLOWISH SPOT* WET CLAY WITH YELLOWISH SPOT*
BROKOBAKA	COARSE SANDY LOAM ON HILL TOP: GOOD DRAINAGE SIDES : GOOD DRAINAGE VALLEYS : MEDIUM TO POOR DRAINAGE

Source: Own tabulation

(*): Predominant soil characteristic.

TABLE 24. LVV, SURINAME. Participation of each field in the compositon of the personnel according to specialization levels. 1984 - 1985.

AREAS	B.SC.	TOTAL B.SC.	M.SC.	TOTAL M.SC.	Ph.D.	TOTAL Ph.D.	TOTAL	
	#	%	#	%	#	%	#	%
1. Soil science	1	10.0	-	-	-	-	1	5.0
2. Agric. Eng.	1	10.0	-	-	-	-	1	5.0
3. Agronomy	1	10.0	3	33.3	-	-	4	20.0
4. Anim. Science	-	-	1	11.1	-	-	1	5.0
5. Plant protection	5	50.0	3	33.3	-	-	8	40.0
6. Horticulture	2	20.0	-	-	1	100.0	3	15.0
7. Technology	-	-	2	22.3	-	-	2	10.0
TOTAL	10	100.0	9	100.0	1	100.0	20	100.0

Source: Own tabulation

TABLE 25. LVV, SURINAME. Participation of each field in the composition of the personnel according to specialization levels. 1986.

AREAS	B.SC. #	TOTAL B.SC. %	M.SC. #	TOTAL M.SC. %	Ph.D. #	TOTAL Ph.D. %	TOTAL #	TOTAL %
1. Soil science	1	11.1	-	-	-	-	1	6.3
2. Agric. Eng.	1	11.1	-	-	-	-	1	6.2
3. Agronomy	1	11.1	2	28.6	-	-	3	18.8
4. Anim. science	-	-	1	14.3	-	-	1	6.2
5. Plant protection	4	44.5	3	42.8	-	-	7	43.8
6. Horticulture	2	22.2	-	-	-	-	2	12.5
7. Technology	-	-	1	14.3	-	-	1	6.2
TOTAL	9	100.0	7	100.0	-	-	16	100.0

Source: Own tabulation

TABLE 26. LVV, SURINAME. Location of the personnel according to specialization levels. 1986*

FIELD	B.SC. #	TOTAL B.SC. %	M.SC. #	TOTAL M.SC. %	Ph.D. #	TOTAL Ph.D. %	NATIN** #	TOTAL NATIN %	TOTAL #	TOTAL %
Agricultural Experiment Station (Paramaribo)	8	88.8	6	85.7	-	-	21	77.8	35	81.4
Boma	-	-	-	-	-	-	-	-	-	-
Oryza	-	-	-	-	-	-	-	-	-	-
Jarikaba	-	-	-	-	-	-	1	3.7	1	2.3
La Poule	-	-	-	-	-	-	1	3.7	1	2.3
Dirkshoop	-	-	-	-	-	-	-	-	-	-
Tijgerkreek-W	-	-	-	-	-	-	1	3.7	1	2.3
Europolder	1	11.2	-	-	-	-	1	3.7	2	4.7
Jenny	-	-	-	-	-	-	-	-	-	-
Coebiti	-	-	-	-	-	-	1	3.7	1	2.3
Brokobaka	-	-	1	14.3	-	-	1	3.7	2	4.7
TOTAL	9	100.0	7	100.0	-	-	27	100.0	43	100.0

Source: Own tabulation
(*): Until August, 1986
(**): Technical Degree

ANNEX N° 5

CONTACTS ESTABLISHED IN DOING THIS ANALYSIS

Permanent Secretary, LVV
Deputy Director for Animal Husbandry, LVV
Research Coordinator, LVV
Coordinator Planning Division, LVV
Coordinator Fisheries, LVV
Virologist Specialist, LVV
Bacteriology - Mycology Specialist, LVV
Oil Palm & Coconut Specialist, LVV
Chief Division International Affairs, LVV
Director of SEL
Manager Baboenhol, SEL
Deputy Director OAS

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